Table of Contents

As filed with the Securities and Exchange Commission on April 6, 2015

Registration No. 333-

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM S-1
REGISTRATION STATEMENT

Under
The Securities Act of 1933

ATYR PHARMA, INC.

(Exact name of registrant as specified in its charter)

Delaware	2836	20-3435077
(State or other jurisdiction of incorporation or organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification Number)

3545 John Hopkins Court, Suite #250
San Diego, CA 92121
(858) 731-8389
(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

John D. Mendlein, Ph.D.
Chief Executive Officer and Executive Chairman
3545 John Hopkins Court, Suite #250
San Diego, CA 92121
(858) 731-8389
(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:

Kingsley L. Taft Maggie L. Wong Mitzi Chang Goodwin Procter LLP 3 Embarcadero Center, 24th Floor San Francisco, CA 94111 (415) 733-6000	Nancy D. Krueger Vice President, Legal Affairs aTyr Pharma, Inc. 3545 John Hopkins Court, Suite #250 San Diego, CA 92121 (858) 731-8389	Alan F. Denenberg Davis Polk & Wardwell LLP 1600 El Camino Real Menlo Park, CA 94025 (650) 752-2000

Approximate date of commencement of proposed sale to the public: **As soon as practicable after the effective date of this registration statement**.

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, as amended, check the following box. ☐

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, please check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this Form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act.

Large Accelerated Filer	☐	Accelerated Filer	☐
Non-Accelerated Filer	☒ (Do not check if a smaller reporting company)	Smaller Reporting Company	☐

CALCULATION OF REGISTRATION FEE

Title of Each Class of Securities to be Registered	Proposed Maximum Aggregate Offering Price (1)(2)	Amount of Registration Fee
Common Stock, par value $0.001 per share	$86,250,000	$10,022.25

(1) Estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(o) under the Securities Act.
(2) Includes the offering price of shares that the underwriters may purchase pursuant to an over-allotment option.

The registrant hereby amends this registration statement on such date or dates as may be necessary to delay its effective date until the registrant shall file a further amendment which specifically states that this registration statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933 or until this registration statement shall become effective on such date as the Commission, acting pursuant to said Section 8(a), may determine.

Table of Contents

The information in this preliminary prospectus is not complete and may be changed. We may not sell these securities until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell nor does it seek an offer to buy these securities in any jurisdiction where the offer or sale is not permitted.

Subject to completion, dated , 2015

Preliminary Prospectus

Shares

Common Stock

This is the initial public offering of shares of common stock of aTyr Pharma, Inc. We are offering shares to be sold in this offering. Prior to this offering, there has been no public market for our common stock. The initial public offering price of our common stock is expected to be between $ and $ per share. We have applied to list our common stock on The NASDAQ Global Market under the symbol "LIFE."

We are an "emerging growth company" under applicable Securities and Exchange Commission rules and will be subject to reduced public company reporting requirements.

	Per share	Total
Initial public offering price	$	$
Underwriting discounts and commissions (1)	$	$
Proceeds to aTyr, before expenses	$	$

(1) See "Underwriting" for additional disclosure regarding underwriting discounts, commissions and estimated offering expenses.

The underwriters may also purchase up to an additional shares from us at the public offering price, less the underwriting discount, within 30 days from the date of this prospectus to cover over-allotments.

Investing in our common stock involves a high degree of risk. See "Risk Factors" beginning on page 12.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The underwriters expect to deliver the shares on or about , 2015.

J.P. Morgan **Citigroup**

BMO Capital Markets

William Blair

, 2015

TABLE OF CONTENTS

Through and including , 2015 (the 25th day after the date of this prospectus), all dealers effecting transactions in these securities, whether or not participating in this offering, may be required to deliver a prospectus. This delivery requirement is in addition to the obligation of dealers to deliver a prospectus when acting as underwriters and with respect to their unsold allotments or subscriptions.

You should rely only on the information contained in this prospectus or in any free writing prospectus we file with the Securities and Exchange Commission. Neither we nor the underwriters have authorized anyone to provide you with information different from that contained in this prospectus or any free writing prospectus. We take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. We and the underwriters are offering to sell, and seeking offers to buy, common stock only in jurisdictions where offers and sales are permitted. The information contained in this prospectus is accurate only as of the date on the front cover page of this prospectus, or other earlier date stated in this prospectus, regardless of the time of delivery of this prospectus or of any sale of our common stock.

The market data and certain other statistical information used throughout this prospectus are based on independent industry publications, governmental publications, reports by market research firms or other independent sources. Some data are also based on our good faith estimates.

We own various U.S. federal trademark applications and unregistered trademarks, including our company name and Resolaris™. All other trademarks or trade names referred to in this prospectus are the property of their respective owners. Solely for convenience, the trademarks and trade names in this prospectus are referred to without the symbols ® and ™, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

PROSPECTUS SUMMARY

This summary highlights information contained elsewhere in this prospectus and does not contain all of the information that you should consider in making your investment decision. Before investing in our common stock, you should carefully read this entire prospectus, including our consolidated financial statements and the related notes included elsewhere in this prospectus. You should also consider, among other things, the matters described under "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations," in each case appearing elsewhere in this prospectus. Unless otherwise stated, all references to "us," "our," "aTyr," "we," the "Company" and similar designations refer to aTyr Pharma, Inc. and its subsidiary, Pangu BioPharma Limited.

Overview

We engage in the discovery and clinical development of innovative medicines for patients suffering from severe, rare diseases using our knowledge of Physiocrine biology, a newly discovered set of physiological modulators. We have discovered approximately 300 Physiocrines (*physio* for life and *crine* for specific activity), a class of naturally occurring proteins that we believe promote homeostasis, a fundamental process of restoring stressed or diseased tissue to a healthier state. Physiocrines are extracellular signaling regions of tRNA synthetases, an ancient family of enzymes that catalyze a key step in protein synthesis. We believe that Physiocrines have evolved over time to modulate important cellular pathways by interacting with various types of cells, including immune and stem cells. Approximately 100 of these proteins interact with the immune system, which we believe presents a significant therapeutic opportunity to restore affected tissues to a healthier state through natural immuno-modulation mechanisms. We successfully completed a Phase 1 clinical trial of Resolaris, our first development candidate from our discovery engine, and are currently conducting a multi-national exploratory Phase 1b/2 clinical trial of Resolaris in adult patients with facioscapulohumeral muscular dystrophy, or FSHD, a severe, rare genetic myopathy with an immune component, for which there are currently no approved treatments. By leveraging our discovery engine and our knowledge of rare diseases, we aim to build a proprietary pipeline of novel product candidates with the potential to treat severe, rare diseases characterized by immune dysregulation. We plan to independently commercialize our Physiocrine-based therapeutics.

Our scientists were the first to identify the Resokine pathway (*reso* for restoring skeletal muscle health and *kine* for activity related to cytokines), an extracellular pathway in human skeletal muscle tissue associated with activities arising from various Physiocrine regions of the histidine aminoacyl tRNA synthetase, or HARS. We believe the Resokine pathway may play an important role in muscle and lung health. Certain patients with antisynthetase syndrome, a rare auto-immune disease, have antibodies to HARS, which are known as Jo-1 antibodies. These Jo-1 antibody patients often develop two significant clinical manifestations, skeletal inflammatory myopathy and interstitial lung disease, or ILD. We believe that the binding of Jo-1 antibodies, particularly to the immuno-modulatory domain of HARS, or iMod domain, blocks HARS immuno-modulatory functions and results in the muscle and lung disease in these Jo-1 antibody patients.

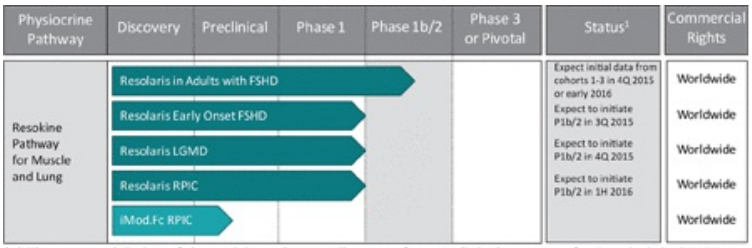
We are harnessing the Resokine pathway and its association with homeostasis in skeletal muscle to develop Resolaris as a first-in-class therapeutic for patients with rare myopathies with an immune component, or RMICs, for which there are limited or no approved treatments. A myopathy is a disease of skeletal muscle tissue, characterized by muscle fiber deterioration, muscle weakness and often an immune response in the affected muscle tissue. In contrast to most current immunology drugs, which are engineered antagonists of immunological pathways, Resolaris is derived from a naturally occurring protein, HARS, which we believe has the potential to reset the immune system in diseased tissue to a more normal state while maintaining the immune system's activity against exogenous, pathogen-based insults. We observed that stimulation of the Resokine pathway through the introduction of Resolaris and its derivatives in rodent models of both severe inflammation and myopathy led to immuno-modulatory effects. We have shown that stimulation of the Resokine pathway by Resolaris alters immune responses and the expression or release of immune-related proteins from cells in response to inflammation. HARS, which

contains the immuno-modulatory domain, is also released from human skeletal muscle. In addition to its immuno-modulatory properties, we believe the Resokine pathway may act on other physiological processes, including processes associated with stem cells, fibrosis and endothelial cells. Our initial therapeutic efforts target severe, rare disease indications in which patients suffer from the immune-related consequences of their genetic disease. We have identified over 20 distinct, molecularly definable RMIC indications, including FSHD and limb-girdle muscular dystrophies, or LGMD, in which we believe Resolaris has the potential to target the immune component of these genetic diseases.

We are also harnessing the Resokine pathway and its potential role in lung disease, specifically ILD, to develop Resolaris as a therapeutic for patients with rare pulmonary diseases with an immune component, or RPICs. ILD is associated with Jo-1 antibody patients and occurs in multiple other clinical settings. We are currently evaluating these other forms of ILD to identify the most appropriate RPIC indication for the initial clinical assessment of augmenting the Resokine pathway with Resolaris.

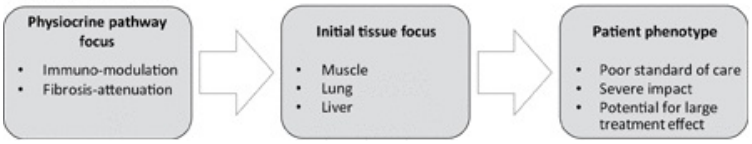
We have initiated a discovery program to explore varying exposures of the iMod domain of the Resokine pathway through protein engineering. The program seeks to develop a potential therapeutic that we refer to as iMod.Fc. We also believe our proprietary inventory of Physiocrines with their diverse functions have potential therapeutic application in a variety of diseases characterized by tissue dysfunction, including severe diseases of the lung, gut, skin, brain and liver. We intend to leverage our unique understanding of Physiocrines and their functions and our broad intellectual property portfolio, which we believe covers this entire class of potential protein therapeutics, to build a pipeline of product candidates that we expect to develop and commercialize independently for the treatment of various rare diseases.

Below are summaries of our product development pipeline and discovery engine process:



(1) The expected timing of the anticipated next milestones for our clinical programs for Resolaris in FSHD, LGMD and RPIC is based on our current estimates and is subject to change based upon a variety of factors discussed in this prospectus, including in the section entitled "Risk Factors."

Discovery Engine Process



We were founded in 2005 by Paul Schimmel, Ph.D. and Xiang-Lei Yang, Ph.D., two leading aminoacyl tRNA synthetase scientists at The Scripps Research Institute in San Diego, California. Our Executive Chairman and Chief Executive Officer, John D. Mendlein, Ph.D., was formerly the Chief Executive Officer of Adnexus Therapeutics, Inc. (acquired by Bristol-Myers Squibb Company) and Affinium Pharmaceuticals, Ltd. (acquired by Debiopharm Group), and held various roles at Aurora Biosciences Corporation (acquired by Vertex Pharmaceuticals, Incorporated). We have assembled an executive team with broad experience in the discovery, development and commercialization of innovative therapeutics, including transformative therapies for rare genetic diseases, such as Kalydeco, marketed by Vertex Pharmaceuticals Incorporated for the treatment of cystic fibrosis. We are advised by a Therapeutic Advisory Board and a Scientific Advisory Board, both comprised of leaders in the field of biology for medical applications, including our special advisor in immunology, Bruce Beutler, M.D., recipient of the 2011 Nobel Prize in Physiology or Medicine for his work in immunology. Our key investors include entities affiliated with Alta Partners; Cardinal Partners; Domain Associates; Fidelity Management & Research Company; Polaris Partners and Sofinnova Ventures.

Our Physiocrine Advantage: Targeting the Immune System in Genetic Diseases

We believe the immune system is an important component of the pathophysiology of many rare genetic diseases. It is our belief that the immune system acts differently in the presence of some genetic mutations that alter protein levels, structure or function compared to normal tissue. This immune response contributes to a pathophysiologic state in the diseased tissue. By modulating various components of the immune system, Physiocrines can potentially alter this pathophysiological immune activity in the diseased tissue by promoting homeostasis and restoring immune balance in the diseased tissue. Using the immune component as a target or intervention point in the treatment of genetic diseases has precedent as an approach to developing a protein therapeutic. Examples include Soliris, for acquired paroxysmal nocturnal hemoglobinuria (PNH), and Cinryze, for hereditary angioedema (HAE).

Resolaris, Our First Clinical Product Candidate: a Pipeline within a Product Opportunity

Resolaris in FSHD, a Rare Myopathy with an Immune Component (RMIC)

We developed Resolaris based on our discovery of the Resokine pathway in skeletal muscle tissue, an extracellular pathway in human skeletal muscle tissue associated with activities arising from various Physiocrine regions of the human histidine aminoacyl tRNA synthetase. We believe, based on preclinical data and observations from Jo-1 antibody patients, that the Resokine pathway is involved in promoting skeletal muscle health and homeostasis. We believe it does so, in part, by acting as an immunomodulator in skeletal muscle.

Our first clinical development target for Resolaris is FSHD, a rare genetic myopathy in which immune cells invade diseased skeletal muscle and for which there are no approved treatments. The primary clinical phenotype of FSHD is debilitating skeletal muscle deterioration and weakness. The symptoms of FSHD develop in an asymmetrical “muscle by muscle” fashion. This is in contrast to other genetic myopathies, such as Duchenne muscular dystrophy, that usually affect groups of muscles concurrently and symmetrically. In addition to debilitating muscle weakness, FSHD patients often experience severe fatigue, muscle deterioration and pain. The disease is typically diagnosed by the presence of a characteristic pattern of muscle weakness and other clinical symptoms, as well as through genetic testing. While estimates of FSHD prevalence vary, studies exploring the topic have identified average prevalence rates of approximately one in 17,000. Applying this rate to the U.S. population, based on recent census data, yields a domestic FSHD population of approximately 19,000.

We successfully completed a single ascending dose Phase 1 clinical trial in healthy subjects of Resolaris in the first quarter of 2014. Resolaris was found to be well tolerated in all dose cohorts and there were no serious adverse events. We are currently conducting a multi-national exploratory Phase 1b/2 clinical trial of Resolaris in

adult patients with FSHD in the European Union. This randomized, double-blind, placebo-controlled trial is designed to evaluate the safety, tolerability, pharmacokinetics and immunogenicity of multiple intravenous doses of Resolaris in adults with FSHD. We also intend to explore pharmacodynamic changes in immune activity and responses in skeletal muscle. Resolaris is being studied in three dose escalation cohorts (0.3 mg/kg, 1.0 mg/kg and 3.0 mg/kg). In the fourth quarter of 2014, we completed multiple dosing of the patients in the first dose cohort. We are currently dosing patients in the second cohort. Subject to our interactions with regulatory authorities and patient enrollment in accordance with our clinical development plans, we expect to report initial results from this clinical trial in the fourth quarter of 2015 or early 2016. In parallel with conducting our initial clinical trial in adults with FSHD, we are finalizing our plans to evaluate Resolaris in a multi-center, international trial of patients with early onset FSHD, which we define as patients with onset of disease before the age of 18. Subject to our interactions with regulatory authorities, we expect to initiate this clinical trial in the third quarter of 2015.

Resolaris in Other RMIC Indications

In addition to FSHD, we plan to address other severe, genetic diseases in which immune cells invade diseased muscle. We are evaluating various forms of limb-girdle muscular dystrophy, or LGMD, a broad class of indications of over 20 rare genetically defined myopathies. These diseases are linked by the common distribution of their muscle weakness (e.g., predominantly in the proximal limb muscles and the pelvic and shoulder girdle muscles). We intend to select genetic forms of LGMD that we believe will be most amenable to treatment with Resolaris, such as those with the characteristics of the associated immuno-pathology in skeletal muscle. We plan to commence clinical trials of Resolaris in at least one LGMD indication in adult patients in the fourth quarter of 2015.

Resolaris Non-Muscle Indication Set: Rare Pulmonary Diseases with an Immune Component (RPICs)

The Resokine pathway may play an important role in lung health. ILD develops in approximately 85% of anti-synthetase syndrome patients with Jo-1 antibodies to Resokine. In addition to its association with Jo-1 antibody patients, ILD occurs in multiple other clinical settings. We are currently evaluating these forms of ILD to identify the most appropriate RPIC indication for the initial clinical assessment of Resolaris. Among these forms of ILD, we have identified several that can result in severe and progressive lung disease and share immuno-pathophysiology features that overlap with our demonstrated Resolaris activities. Examples include idiopathic non-specific interstitial pneumonias, idiopathic pulmonary fibrosis, lymphocytic interstitial pneumonia, bleomycin (the chemotherapeutic agent)-induced pulmonary fibrosis, and ILD in the setting of systemic sclerosis, or scleroderma, and sarcoidosis.

To test that augmenting the Resokine pathway has therapeutic potential in ILD, we have recently generated data in a mouse model of lung inflammation and pulmonary fibrosis induced by bleomycin. The mouse equivalent of Resolaris has shown promising therapeutic activity in this model which has been used previously in the development of therapeutics for different forms of ILD, including the drug pirfenidone or Esbriet, which was approved by the FDA in October 2014 for the treatment of idiopathic pulmonary fibrosis. We noted that Resolaris administration attenuated the radiographic and histological manifestations of pathophysiology in this model when it was dosed therapeutically. These mouse Resolaris pharmacology data provide pre-clinical evidence supporting the therapeutic potential of Resolaris for the treatment of ILD.

We are currently evaluating the most appropriate RPIC indication for the initial clinical evaluation of augmenting the Resokine pathway in lung via Resolaris. The data obtained in this initial ILD trial will inform further development of therapeutics leveraging the Resokine pathway in RPICs.

An Emerging Pipeline of Product Opportunities

Our Preclinical Immuno-Modulatory Domain Program from the Resokine Pathway: iMod.Fc

We have conducted a series of experiments to understand how various product form modifications enhance exposure and activity of the iMod domain of Resokine. Fc fusion proteins have been successfully commercialized previously by others to enhance exposure while enabling biological activity. We explored this approach by fusing the immunoglobin Fc with one iMod domain, which can form a dimer.

Our Fc fusion experiments have begun to delineate how to enhance the exposure of the iMod domain of Resokine while maintaining activity and provide insights into this domain harboring immuno-modulatory activity. Initial experiments have indicated that Fc fusion proteins can increase exposure and maintain iMod domain activity. We have generated encouraging results for one iMod.Fc in a mouse model of lung inflammation and fibrosis.

Our Discovery Engine for Therapeutic Applications of Physiocrines: Lung and Liver Focused

Our discovery efforts are based on our scientific investigation of Physiocrine pathways. Through a combination of deep sequencing and bioinformatics panning, augmented by proteomic analysis, we identified over 300 naturally occurring Physiocrines. We expressed and purified over 200 of these Physiocrines and evaluated these purified Physiocrines in numerous cell-based assays to determine their activity in important human physiological pathways. In July 2014, a publication in *Science* described a portion of the results from our research, along with our collaborators at Scripps La Jolla, Scripps Florida, Stanford University and the Hong Kong University of Science and Technology.

Our scientists have conducted experiments that demonstrated that the blockade of Physiocrine pathways in rodents resulted in an *in vivo* phenotype characterized by immune cell infiltration or fibrotic disease in the lung or the liver. These data support the concept that Physiocrines may have the potential to inhibit, limit, or otherwise regulate immune cell activity in both the lung and the liver, as well as the subsequent development of fibrosis in these tissues. Accordingly, we are continuing to investigate certain Physiocrines for potential therapeutic applications in both lung and liver indications.

Our Strategy

We aim to capitalize on Physiocrine biology, a new and important area of human health, to develop first-in-class medicines to treat patients with severe diseases characterized by an immune component. Key elements of our strategy include the following:

- ***Leverage our leadership position in Physiocrine biology to develop and commercialize novel, first-in-class medicines for patients affected by severe, rare diseases with significant unmet need.*** We believe our initial focus on severe, rare diseases will allow us to more effectively deploy investor capital for the independent development and commercialization of medicines for the benefit of patients and our stakeholders.
- ***Rapidly and prudently pursue the development and commercialization of Resolaris to treat patients across multiple severe, rare disease indications.*** We are currently evaluating Resolaris in a Phase 1b/2 clinical trial in adult patients with FSHD and expect to report initial results from this clinical trial in the fourth quarter of 2015 or early 2016. In addition, we plan to initiate clinical trials of Resolaris in early onset FSHD and other RMIC indications, including LGMD, as well as other rare diseases with an immune component, such as RPIC indications.
- ***Leverage our discovery engine to build a pipeline of first-in-class Physiocrine medicines to address severe conditions characterized by immune pathway dysfunction or fibrosis.*** We plan to leverage our discovery engine to identify other Physiocrine pathways of interest and select additional potential product candidates for preclinical and clinical investigation in a variety of disease settings on a tissue-by-tissue basis, which may include severe, currently inadequately treated diseases of the lung and liver.

- ***Retain exclusive worldwide commercial rights to our product candidates to pursue autonomous commercialization***. We intend to build a pipeline of product candidates that we can commercialize independently through a relatively small, dedicated commercial organization focused on patient needs and directed at a limited number of physicians who specialize in the treatment of our target patient populations.
- ***Expand our knowledge and intellectual property position in Physiocrine biology by emphasizing continuous scientific and business improvements.*** We intend to aggressively pursue new scientific and therapeutic insights into the potential therapeutic applications of Physiocrines, and to broaden our patent portfolio across this class of novel protein therapeutics and their antibody antagonists.
- ***Build a world class organization oriented to patients and focused on rigorous scientific, clinical and industrial advancements***. We have assembled a world class team with industry-recognized expertise in biology, medicine and the commercialization of innovative and important therapeutics. We intend to continue to build on our leadership position in Physiocrine and immunology-based therapeutics and grow an organization and culture dedicated to the development and commercialization of medicines with the potential to positively transform the lives of patients with severe, rare diseases.

Risks Associated with Our Business

Our ability to implement our business strategy is subject to numerous risks, as more fully described in the section entitled "Risk Factors" immediately following this prospectus summary. These risks include, among others:

- Resolaris, and any other product candidates that we may develop, represent novel therapeutic approaches, which may cause significant delays or may not result in any commercially viable drugs.
- We are highly dependent on the success of Resolaris, which is still in early clinical development. If we are unable to successfully complete or otherwise advance clinical development, obtain regulatory or marketing approval for, or successfully manufacture or commercialize, Resolaris, or experience significant delays in doing so, our business will be materially harmed.
- Data generated in our preclinical studies and patient sample data relating to the Resokine pathway may not be predictive or useful for determining the immuno-modulatory activity or therapeutic effects, if any, of Resolaris in patients, and success in early-stage clinical trials may not be predictive of success in later-stage clinical trials.
- We have incurred significant losses since our inception and anticipate that we will continue to incur significant losses for the foreseeable future. We have never generated any revenue from product sales and may never be profitable.
- We will need substantial additional funding. If we are unable to raise capital when needed, we would be forced to delay, reduce or eliminate product development programs or commercialization efforts.
- We have not studied Resolaris or any of our other product candidates in any human clinical trials designed to show efficacy to date.
- We are developing novel product candidates for the treatment of diseases in which there is little clinical drug development experience and, in some cases, are using new endpoints or methodologies. The regulatory pathways for approval are not well defined, and as a result there is greater risk that the outcome of our clinical trials will not be favorable.
- We rely, and expect to continue to rely, on third parties to conduct some or all aspects of our product manufacturing, protocol development, research and preclinical and clinical testing, and these third parties may not perform satisfactorily.

- If we are unable to obtain and maintain patent, trade secret or other intellectual property protection for our medicines and technology, or if the scope of the patent protection obtained is not sufficiently broad, our competitors could develop and commercialize medicines and technology similar or identical to ours, and our ability to successfully commercialize our medicines and technology may be adversely affected.
- If we are not able to obtain, or if there are delays in obtaining, required regulatory approvals, we will not be able to commercialize, or will be delayed in commercializing, our product candidates, and our ability to generate revenue will be materially impaired.

Implications of Being an Emerging Growth Company

We qualify as an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012, as amended, or the JOBS Act. As an emerging growth company, we may take advantage of specified reduced disclosure and other requirements that are otherwise applicable generally to public companies. These provisions include:

- only two years of audited financial statements in addition to any required unaudited interim financial statements with correspondingly reduced "Management's Discussion and Analysis of Financial Condition and Results of Operations" disclosure;
- reduced disclosure about our executive compensation arrangements;
- no non-binding advisory votes on executive compensation or golden parachute arrangements; and
- exemption from the auditor attestation requirement in the assessment of our internal control over financial reporting.

We may take advantage of these exemptions for up to five years or such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company on the date that is the earliest of (i) the last day of the fiscal year in which we have total annual gross revenues of $1 billion or more; (ii) the last day of our fiscal year following the fifth anniversary of the date of the completion of this offering; (iii) the date on which we have issued more than $1 billion in nonconvertible debt during the previous three years; or (iv) the date on which we are deemed to be a large accelerated filer under the rules of the Securities and Exchange Commission, or SEC. We may choose to take advantage of some but not all of these exemptions. We have taken advantage of reduced reporting requirements in this prospectus. Accordingly, the information contained herein may be different from the information you receive from other public companies in which you hold stock. We have irrevocably elected to "opt out" of the exemption for the delayed adoption of certain accounting standards and, therefore, will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

Company and Other Information

We were incorporated under the laws of the State of Delaware in September 2005. Our principal executive office is located at 3545 John Hopkins Court, Suite #250, San Diego, California 92121, and our telephone number is (858) 731-8389. Our website address is www.atyrpharma.com. We do not incorporate the information on or accessible through our website into this prospectus, and you should not consider any information on, or that can be accessed through, our website as part of this prospectus.

THE OFFERING

Common stock offered by us	shares.
Common stock to be outstanding immediately after this offering	shares (shares if the underwriters exercise their over-allotment option in full).
Underwriters' option to purchase additional shares	We have granted a 30-day option to the underwriters to purchase up to an aggregate of additional shares of common stock to cover over-allotments.
Use of proceeds	We intend to use the net proceeds from this offering to fund our clinical development of Resolaris, to advance our other research, discovery and development activities, and for working capital and general corporate purposes. For a more complete description of our intended use of the proceeds from this offering, see "Use of Proceeds."
Risk factors	You should carefully read "Risk Factors" in this prospectus for a discussion of factors that you should consider before deciding to invest in our common stock.
Proposed NASDAQ Global Market symbol	"LIFE"

The number of shares of our common stock to be outstanding after this offering is based on 136,729,927 shares of our common stock outstanding as of December 31, 2014, which includes the conversion of all outstanding shares of redeemable convertible preferred stock, including the shares of our Series E redeemable convertible preferred stock issued in March 2015, into an aggregate of 129,492,356 shares of common stock immediately prior to the completion of this offering and excludes:

- 12,047,225 shares of common stock issuable upon the exercise of stock options outstanding as of December 31, 2014 at a weighted average exercise price of $0.58 per share;
- 206,581 shares of common stock issuable upon the exercise of warrants outstanding as of December 31, 2014 at a weighted average exercise price of $1.82 per share, which warrants prior to the completion of this offering are exercisable to purchase redeemable convertible preferred stock;
- the issuance of 953,228 shares of common stock to The Scripps Research Institute on March 31, 2015;
- 2,388,777 shares of common stock issuable upon the exercise of stock options granted to employees, directors and consultants subsequent to December 31, 2014 at a weighted average exercise price of $1.15 per share;
- 10,527,447 shares of common stock currently available for future issuance under our 2014 Stock Plan;
- 751,314 shares of common stock issuable upon the conversion of 751,314 shares of Series D redeemable convertible preferred stock that may be issued under a convertible promissory note issued to an affiliate of our landlord, if the noteholder elects to convert the note in accordance with its terms; and
- shares of common stock reserved for future issuance under our 2015 Stock Option and Incentive Plan, or the 2015 Plan, which will become effective immediately prior to the completion of this offering.

Unless otherwise indicated, all information in this prospectus reflects or assumes the following:

- the filing of our amended and restated certificate of incorporation and the adoption of our amended and restated bylaws, which will occur immediately prior to the completion of this offering;
- the issuance and sale of 68,166,894 shares of our Series E redeemable convertible preferred stock in March 2015 for aggregate gross proceeds of approximately $76.3 million;
- the conversion of all of our outstanding shares of redeemable convertible preferred stock, including the shares of our Series E redeemable convertible preferred stock issued in March 2015, into 129,492,356 shares of common stock upon the completion of this offering at a rate of one share of redeemable convertible preferred stock into one share of common stock, except for our Series E redeemable convertible preferred stock, for which the conversion rate is one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock;
- our repayment in cash, upon the completion of this offering, of approximately $2.5 million in principal and accrued interest as of December 31, 2014 under a convertible promissory note issued to an affiliate of our landlord, assuming the note holder does not elect, on or prior to the date of completion of this offering, to forgive all accrued interest under the note and convert the $2.0 million in principal under the note into 751,314 shares of our Series D redeemable convertible preferred stock, which would convert into 751,314 shares of common stock upon the completion of this offering; and
- no exercise by the underwriters of their option to purchase up to an additional shares of common stock in this offering.

SUMMARY CONSOLIDATED FINANCIAL DATA

The following summary consolidated financial information should be read together with the information under the caption "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our consolidated financial statements and accompanying notes appearing elsewhere in this prospectus. The summary consolidated statement of operations data for the years ended December 31, 2013 and 2014 and the summary consolidated balance sheet data as of December 31, 2014 are derived from our audited consolidated financial statements appearing elsewhere in this prospectus. Our historical results are not necessarily indicative of results that may be expected in the future.

	Years Ended December 31,	
	2013	2014
	(in thousands, except share and per share data)	
Statements of Operations Data:		
Operating expenses:		
Research and development	$ 13,832	$ 16,777
General and administrative	5,710	6,777
Total operating expenses	19,542	23,554
Loss from operations	(19,542)	(23,554)
Other income (expense)	(472)	(796)
Net loss	(20,014)	(24,350)
Accretion to redemption value of redeemable convertible preferred stock	(1,637)	(416)
Net loss attributable to common stockholders	$ (21,651)	$ (24,766)
Net loss per share attributable to common stockholders, basic and diluted (1)	$ (3.57)	$ (3.73)
Weighted average shares outstanding, basic and diluted (1)	6,067,342	6,635,778
Pro forma net loss per share attributable to common stockholders, basic and diluted (unaudited) (1)		$ (0.30)
Pro forma weighted average shares outstanding, basic and diluted (unaudited) (1)		80,123,193

(1) See Note 2 to our audited consolidated financial statements included elsewhere in this prospectus for an explanation of the method used to calculate the historical and pro forma net loss per share, basic and diluted, and the number of shares used in the computation of the per share amounts.

	As of December 31, 2014		
	Actual	Pro Forma (1)	Pro Forma As Adjusted (2)(3)
		(in thousands)	
Consolidated Balance Sheet Data:			
Cash, cash equivalents and investment securities	$ 15,853	$ 89,647	$
Total assets	20,644	94,438	
Preferred stock warrant liabilities	319	—	
Convertible promissory note	2,000	—	
Working capital	6,396	82,994	
Commercial bank debt, net of current portion	5,142	5,142	
Redeemable convertible preferred stock	95,619	—	
Accumulated deficit	(110,151)	(110,151)	
Total stockholders' equity (deficit)	(91,010)	81,207	

(1) Pro forma amounts reflect (i) the filing and effectiveness of our amended and restated certificate of incorporation, (ii) the issuance and sale of 68,166,894 shares of our Series E redeemable convertible preferred stock in March 2015 for aggregate gross proceeds of approximately $76.3 million, (iii) the conversion of all our outstanding shares of redeemable convertible preferred stock, including the shares of our Series E redeemable convertible preferred stock issued in March 2015, into an aggregate of 129,492,356 shares of our common stock at a rate of one share of redeemable convertible preferred stock into one share of common stock, except for our Series E redeemable convertible preferred stock, for which the conversion rate is one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, and the resultant reclassification of our redeemable convertible preferred stock to stockholders' deficit, (iv) the adjustment of our outstanding warrants to purchase redeemable convertible preferred stock into warrants to purchase 206,581 shares of our common stock, and the resultant reclassification of our preferred stock warrant liabilities to additional paid-in capital, a component of total stockholders' equity (deficit) and (v) our repayment in cash, upon the completion of this offering, of approximately $2.5 million in principal and accrued interest as of December 31, 2014 under a convertible promissory note issued to an affiliate of our landlord, assuming the note holder does not elect, on or prior to the date of completion of this offering, to forgive all accrued interest under the note and convert the $2.0 million in principal under the note into 751,314 shares of our Series D redeemable convertible preferred stock, which would convert into 751,314 shares of common stock upon the completion of this offering.

(2) Pro forma as adjusted amounts reflect the pro forma conversion adjustments described in footnote (1) above, as well as the sale of shares of our common stock in this offering at the assumed initial public offering price of $ per share, the midpoint of the range set forth on the cover page of this prospectus, and after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

(3) A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the range set forth on the cover page of this prospectus, would increase (decrease) each of cash, cash equivalents and investment securities, total assets, working capital and total stockholders' equity (deficit) by approximately $ million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of one million shares in the number of shares offered by us would increase (decrease) each of cash, cash equivalents and investment securities, total assets, working capital and total stockholders' equity (deficit) by approximately $ million, assuming the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. The pro forma as adjusted information discussed above is illustrative only and will be adjusted based on the actual public offering price and other terms of this offering determined at pricing.

RISK FACTORS

Investing in our common stock involves a high degree of risk. You should carefully consider the risks described below along with all of the other information contained in this prospectus, including our consolidated financial statements and the related notes and "Management's Discussion and Analysis of Financial Condition and Results of Operations," before deciding whether to purchase our common stock. If any of the adverse events described in the following risk factors actually occurs, our business, results of operations and financial condition may suffer significantly. As a result, the trading price of our common stock could decline, and you may lose all or part of your investment in our common stock. Additional risks or uncertainties not presently known to us or that we do not currently deem material may also impair our business operations.

Risks related to the discovery, development and regulation of our Physiocrine-based product candidates

Resolaris and any other product candidates that we may develop from our discovery engine represent novel therapeutic approaches, which may cause significant delays or may not result in any commercially viable drugs.

We have concentrated our research and development efforts on Physiocrine biology, a new area of biology, and our future success is highly dependent on the successful development of Physiocrine-based product candidates, including Resolaris and additional product candidates arising from the Resokine pathway. Physiocrine-based biology represents a novel approach to drug discovery and to our knowledge, no drugs have been developed using, or based upon, this approach. Despite the successful development of other naturally occurring proteins, such as erythropoietin and insulin, as therapeutics, Physiocrines represent a novel class of protein therapeutics, and our development of these therapeutics is based on our new understanding of human physiology. In particular, the mechanism of action of Physiocrines and their role in immuno-modulation and tissue regeneration have not been studied extensively, nor has the safety of this class of protein therapeutics been evaluated extensively in humans. The Physiocrines that we elect to develop may not have the physiological functions that we currently ascribe to them, may have limited or no therapeutic applications, or may present safety problems of which we are not yet aware. We cannot be sure that our discovery engine will yield product candidates with therapeutic applications of Physiocrines that are safe, effective, approvable by regulatory authorities, manufacturable, scalable, or profitable.

Because our work in Physiocrine biology and our product candidates represent a new therapeutic approach, developing and commercializing our product candidates subjects us to a number of challenges, including:

- defining indications within our targeted rare diseases and clinical endpoints within each indication that are appropriate to support regulatory approval;
- obtaining regulatory approval from the U.S. Food and Drug Administration, or the FDA, and other regulatory authorities that have little or no experience with the development of Physiocrine-based therapeutics;
- educating medical personnel regarding the potential side effect profile of each of our product candidates, such as the potential for the development of antibodies against our purified protein therapeutics;
- developing processes for the safe administration of these product candidates, including long-term follow-up for all patients who receive our product candidates;
- sourcing clinical and, if approved, commercial supplies for the materials used to manufacture and process our product candidates;
- developing a manufacturing process and distribution network that ensures consistent manufacture of our product candidates in compliance with current Good Manufacturing Practices, or cGMPs, and related requirements, with a cost of goods that allows for an attractive return on investment;
- establishing sales and marketing capabilities after obtaining any regulatory approval to gain market acceptance; and

- developing therapeutics for rare and more common diseases or indications beyond those addressed by our current product candidates.

Moreover, public perception of safety issues, including adoption of new therapeutics or novel approaches to treatment, may adversely influence the willingness of subjects to participate in clinical trials, or if approved, of physicians to adopt and prescribe novel therapeutics. Physicians, hospitals and third-party payors often are slow to adopt new products, technologies and treatment practices. Physicians may decide the therapy is too complex or unproven to adopt and may choose not to administer the therapy. Based on these and other factors, healthcare providers and payors may decide that the benefits of any Physiocrine-based therapeutic for which we receive regulatory approval do not or will not outweigh its costs.

We are highly dependent on the success of Resolaris, our first clinical product candidate, which is still in early clinical development. If we are unable to successfully complete or otherwise advance clinical development, obtain regulatory or marketing approval for, or successfully commercialize, Resolaris, or experience significant delays in doing so, our business will be materially harmed.

To date, we have expended significant time, resources and effort on the discovery and development of Resolaris, including conducting preclinical studies and our Phase 1 clinical trial, and initiating and preparing for additional clinical trials. We have not yet commenced or completed any evaluation of Resolaris in human clinical trials designed to demonstrate efficacy to the satisfaction of the FDA. We currently generate no revenue from the sale of any product, and our ability to generate product revenues and to achieve commercial success, which we do not expect will occur for many years, if ever, will initially depend on our ability to successfully develop, obtain regulatory approval for and commercialize Resolaris for the treatment of one or more of our target rare disease indications in the United States and any foreign jurisdictions. Before we can market or sell Resolaris in the United States or foreign jurisdictions, we will need to commence and complete additional clinical trials (including larger, pivotal trials, which we have not yet commenced), manage clinical and manufacturing activities, obtain necessary regulatory approvals from the FDA in the United States and from similar regulatory authorities in other jurisdictions, obtain adequate clinical and commercial manufacturing supplies, build commercial capabilities, which may include entering into a marketing collaboration with a third party, and in some jurisdictions, obtain reimbursement authorization, among other things. We cannot assure you that we will be able to successfully complete the necessary clinical trials, obtain regulatory approvals, secure an adequate commercial supply for, or otherwise successfully commercialize, Resolaris. If we do not receive regulatory approvals for Resolaris, and even if we do obtain regulatory approvals, we may never generate significant revenues, if any, from commercial sales. If we fail to successfully commercialize Resolaris, we may be unable to generate sufficient revenues to sustain and grow our company, and our business, prospects, financial condition and results of operations will be adversely affected.

Data generated in our preclinical studies and patient sample data relating to the Resokine pathway may not be predictive or indicative of the immuno-modulatory activity or therapeutic effects, if any, of Resolaris in patients.

Our scientists discovered the Resokine pathway using *in vivo* screening systems designed to test potential immuno-modulatory activity in animal models of severe immune activity or inflammation, combined with data relating to the potential blockade of the Resokine pathway in a population of patients with myopathy that occurs in a particular rare disease, anti-synthetase syndrome, with Jo-1 antibodies. Translational medicine, or the application of basic scientific findings to develop therapeutics that promote human health, is subject to a number of inherent risks. In particular, scientific hypotheses formed from non-clinical observations may prove to be incorrect, and the data generated in animal models or observed in limited patient populations may be of limited value, and may not be applicable in clinical trials conducted under the controlled conditions required by applicable regulatory requirements and our protocols. For example, we have not studied the activity of the Resokine pathway in patients with rare genetic myopathies with an immune component, which forms the basis for our first clinical trial of Resolaris in facioscapulohumeral dystrophy, or FSHD, nor have we evaluated the

activity of the Resokine pathway in patients with interstitial lung disease, or ILD. Our knowledge of the activity of this pathway in Jo-1 antibody patients may not be applicable to our target patient populations in rare myopathies with an immune component, or RMICs, or rare pulmonary diseases with an immune component, or RPICs. In addition, our classification of diseases based on the existence of immune cell invasion (RMICs and RPICs) and our hypothesis that these represent potential indications for Resolaris may not prove to be therapeutically relevant. Accordingly, the conclusions that we have drawn from animal studies and patient sample data regarding the potential immuno-modulatory activity of molecules containing the immono-modulatory domain, or iMod domain, may not be substantiated in other animal models or in clinical trials. Any failure to demonstrate in controlled clinical trials the requisite safety and efficacy of Resolaris or other product candidates that we may develop will adversely affect our business, prospects, financial condition and results of operations.

We have not studied Resolaris or any of our other product candidates in any human clinical trials designed to show efficacy.

Preclinical and clinical data are often susceptible to varying interpretations and analyses, which may delay, limit or prevent regulatory approval. Many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their products. Accordingly, our earlier preclinical and clinical studies should not be relied upon as evidence that our current or future clinical trials will succeed. Study designs and results from previous studies are not necessarily predictive of our future clinical trial designs or results, and initial results may not be confirmed upon full analysis of the complete study data. In particular, Resolaris may not achieve positive results in our current and planned Phase 1b/2 clinical trials in RMICs and RPICs, and any results observed in our ongoing Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD may not be predictive of results for subsequent cohorts or of the overall results of the trial. Additionally, Resolaris may fail to show the desired safety and efficacy in later stages of clinical development, such as pivotal clinical trials, despite having successfully advanced through initial clinical trials. Any failure of Resolaris or any other product candidates that we may develop at any stage in the clinical development process would have a material adverse impact on our business, prospects, financial condition and results of operations.

Because we are developing novel product candidates for the treatment of diseases in which there is little clinical drug development experience and, in some cases, are using new endpoints or methodologies, the regulatory pathways for approval are not well defined, and as a result, there is greater risk that our clinical trials will not result in our desired outcomes.

Our initial clinical focus is on the development of Physiocrine-based therapeutics for the treatment of rare diseases, including FSHD, where patients may benefit from the activation of immuno-modulatory pathways. There are currently no approved treatments for FSHD or other rare disease indications that we intend to initially pursue, such as limb-girdle muscular dystrophy, or LGMD. As a result, the design and conduct of clinical trials for these indications are subject to increased risk, and we may experience setbacks with our ongoing or planned clinical trials for Resolaris or other product candidates that we may develop because of the limited clinical experience in our target indications. In particular, regulatory authorities in the United States and European Union have not issued definitive guidance as to how to measure and achieve efficacy. In addition, the protocol for our Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD includes the use of magnetic resonance imaging, or MRI, data as a measure of potential immuno-modulatory effects of Resolaris in diseased muscle tissue. Regulators have not yet determined that such data in FSHD patients signifies a clinical meaningful result or can support regulatory approvals. We may not achieve the pre-specified endpoint with statistical significance in our planned clinical trials of Resolaris in this indication or in other indications where there is limited or no regulatory guidance regarding appropriate clinical endpoints, which would decrease the chance of obtaining marketing approval for Resolaris. Additionally, it is difficult to establish clinically relevant endpoints for some of these indications because it may take a long time before any therapeutic effects of a drug can be observed.

We could also face challenges in designing clinical trials and obtaining regulatory approval for product candidates from our discovery engine due to the lack of historical clinical trial experience for this novel class of therapeutics. At the moment, because no Physiocrine-based products have received regulatory approval anywhere in the world, it is difficult to determine whether regulatory agencies will be receptive to the approval of our product candidates and to predict the time and cost associated with obtaining regulatory approval. The clinical trial requirements of the FDA and other regulatory agencies and the criteria these regulators use to determine the safety and efficacy of a product candidate vary substantially according to the type, complexity, novelty and intended use and market of the potential products. The regulatory approval process for novel product candidates such as ours can be more expensive and take longer than for other, better known or more extensively studied classes of product candidates. Any inability to design clinical trials with protocols and endpoints acceptable to applicable regulatory authorities, and to obtain regulatory approvals for our product candidates, would have an adverse impact on our business, prospects, financial condition and results of operations.

We may encounter substantial delays and other challenges in our clinical trials or we may fail to demonstrate safety and efficacy to the satisfaction of applicable regulatory authorities.

Before obtaining marketing approval from regulatory authorities for the sale of our product candidates, we must conduct extensive clinical trials to demonstrate the safety and efficacy of the product candidates in humans. Clinical trials are expensive, time-consuming, often delayed and uncertain as to outcome. We cannot guarantee that our ongoing and planned clinical trials of Resolaris in RMICs or RPICs, or any other clinical trials that we may plan to conduct, will be initiated or conducted as planned or completed on schedule, if at all. Following our submission of an investigational new drug application, or IND, to the Division of Neurology Products at the FDA to evaluate Resolaris in a Phase 1b/2 trial in adult patients with FSHD in the United States, our IND was placed on full clinical hold to address the non-clinical issue of the comparability of the drug substance used in our preclinical toxicology studies to that used in our Phase 1 clinical trial and proposed for use in the U.S. clinical trial in FSHD patients. We responded to the FDA's comparability request, and, in January 2015, our IND was removed from full clinical hold, allowing us to initiate the Phase 1b/2 trial in the United States. Our IND remains on partial clinical hold, which prohibits the evaluation of Resolaris at doses higher than our proposed 3.0 mg/kg dose pending our submission of additional non-clinical data to the FDA and the FDA's review of that data. We intend to submit a complete response to address this concern in the second half of 2015. We cannot assure you that the FDA will deem our response to be a complete response or that it will determine to lift the partial clinical hold. Although we do not expect the partial clinical hold to have a material impact on our current clinical development timeline for Resolaris in FSHD because we do not intend to evaluate Resolaris at doses higher than 3.0 mg/kg in the current clinical trial in the United States, any inability to initiate or complete our clinical trial of Resolaris in adult patients with FSHD in the United States, as a result of the partial clinical hold or otherwise, would delay our clinical development plans, may require us to incur additional clinical development costs and could impair our ability to obtain U.S. regulatory approval for Resolaris.

A failure of one or more clinical trials can occur at any stage of testing, and our clinical trials may not be successful. Events that may prevent successful or timely completion of clinical development include, but are not limited to:

- inability to generate sufficient preclinical, toxicology, or other *in vivo* or *in vitro* data to support the initiation of human clinical trials;
- delays in reaching consensus with regulatory agencies on trial design;
- delays in reaching agreement on acceptable terms with prospective contract research organizations, or CROs, and clinical trial sites;
- delays in obtaining required Institutional Review Board, or IRB, or Ethics Committee approval at each clinical trial site;
- delays in recruiting suitable patients to participate in our clinical trials, or delays that may result if the number of patients required for a clinical trial is larger than we anticipate;

- imposition of a clinical hold by regulatory agencies, which may occur after our submission of data to these agencies or an inspection of our clinical trial operations or trial sites;
- failure by our CROs, other third parties or us to adhere to clinical trial requirements;
- failure to perform in accordance with the FDA's good clinical practices, or GCPs, or applicable regulatory requirements in other countries;
- delays in the testing, validation, manufacturing and delivery of our product candidates to the clinical sites;
- delays in having patients complete participation in a trial or return for post-treatment follow-up;
- disagreements with regulators regarding our interpretation of data from preclinical studies or clinical trials;
- occurrence of adverse events associated with the product candidate that are viewed to outweigh its potential benefits; or
- changes in regulatory requirements and guidance that require amending or submitting new clinical protocols.

Any delay in or inability to successfully complete preclinical and clinical development could result in additional costs to us and impair our ability to generate revenue. In addition, if we make manufacturing or formulation changes to our product candidates (including currently contemplated changes in our contract manufacturer, production capacity and manufacturing cell line), we may need to conduct additional studies to bridge our modified product candidates to earlier versions. Clinical trial delays could also shorten any periods during which we may have the exclusive right to commercialize our product candidates or allow our competitors to bring products to market before we do, which could impair our ability to obtain orphan exclusivity and successfully commercialize our product candidates and may harm our business and results of operations.

If the results of our clinical trials are perceived to be negative or inconclusive, or if there are safety concerns or adverse events associated with our product candidates, we may:

- be required to perform additional clinical trials to support approval or be subject to additional post-marketing testing requirements;
- be delayed in obtaining marketing approval for our product candidates, if at all;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- obtain approval with labeling that includes significant use or distribution restrictions or safety warnings;
- be subject to changes in the way the product is manufactured or administered;
- have regulatory authorities withdraw their approval of the product or impose restrictions on its distribution in the form of a modified risk evaluation and mitigation strategy, or REMS;
- be subject to litigation; or
- experience damage to our reputation.

To date, the safety and efficacy of Physiocrine-based therapeutics in humans has not been studied to any significant extent. Accordingly, our product candidates could potentially cause adverse events that have not yet been predicted. In addition, the inclusion of critically ill patients in our clinical trials may result in deaths or other adverse medical events due to the natural progression of the disease. As described above, any of these events could prevent us from successfully completing the clinical development of our product candidates and impair our ability to commercialize any products.

We may not be successful in our efforts to identify or discover additional product candidates.

A key element of our strategy is to leverage our discovery engine to identify tRNA synthetases that exhibit activity in physiological disease pathways of interest, and to develop purified forms of these proteins that are suitable for therapeutic application. A significant portion of the research that we are conducting involves new compounds and drug discovery methods, including our proprietary technology. Our drug discovery activities using our proprietary technology may not be successful in identifying proteins that are useful in treating rare or more common diseases. Our research programs may initially show promise in identifying potential product candidates, yet fail to yield product candidates for clinical development for a number of reasons, including:

- the research methodology used may not be successful in identifying appropriate potential product candidates; or
- potential product candidates may, on further study, be shown to have harmful side effects or other characteristics that indicate that they are unlikely to be medicines that will receive marketing approval and achieve market acceptance.

Research programs to identify new product candidates require substantial technical, financial and human resources. We may choose to focus our efforts and resources on a potential product candidate that ultimately proves to be unsuccessful. If we are unable to identify suitable product candidates for preclinical and clinical development and regulatory approval, we will not be able to generate product revenues, which would have an adverse impact on our business, prospects, financial condition and results of operations.

We may encounter difficulties enrolling patients in our clinical trials for a variety of reasons, including the limited number of patients who have the diseases for which our product candidates are being studied, which could delay or halt the clinical development of our product candidates.

Identifying and qualifying patients to participate in our ongoing and planned clinical trials of Resolaris and any other clinical trials that we may conduct for our product candidates is critical to our success. In particular, each of the conditions for which we currently plan to evaluate Resolaris is a rare disease with limited patient pools from which to draw for clinical trials. For example, while estimates of FSHD prevalence vary, studies exploring the topic have identified average prevalence rates of approximately one in 17,000. Applying this rate to the U.S. population, as of November 1, 2014, yields a domestic FSHD population of approximately 19,000. The eligibility criteria for our clinical trials, such as the requirement of at least one skeletal muscle in the lower extremities displaying an inflammatory immune response by MRI for enrollment in our ongoing Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD, may further limit the pool of available participants in the trial. We may be unable to identify and enroll a sufficient number of patients with the disease in question and who meet the eligibility criteria for, and are willing to participate in, our clinical trials.

Our ability to identify, recruit and enroll a sufficient number of patients, or those with required or desired characteristics to achieve diversity in a study, to complete our clinical trials in a timely manner may also be affected by other factors, including:

- proximity and availability of clinical trial sites for prospective patients;
- severity of the disease under investigation;
- design of the study protocol and the burdens to patients of compliance with our study protocols;
- perceived risks and benefits of the product candidate under study;
- availability of competing therapies and clinical trials for the patient populations and indications under study;
- efforts to facilitate timely enrollment in clinical trials;
- patient referral practices of physicians; and

- ability to monitor patients adequately during and after treatment.

We are initially focused on the development of Physiocrine-based therapeutics to treat rare conditions. We plan to seek initial marketing approval in the United States. We may not be able to initiate or continue clinical trials if we cannot enroll a sufficient number of eligible patients to participate in the clinical trials required by the FDA or other regulatory agencies. Our ability to successfully initiate, enroll and complete a clinical trial in any foreign country is subject to numerous risks unique to conducting business in foreign countries, including:

- difficulty in establishing or managing relationships with CROs and physicians;
- different requirements and standards for the conduct of clinical trials;
- our inability to locate qualified local consultants, physicians and partners; and
- the potential burden of complying with a variety of foreign laws, medical standards and regulatory requirements, including the regulation of pharmaceutical and biotechnology products and treatment.

Additionally, if patients are unwilling to participate in our clinical trials because of negative publicity from adverse events in the biotechnology or protein therapeutics industries or for other reasons, including competitive clinical trials for similar patient populations, the timeline for recruiting patients, conducting studies and obtaining regulatory approval of potential products may be delayed. These delays could result in increased costs, delays in advancing our product development or termination of our clinical trials altogether. If we have difficulty enrolling a sufficient number of patients to conduct our clinical trials as planned for any reason, we may need to delay, limit or terminate ongoing or planned clinical trials, any of which would have an adverse effect on our business, prospects, financial condition and results of operations.

Resolaris and any other product candidates that we may discover and develop may cause undesirable side effects or have other properties that could delay or prevent their regulatory approval, limit the commercial profile of an approved label, or result in significant negative consequences following marketing approval, if any.

Undesirable side effects caused by Resolaris and any other product candidates that we may discover or develop, or safety or toxicity issues that we may experience in our preclinical studies, clinical trials or in the future, could cause us or regulatory authorities to interrupt, restrict, delay, or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or other comparable foreign authorities. For example, in its partial clinical hold letter, the FDA has requested that, to support clinical trials of Resolaris at doses higher than our proposed 3.0 mg/kg dose, we will need to provide additional non-clinical data demonstrating that certain rodent deaths in our GLP safety studies of Resolaris at the highest doses administered to rodents were not drug-related or to propose a human clinical monitoring strategy acceptable to the FDA to prevent serious toxicity in humans. We intend to submit a complete response to address this concern regarding rodent deaths in the second half of 2015. Any failure to proceed with clinical testing of Resolaris at the doses required to demonstrate efficacy will impair our ability to obtain regulatory approval.

In our Phase 1 clinical trial, we observed low levels of antibodies to Resolaris in some subjects in response to the administration of Resolaris. The development of higher levels of such antibodies over a longer course of treatment may ultimately limit the efficacy of Resolaris and trigger a negative autoimmune response, including the development of anti-synthetase syndrome. Anti-synthetase syndrome can include one or more of the following clinical features: ILD, inflammatory myopathy and inflammatory polyarthritis. Other symptoms which may occur in this setting include fever, weight loss, fatigue, Raynaud's phenomenon of the digits, rash and difficulty swallowing. Additionally, our product candidates are designed to be administered by intravenous injection, which may cause side effects, including acute immune responses and injection site reactions. The risk of adverse immune responses remains a significant concern for protein therapeutics, and we cannot assure that these or other risks will not occur in any of our clinical trials for Resolaris or other product candidates we may develop. There is also a risk of delayed adverse events as a result of long-term exposure to protein therapeutics that must be administered repeatedly for the

management of chronic conditions, such as the development of antibodies, which may occur over time. If any such adverse events occur, which may include the development of anti-synthetase syndrome from antibodies, further advancement of our clinical trials could be halted or delayed, which would have a material adverse effect on our business, prospects, financial condition and results of operations.

If one or more of our product candidates receives marketing approval, and we or others later identify undesirable side effects or other safety concerns caused by such products, a number of potentially significant negative consequences could result, including but not limited to:

- regulatory authorities may withdraw approvals of such products;
- regulatory authorities may require additional warnings on the label;
- we may be required to create a REMS plan, which could include a medication guide outlining the risks of such side effects for distribution to patients, a communication plan for healthcare providers, or other elements to assure safe use;
- we could be sued and held liable for harm caused to patients; and
- our reputation may suffer.

Any of these events could prevent us from achieving or maintaining market acceptance of the particular product candidate, if approved, and could significantly harm our business, prospects, financial condition and results of operations.

We may face challenges associated with the clinical or commercial manufacture of our Physiocrine-based therapeutics.

All entities involved in the preparation of therapeutics for clinical trials or commercial sale, including our existing contract manufacturers for our product candidates, are subject to extensive regulation. Components of a finished therapeutic product approved for commercial sale or use in late-stage clinical trials must be manufactured in accordance with cGMP. These regulations govern manufacturing processes and procedures (including record keeping) and the implementation and operation of quality systems to control and assure the quality of investigational products and products approved for sale. Poor control of production processes can lead to the introduction of contaminants or to inadvertent changes in the properties or stability of our product candidates that may not be detectable in final product testing. We or our contract manufacturers must supply all necessary documentation in support of a biologics license application, or BLA, on a timely basis and must adhere to the FDA's good laboratory practices, or GLP, and cGMP regulations enforced by the FDA through its facilities inspection program. Some of our contract manufacturers have not produced a commercially-approved product and therefore have not undergone the requisite FDA or other regulatory pre-approval inspection to do so. The facilities and quality systems of our contract manufacturers and other third-party contractors must pass a pre-approval inspection for compliance with applicable regulations as a condition of regulatory approval of our product candidates. In addition, the regulatory authorities may, at any time, audit or inspect a manufacturing facility involved with the preparation of our product candidates or the associated quality systems for compliance with the regulations applicable to the activities being conducted. If these facilities do not pass a pre-approval plant inspection, FDA approval of the products will not be granted.

The regulatory authorities also may, at any time following approval of a product for sale, audit the facilities in which the product is manufactured. If any such inspection or audit of our facilities or those of our third-party contractors identifies a failure to comply with applicable regulations or if a violation of our product specifications or applicable regulations occurs independently of such an inspection or audit, we or the relevant regulatory authority may require remedial measures that may be costly or time-consuming for us or a third party to implement and that may include the temporary or permanent suspension of a clinical trial or commercial sales or the temporary or permanent closure of a facility. Any such remedial measures imposed upon us or third parties with whom we contract could materially harm our business.

If we or any of our third-party manufacturers fail to maintain regulatory compliance, the FDA can impose regulatory sanctions including, among other things, refusal to approve a pending application for a new drug product or biologic product, or revocation of a pre-existing approval. Additionally, if supply from one approved manufacturer is interrupted, there could be a significant disruption in clinical or commercial supply. An alternative manufacturer would need to be qualified through a BLA supplement which could result in further delay. The regulatory agencies may also require additional studies if a new manufacturer is relied upon for commercial production. Switching manufacturers may involve substantial costs and is likely to result in a delay in our desired clinical and commercial timelines.

In addition, the manufacture of Resolaris and any other Physiocrine-based therapeutics that we may develop presents challenges associated with biologics production, including the inherent instability of larger, more complex molecules and the need to ensure uniformity of the drug substance produced in different facilities or across different batches. We are also currently in the process of changing cell lines for the production of Resolaris in connection with our potential engagement of a new contract manufacturer to meet our projected needs for pivotal clinical trials and a commercial chemistry, manufacturing and controls specification, which may present production challenges or delays. Furthermore, although Physiocrines represent a class of proteins that may share immuno-modulatory properties in various physiological pathways, each Physiocrine has a different structure and may have unique manufacturing requirements that are not applicable across the entire class. For example, Fc fusion proteins, such as iMod.Fc, include an additional antibody domain to improve pharmacokinetic, or PK, characteristics, and may therefore require a more complex and time-consuming manufacturing process than other Physiocrines. As a result, the manufacturing processes for one of our product candidates may not be readily adaptable to other product candidates that we develop, and we may need to engage multiple third-party manufacturers to produce our product candidates. Any inability to consistently manufacture adequate supplies of our product candidates for clinical trials or on a commercial scale will harm our business, prospects, financial condition and results of operations.

We may not receive orphan drug designation for Resolaris or any other product candidates we may develop under any new applications for orphan drug designation that we may submit, and any orphan drug designations that we have received or may receive may not confer marketing exclusivity or other expected commercial benefits.

The European Commission has granted orphan drug designation to Resolaris for the treatment of FSHD. We have filed an application in the United States for orphan drug designation for Resolaris for the treatment of FSHD with the FDA, and we may also apply for orphan drug designation in other territories and for other indications and product candidates. Orphan drug status confers up to ten years of marketing exclusivity in Europe, and up to seven years of marketing exclusivity in the United States, for a particular product in a specified indication. To date, we have been granted orphan drug designation for only one product candidate and only in the European Union. We cannot assure you that we will be able to obtain orphan drug designation, or rely on orphan drug or similar designations to exclude other companies from manufacturing or selling biological products using the same principal mechanisms of action for the same indications that we pursue beyond these timeframes. Furthermore, marketing exclusivity in Europe can be reduced from ten years to six years if the initial designation criteria have significantly changed since the market authorization of the orphan product. Even if we are the first to obtain marketing authorization for an orphan drug indication, there are circumstances under which a competing product may be approved for the same indication during the period of marketing exclusivity, such as if the later product is shown to be clinically superior to the orphan product, or if the later product is deemed a different product than ours. Further, the marketing exclusivity would not prevent competitors from obtaining approval of the same product candidate as ours for indications other than those in which we have been granted orphan drug designation, or for the use of other types of products in the same indications as our orphan product.

Even if we complete the necessary preclinical studies and clinical trials, we cannot predict when or if we will obtain regulatory approval to commercialize a product candidate, and the scope of any approval may be narrower than we expect.

We cannot commercialize a product until the appropriate regulatory authorities have reviewed and approved the product candidate. Even if our product candidates demonstrate safety and efficacy in clinical trials, the regulatory agencies may not complete their review processes in a timely manner, or we may not be able to obtain regulatory approval. Additional delays may result if an FDA Advisory Committee or regulatory authority recommends non-approval or restrictions on approval. In addition, we may experience delays or rejections based upon additional government regulation from future legislation or administrative action, or changes in regulatory agency policy during the period of product development, clinical trials and the review process. Regulatory agencies also may approve a product candidate for fewer or more limited indications than requested, may impose restrictions on dosing or may grant approval subject to the performance of post-marketing studies. In addition, regulatory agencies may not approve the labeling claims that are necessary or desirable for the successful commercialization of our product candidates.

Failure to obtain marketing approval in international jurisdictions would prevent our medicines from being marketed in such jurisdictions.

In order to market and sell our medicines in the European Union and many other jurisdictions, we must obtain separate marketing approvals and comply with numerous and varying regulatory requirements. The approval procedure varies among countries and can involve additional testing, and we have limited regulatory experience in many jurisdictions. The time required to obtain approval in one jurisdiction may differ substantially from that required to obtain approval in other jurisdictions. The regulatory approval process outside the United States generally includes all of the risks associated with obtaining FDA approval. In addition, in many countries outside the United States, it is required that the product be approved for reimbursement before the product can be approved for sale in that country. We may not obtain approvals from regulatory authorities outside the United States on a timely basis, if at all. Approval by one regulatory authority does not ensure approval by regulatory authorities in other countries or jurisdictions, and we may not be able to file for marketing approvals and may not receive necessary approvals to commercialize our medicines in any market.

We may not elect or be able to take advantage of any expedited development or regulatory review and approval processes available to product candidates granted breakthrough therapy or fast track designation by the FDA.

We are evaluating the possibility of seeking breakthrough therapy or fast track designation for Resolaris and any other product candidates that we may develop, although we may elect not to do so. A breakthrough therapy program is for a product candidate intended to treat a serious or life-threatening condition, and preliminary clinical evidence indicates that the product candidate may demonstrate substantial improvement on a clinically significant endpoint(s) over available therapies. A fast track program is for a product candidate that treats a serious or life-threatening condition, and nonclinical or clinical data demonstrate the potential to address an unmet medical need. Although we believe Resolaris and other product candidates that we may develop from our discovery engine may qualify under either or both of the breakthrough therapy and fast track programs, we may elect not to pursue either of these programs, and even if we do, the FDA has broad discretion whether or not to grant these designations. Accordingly, even if we believe a particular product candidate is eligible for breakthrough therapy or fast track designation, we cannot assure you that the FDA would decide to grant it. Even if we do receive breakthrough therapy or fast track designation, we may not experience a faster development process, review or approval compared to conventional FDA procedures. The FDA may withdraw breakthrough therapy or fast track designation if it believes that the product no longer meets the qualifying criteria. In addition, the breakthrough therapy program is a relatively new program. As a result, we cannot be certain whether any of our product candidates can or will qualify for breakthrough therapy designation. Our business may be harmed if we are unable to avail ourselves of these or any other expedited development and regulatory pathways.

Even if we obtain regulatory approval for a product candidate, our products will remain subject to regulatory scrutiny.

Even if Resolaris or any other product candidates that we discover and develop are approved, they will be subject to ongoing regulatory requirements for manufacturing, labeling, packaging, storage, advertising, promotion, sampling, record-keeping, conduct of post-marketing studies, and submission of safety, efficacy, and other post-market information, including both federal and state requirements in the United States and requirements of comparable foreign regulatory authorities.

Manufacturers and manufacturers' facilities are required to comply with extensive FDA, and comparable foreign regulatory authority, requirements, including ensuring that quality control and manufacturing procedures conform to cGMP regulations. As such, we and our contract manufacturers will be subject to continual review and inspections to assess compliance with cGMP and adherence to commitments made in any BLA, new drug application, or NDA, or marketing authorization application, or MAA. Accordingly, we and others with whom we work will need to continue to expend time, money, and effort in all areas of regulatory compliance, including manufacturing, production, and quality control.

Any regulatory approvals that we receive for our product candidates may be subject to limitations on the approved indicated uses for which the product may be marketed or to the conditions of approval, or contain requirements for potentially costly post-marketing testing, including Phase 4 clinical trials, and surveillance to monitor the safety and efficacy of the product candidate. We will be required to report certain adverse reactions and production problems, if any, to the FDA and comparable foreign regulatory authorities. Any new legislation addressing drug safety issues could result in delays in product development or commercialization, or increased costs to assure compliance.

We will have to comply with requirements concerning advertising and promotion for our products. Promotional communications with respect to prescription drugs are heavily scrutinized by the FDA, the Department of Justice, state attorneys general and comparable foreign regulatory authorities. For example, we may face claims associated with the use or promotion of our products for uses outside the scope of their approved label indications. Violations, including actual or alleged promotion of our products for unapproved, or off-label, uses are subject to enforcement letters, inquiries and investigations, and civil and criminal sanctions. Any actual or alleged failure to comply with labeling and promotion requirements may have a negative impact on our business. In the United States, engaging in impermissible promotion of our products for off-label uses can also subject us to false claims litigation under federal and state statutes, which can lead to civil and criminal penalties and fines and agreements that would materially restrict the manner in which we promote or distribute our drug products. These false claims statutes include the federal False Claims Act, which allows any individual to bring a lawsuit against a pharmaceutical company on behalf of the federal government alleging submission of false or fraudulent claims, or causing to present such false or fraudulent claims, for payment by a federal program such as Medicare or Medicaid. If the government prevails in the lawsuit, the individual will share in any fines or settlement funds. Since 2004, these False Claims Act lawsuits against pharmaceutical companies have increased significantly in volume and breadth, leading to several substantial civil and criminal settlements based on certain sales practices promoting off-label drug uses. This growth in litigation has increased the risk that a pharmaceutical company will have to defend a false claims action, pay settlement fines or restitution, agree to comply with burdensome reporting and compliance obligations, and be excluded from Medicare, Medicaid and other federal and state healthcare programs. If we do not lawfully promote our approved products, we may become subject to such litigation and, if we are not successful in defending against such actions, those actions could compromise our ability to become profitable.

The holder of an approved BLA, NDA or MAA must submit new or supplemental applications and obtain approval for certain changes to the approved product, product labeling, or manufacturing process. We could also be asked to conduct post-marketing clinical trials to verify the safety and efficacy of our products in general or in specific patient subsets. If original marketing approval were obtained through an accelerated approval pathway,

we could be required to conduct a successful post-marketing clinical trial to confirm clinical benefit for our products. An unsuccessful post-marketing study or failure to complete such a trial could result in the withdrawal of marketing approval.

If a regulatory agency discovers previously unknown problems with a product, such as adverse events of unanticipated severity or frequency, or problems with the facility where the product is manufactured, or disagrees with the promotion, marketing or labeling of a product, such regulatory agency may impose restrictions on that product or us, including requiring withdrawal of the product from the market. If we fail to comply with applicable regulatory requirements, a regulatory agency or enforcement authority may, among other things:

- issue untitled or warning letters;
- impose civil or criminal penalties;
- suspend or withdraw regulatory approval;
- suspend any of our ongoing clinical trials;
- refuse to approve pending applications or supplements to approved applications submitted by us;
- impose restrictions on our operations, including closing our contract manufacturers' facilities; or
- seize or detain products, or require a product recall.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response, and could generate negative publicity. Any failure to comply with ongoing regulatory requirements may significantly and adversely affect our ability to commercialize and generate revenue from our products. If regulatory sanctions are applied or if regulatory approval is withdrawn, the value of our company and our operating results will be adversely affected.

Because of our focus on treatments for severe, rare diseases, Resolaris and other product candidates that we develop may be subject to requests for treatment use under individual patient INDs, which would present a variety of risks.

FDA regulations permit an investigational drug or biologic to be used for the treatment of an individual patient by a licensed physician under certain circumstances if the patient has a serious disease or condition, generally defined as a disease or condition associated with morbidity that has a substantial impact on day-to-day functioning. We believe that Resolaris and other product candidates that we develop may be susceptible to physician requests for use in these settings given the severity of the disease indications that we are targeting and the limited availability of approved and other investigational therapeutics for these indications. The treatment use of our product candidates under individual patient INDs would present a number of risks, including the following:

- The treatment use of our product candidates under individual patient INDs may be subject to less stringent or otherwise different protocols from our clinical trials, subjecting the patient to additional risk, which could negatively affecting the perception of our product candidates among physicians, patients and regulators;
- The actual or perceived availability of a product candidate for use under individual patient INDs may impair patient enrollment in our clinical trials; and
- Any decision to make quantities of our product candidates available for use under individual patient INDs may impair our or our third-party manufacturers' ability to timely supply adequate quantities of our product candidates for our clinical trials.

Physicians may independently file individual patient INDs for Resolaris or one of our other product candidates. We may disagree with a physician's or the FDA's conclusion that our product candidate is suitable for evaluation under a particular individual patient IND, and any decision by us not to make our product candidate available for evaluation under this setting may subject us to negative publicity or market perception.

Risks related to our financial condition and capital requirements

We have incurred significant losses since our inception and anticipate that we will continue to incur significant losses for the foreseeable future.

We are a clinical stage biotherapeutics company, and we have not yet generated any revenues from product sales. We have incurred net losses in each year since our inception in 2005, including net losses of $20.0 million and $24.4 million for the years ended December 31, 2013 and 2014, respectively. As of December 31, 2014, we had an accumulated deficit of $110.2 million.

We have devoted most of our financial resources to research and development, including our clinical and preclinical development activities. To date, we have financed our operations primarily through the sale of equity securities and convertible debt and through commercial bank debt. The amount of our future net losses will depend, in part, on the rate of our future expenditures and our ability to obtain funding through equity or debt financings, grant funding or strategic collaborations. We have not commenced pivotal clinical trials for any product candidate and it will be several years, if ever, before we have a product candidate ready for commercialization. Even if we obtain regulatory approval to market a product candidate, our future revenues will depend upon the size of any markets in which our product candidates have received approval, and our ability to achieve sufficient market acceptance, reimbursement from third-party payors and adequate market share for our product candidates in those markets. However, even if we obtain adequate market share for our product candidates, because the potential markets in which our product candidates may ultimately receive regulatory approval are very small, we may never become profitable despite obtaining such market share and acceptance of our products.

We expect to continue to incur significant expenses and increasing operating losses for the foreseeable future. We anticipate that our expenses will increase substantially if and as we:

- continue our research and preclinical and clinical development of Resolaris, our lead product candidate, or any other product candidates that we may develop;
- continue our current clinical trial of Resolaris in adult patients with FSHD and initiate and conduct our planned additional clinical trials of Resolaris in FSHD, LGMD and other RMICs;
- initiate and conduct any additional preclinical studies, clinical trials or other studies for Resolaris and any other product candidates that we may develop;
- further develop the manufacturing process for our product candidates;
- change or add additional manufacturers, including manufacturers of quantities of drug substance suitable for pivotal clinical trials and commercialization;
- seek regulatory and marketing approvals for our product candidates that successfully complete clinical trials;
- establish a sales, marketing and distribution infrastructure to commercialize any products for which we may obtain marketing approval;
- seek to identify and validate additional product candidates;
- make milestone or other payments under our in-license agreements;
- maintain, protect and expand our portfolio of owned and in-licensed intellectual property;
- acquire or in-license other product candidates and technologies;
- attract and retain skilled personnel;
- create additional infrastructure to support our operations as a public company and our product development and planned future commercialization efforts; and

- experience any delays or encounter challenges with any of the above.

The net losses we incur may fluctuate significantly from quarter to quarter and year to year, such that a period-to-period comparison of our results of operations may not be a good indication of our future performance. In any particular quarter or quarters, our operating results could be below the expectations of securities analysts or investors, which could cause our stock price to decline.

We have never generated any revenue from product sales and may never be profitable.

Our ability to generate revenue and achieve profitability depends on our ability to successfully complete the development of, and obtain the regulatory approvals necessary to commercialize, Resolaris and any other product candidates that we may develop. We do not anticipate generating revenues from product sales for the foreseeable future, if ever. Our ability to generate future revenues from product sales depends heavily on our success in:

- completing research, preclinical development and clinical development of Resolaris and other product candidates;
- seeking and obtaining regulatory and marketing approvals for product candidates for which we complete clinical trials;
- developing a sustainable, scalable, reproducible, and transferable manufacturing process for Resolaris and any other product candidates that we may develop;
- establishing and maintaining supply and manufacturing relationships with third parties that can provide products and services that are adequate in both amount and quality to support clinical development and the market demand for our product candidates, if approved;
- launching and commercializing product candidates for which we obtain regulatory and marketing approval, by establishing a sales force, marketing and distribution infrastructure;
- maintaining, protecting and expanding our portfolio of intellectual property rights, including patents, trademarks, trade secrets and know-how;
- obtaining market acceptance of Physiocrine therapeutics and our product candidates as viable treatment options for our target indications;
- addressing any competing technological and market developments;
- implementing additional internal systems and infrastructure, as needed;
- identifying and validating new Physiocrine therapeutic product candidates;
- attracting, hiring and retaining qualified personnel; and
- negotiating favorable terms in any licensing, collaboration or other arrangements into which we may enter.

Even if Resolaris or any of the other product candidates that we may develop is approved for commercial sale, we anticipate incurring significant costs associated with commercializing any approved product candidate. Our expenses could increase beyond expectations if we are required by the FDA or other regulatory agencies, domestic or foreign, to perform clinical trials and other studies in addition to those that we currently anticipate. In cases where we are successful in obtaining regulatory approvals to market one or more of our product candidates, our revenue will be dependent, in part, upon the size of the markets in the territories for which we gain regulatory approval, the accepted price for the product, the ability to get reimbursement at any price, the competition we face, and whether we own the commercial rights for that territory. If the number of our addressable rare disease patients is not as significant as we estimate, the indication approved by regulatory authorities is narrower than we expect, or the reasonably accepted population for treatment is narrowed by competition, physician choice or treatment guidelines, we may not generate significant revenue from sales of such products, even if approved. Even if we are able to generate revenues from the sale of any approved products, we may not become profitable and may need to obtain additional funding to continue operations.

Even if this offering is successful, we will need to raise additional funding, which may not be available on acceptable terms, or at all. Failure to obtain this necessary capital when needed may force us to delay, limit or terminate our product development efforts or other operations.

We are currently advancing Resolaris through clinical development and conducting preclinical development activities directed at the identification and selection of additional Physiocrine-based therapeutic candidates. The development of protein therapeutics is expensive, and we expect our research and development expenses to increase substantially in connection with our ongoing activities, particularly as we advance Resolaris into further clinical trials in multiple indications.

As of December 31, 2014, our cash, cash equivalents and investments were approximately $15.9 million. We estimate that the net proceeds from this offering will be approximately $ million, based on an assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. We expect that the net proceeds from this offering and our existing cash, cash equivalents and investments will be sufficient to fund our current operations through at least the next 12 months. However, our operating plan may change as a result of many factors currently unknown to us, and we may need to seek additional funds sooner than planned, through public or private equity or debt financings, government or other third-party funding, marketing and distribution arrangements and other collaborations, strategic alliances and licensing arrangements or a combination of these approaches. Our future funding requirements will depend on many factors, including but not limited to:

- the scope, rate of progress, results and cost of our clinical trials, nonclinical testing, and other related activities;
- the cost of manufacturing clinical supplies, and establishing commercial supplies, of our product candidates and any products that we may develop;
- the number and characteristics of product candidates that we pursue;
- the cost, timing, and outcomes of regulatory review of our product candidates;
- the cost and timing of establishing sales, marketing, and distribution capabilities; and
- the terms and timing of any collaborative, licensing, and other arrangements that we may establish, including any required milestone and royalty payments thereunder.

In any event, we will require additional capital to complete additional clinical trials, including larger, pivotal clinical trials, to obtain regulatory approval for, and to commercialize, our product candidates. Raising funds in the current economic environment may present additional challenges. Even if we believe we have sufficient funds for our current or future operating plans, we may seek additional capital if market conditions are favorable or if we have specific strategic considerations. If we are unable to obtain funding on a timely basis, we may be required to significantly curtail, delay or discontinue one or more of our research or development programs or the commercialization of any product candidates, or we may be unable to expand our operations or otherwise capitalize on our business opportunities, as desired, which could materially affect our business, financial condition and results of operations.

Raising additional capital may cause dilution to our existing stockholders, restrict our operations, require us to relinquish rights to our technologies or product candidates on terms unfavorable to us and divert management's attention from our product development activities.

The terms of any financing may adversely affect the holdings or the rights of our stockholders and the issuance of additional securities, whether equity or debt, by us, or the possibility of such issuance, may cause the market price of our shares to decline. The sale of additional equity or convertible securities would cause dilution to all of our stockholders. The incurrence of indebtedness would increase our fixed payment obligations and may

require us to agree to certain restrictive covenants, such as limitations on our ability to incur additional debt, limitations on our ability to acquire, sell or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. We could also be required to seek funds through arrangements with collaborative partners or otherwise at an earlier stage than desirable and we may be required to relinquish rights to some of our technologies or product candidates or otherwise agree to terms unfavorable to us, any of which may have a material adverse effect on our business, operating results and prospects. In addition, any fundraising efforts may divert our management from their day-to-day activities, which may adversely affect our ability to develop and commercialize our product candidates.

We are party to a loan and security agreement that contains operating covenants that may restrict our business and financing activities.

In April 2012, we entered into a loan and security agreement with Silicon Valley Bank, which was subsequently amended in July 2013, pursuant to which we have been extended term loans in the aggregate principal amount of $10.0 million. Borrowings under this loan and security agreement are secured by substantially all of our assets, excluding certain intellectual property rights. The loan and security agreement restricts our ability, among other things, to:

- sell, transfer or otherwise dispose of any of our business or property, subject to limited exceptions;
- make material changes to our business or management;
- enter into transactions resulting in significant changes to the voting control of our stock;
- make certain changes to our organizational structure;
- consolidate or merge with other entities or acquire other entities;
- move our principal office location or add new office locations;
- incur additional indebtedness or create encumbrances on our assets, subject to limited exceptions;
- pay dividends, other than dividends paid solely in shares of our common stock, or make distributions on and, in certain cases, repurchase our stock;
- enter into transactions with our affiliates, subject to limited exceptions;
- repay subordinated indebtedness; or
- make certain investments.

In addition, we are required under our loan agreement to comply with various affirmative operating covenants. The operating covenants and restrictions and obligations in our loan and security agreement, as well as any future financing agreements that we may enter into, may restrict our ability to finance our operations, engage in business activities or expand or fully pursue our business strategies. Our ability to comply with these covenants may be affected by events beyond our control, and we may not be able to meet those covenants. A breach of any of these covenants could result in a default under the loan and security agreement, which could cause all of the outstanding indebtedness under the facility to become immediately due and payable.

If we are unable to generate sufficient cash available to repay our debt obligations when they become due and payable, either as or when such obligations become due, when they mature, or in the event of a default, we may not be able to obtain additional debt or equity financing on favorable terms, if at all, which may negatively impact our business operations and financial condition.

Risks related to our reliance on third parties

We rely, and expect to continue to rely, on third parties to conduct some or all aspects of our product manufacturing, protocol development, research and preclinical and clinical testing, and these third parties may not perform satisfactorily.

We currently rely, and expect to continue to rely, on third parties to conduct some or all aspects of product manufacturing, protocol development, research and preclinical and clinical testing with respect to our product candidates. Any of these third parties may terminate their engagements with us at any time. If we need to enter into alternative arrangements, it could delay our product development activities. Our reliance on these third parties for research and development activities reduces our control over these activities but does not relieve us of our responsibility to ensure compliance with all required regulations and study protocols. For example, for Resolaris and any other product candidates that we develop and commercialize on our own, we will remain responsible for ensuring that each of our clinical trials is conducted in accordance with the applicable study plan and protocols.

If these third parties do not successfully carry out their contractual duties, meet expected deadlines or conduct our research and development activities, including clinical trials, in accordance with regulatory requirements or our stated study plans and protocols, we will not be able to complete, or may be delayed in completing, the preclinical studies and clinical trials required to support future BLA submissions and approval of our product candidates.

We rely on a third party to manufacture our clinical supply of Resolaris, and we intend to rely on third parties to produce non-clinical, clinical and commercial supplies of any future product candidate.

We do not have, nor do we plan to acquire, the infrastructure or capability internally to manufacture our nonclinical and clinical quantities of our product candidates, and we lack the resources and the capability to manufacture any of our product candidates on a clinical or commercial scale. Reliance on third-party manufacturers entails risks to which we would not be subject if we manufactured the product candidates ourselves, including:

- the inability to negotiate manufacturing agreements with third parties under commercially reasonable terms;
- reduced control as a result of using third-party manufacturers for all aspects of manufacturing activities;
- termination or nonrenewal of manufacturing agreements with third parties in a manner or at a time that is costly or damaging to us; and
- disruptions to the operations of our third-party manufacturers or suppliers caused by conditions unrelated to our business or operations, including the insolvency or bankruptcy of the manufacturer or supplier.

Any of these events could lead to clinical trial delays or failure to obtain regulatory approval, or impact our ability to successfully commercialize future products. Some of these events could be the basis for FDA action, including injunction, recall, seizure or total or partial suspension of production.

Additionally, each manufacturer may require licenses to manufacture our product candidates or components thereof if the applicable manufacturing processes are not owned by the manufacturer or in the public domain, and we may be unable to transfer or sublicense the intellectual property rights we may have with respect to such activities. These factors could cause the delay of clinical development, regulatory submissions, required approvals or commercialization of our product candidates, cause us to incur higher costs and prevent us from commercializing our products successfully.

We rely on a single manufacturer for Resolaris in our clinical trials and are currently in discussions with an additional contract manufacturer to meet our projected needs for anticipated pivotal clinical trials and larger scale commercial manufacturing. We do not have long-term contracts with our manufacturers, and our manufacturers may terminate their agreements with us for a variety of reasons. Furthermore, the manufacturing facilities in which our product candidates are made could be adversely affected by earthquakes and other natural disasters, labor shortages, power failures, and numerous other factors. If our manufacturers fail to meet contractual requirements, and we are unable to secure one or more replacement manufacturers capable of production at a substantially equivalent cost, our clinical development activities may be delayed, or we could lose potential revenue. Manufacturing biologic drugs is complicated and tightly regulated by the FDA and comparable regulatory authorities around the world, and although alternative third-party manufacturers with the necessary manufacturing and regulatory expertise and facilities exist, it could be expensive and take a significant amount of time to arrange for alternative manufacturers, transfer manufacturing procedures to these alternative manufacturers, and demonstrate comparability of material produced by such new manufacturers. New manufacturers of any product would be required to qualify under applicable regulatory requirements. These manufacturers may not be able to manufacture our product candidates at costs, or in quantities, or in a timely manner necessary to complete the clinical development of our product candidates or make commercially successful products.

We rely, and expect to continue to rely, on third parties to conduct, supervise and monitor our clinical trials, and if these third parties perform in an unsatisfactory manner, it may harm our business.

We have relied, and expect to continue to rely, on third-party CROs and clinical trial sites to ensure our clinical trials are conducted properly and on time. While we have and will continue to enter into agreements governing their activities, we will have limited influence over their actual performance. We will control only certain aspects of our CROs' activities. Nevertheless, we will be responsible for ensuring that each of our clinical trials is conducted in accordance with the applicable protocol, legal and regulatory requirements, and scientific standards, and our reliance on the CROs does not relieve us of our regulatory responsibilities.

We and our CROs are required to comply with GCPs for conducting, recording and reporting the results of IND-enabling studies and clinical trials to assure that the data and reported results are credible and accurate and that the rights, integrity and confidentiality of clinical trial participants are protected. The FDA enforces GCPs through periodic inspections of study sponsors, principal investigators and clinical trial sites. If we or our CROs fail to comply with applicable GCPs, the clinical data generated in our future clinical trials may be deemed unreliable and the FDA may require us to perform additional unanticipated clinical trials before approving any marketing applications. Upon inspection, the FDA may determine that our clinical trials did not comply with GCPs. In addition, our future clinical trials will require a sufficient number of test subjects to evaluate the safety and effectiveness of our product candidates. Accordingly, if our CROs fail to comply with these regulations or fail to recruit a sufficient number of patients, we may be required to repeat such clinical trials, which would delay the regulatory approval process.

Our CROs are not our employees, and we are therefore unable to directly monitor whether or not they devote sufficient time and resources to our clinical and nonclinical programs. These CROs may also have relationships with other commercial entities, including our competitors, for whom they may also be conducting clinical trials or other drug development activities that could harm our competitive position. If our CROs do not successfully carry out their contractual duties or obligations, fail to meet expected deadlines, or if the quality or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our clinical protocols or regulatory requirements, or for any other reasons, our clinical trials may be extended, delayed or terminated, and we may not be able to obtain regulatory approval for, or successfully commercialize our product candidates. As a result, our financial results would be harmed, our costs could increase, our ability to generate revenues could be delayed and the commercial prospects for our product candidates will be adversely affected.

Our reliance on third parties requires us to share our trade secrets, which increases the possibility that a competitor will discover them or that our trade secrets will be misappropriated or disclosed.

We rely on third parties to manufacture our product candidates, and we collaborate with various academic institutions in the development of our discovery engine for therapeutic applications of Physiocrines. In connection with these activities, we are required, at times, to share trade secrets with them. We seek to protect our proprietary technology in part by entering into confidentiality agreements and, if applicable, material transfer agreements, collaborative research agreements, consulting agreements or other similar agreements with our collaborators, advisors, employees and consultants prior to beginning research or disclosing proprietary information. These agreements typically limit the rights of the third parties to use or disclose our confidential information, such as trade secrets. Despite the contractual provisions employed when working with third parties, the need to share trade secrets and other confidential information increases the risk that such trade secrets become known by our competitors, are inadvertently incorporated into the technology of others, or are disclosed or used in violation of these agreements. Given that our proprietary position is based, in part, on our know-how and trade secrets, a competitor's discovery of our trade secrets or other unauthorized use or disclosure would impair our competitive position and may have a material adverse effect on our business, prospects, financial condition and results of operations.

In addition, these agreements typically restrict the ability of our collaborators, advisors, employees and consultants to publish data potentially relating to our trade secrets. Our academic collaborators typically have rights to publish data, provided that we are notified in advance and may delay publication for a specified time in order to secure intellectual property rights to which we are entitled arising from the collaboration. In other cases, publication rights are controlled exclusively by us, although in some cases we may share these rights with other parties. We also conduct joint research and development programs that may require us to share trade secrets under the terms of our research and development partnerships or similar agreements. Despite our efforts to protect our trade secrets, our competitors may discover our trade secrets, either through breach of these agreements, independent development or publication of information including our trade secrets in cases where we do not have proprietary or otherwise protected rights at the time of publication. A competitor's discovery of our trade secrets would impair our competitive position and have an adverse impact on our business, prospects, financial condition and results of operations.

Risks related to the commercialization of our product candidates

If we are unable to establish sales and marketing capabilities or enter into agreements with third parties to market and sell our product candidates, we may be unable to generate any revenues.

We do not currently have any infrastructure for the sales, marketing and distribution of pharmaceutical products. In order to market our product candidates, if approved by the FDA or any other regulatory body, we must build our sales, marketing, managerial and other non-technical capabilities or make arrangements with third parties to perform these services. There are risks involved with both establishing our own sales and marketing capabilities and entering into arrangements with third parties to perform these services. For example, recruiting and training a sales force is expensive and time consuming and could delay any product launch. If the commercial launch of a product candidate for which we recruit a sales force and establish marketing capabilities is delayed or does not occur for any reason, we would have prematurely or unnecessarily incurred these commercialization expenses. This may be costly, and our investment would be lost if we cannot retain or reposition our sales and marketing personnel.

Factors that may inhibit our efforts to commercialize our medicines on our own include:

- our inability to recruit and retain adequate numbers of effective sales and marketing personnel;
- the inability of sales personnel to obtain access to physicians or persuade adequate numbers of physicians to prescribe any future medicines;

- the lack of complementary medicines to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines; and
- unforeseen costs and expenses associated with creating an independent sales and marketing organization.

If we enter into arrangements with third parties to perform sales, marketing and distribution services, our product revenues or the profitability of these product revenues to us are likely to be lower than if we were to market and sell any medicines that we develop ourselves. In addition, we may not be successful in entering into arrangements with third parties to sell and market our product candidates or may be unable to do so on terms that are favorable to us. We likely will have little control over such third parties, and any of them may fail to devote the necessary resources and attention to sell and market our medicines effectively. If we do not establish sales and marketing capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our product candidates.

We rely on third-party manufacturers to produce Resolaris and any other product candidates that we may develop, but we have not entered into agreements with any such manufacturers to support commercialization.

We have not yet secured manufacturing capabilities for commercial quantities of Resolaris or any other product candidates. Although we intend to rely on third-party manufacturers for commercialization, we have only entered into agreements with such manufacturers to support our human proof-of-concept clinical trials. We have not yet entered into a long-term commercial supply agreement to support full scale commercial production, and we may be unable to negotiate agreements with the manufacturers to support our commercialization activities at commercially reasonable terms.

No manufacturer currently has the experience or ability to produce our product candidates at commercial levels. We or our contract manufacturers will need to develop a scalable manufacturing process for Resolaris or any other product candidates that we may develop and commercialize. We may run into technical or scientific issues related to manufacturing or development that we may be unable to resolve in a timely manner or with available funds. If we or our manufacturing partners are unable to scale the manufacturing process to produce commercial quantities of our product candidates, or our manufacturing partners do not pass required regulatory pre-approval inspections, our commercialization efforts will be harmed.

In addition, any significant disruption in our relationships with our manufacturers could harm our business. There are a relatively small number of potential manufacturers for Resolaris and any other product candidates that we may develop, and such manufacturers may not be able to supply our drug products at the times we need them or on commercially reasonable terms. Any disruption to our relationship with our current manufacturer and any manufacturers that we contract with in the future will result in delays in our ability to complete the clinical development of, or to commercialize, Resolaris and any other product candidates we may develop, and may require us to incur additional costs.

We face intense competition and rapid technological change and the possibility that our competitors may develop therapies that are more advanced or effective than ours, which may adversely affect our financial condition and our ability to successfully commercialize our product candidates.

We are engaged in the development of medicines for severe, rare diseases, which is a competitive and rapidly changing field. We have competitors both in the United States and internationally, including major multi-national pharmaceutical companies, biotechnology companies and universities and other research institutions. We expect to compete with various companies, academic institutions and other organizations that have products in development for some of our target RMIC indications. For example, although there are currently no approved products for the treatment of FSHD, Acceleron Pharma Inc. is developing a clinical candidate, ACE-083, a locally acting protein therapeutic designed to increase muscle mass and strength in patients with neuromuscular disorders and other diseases characterized by a loss of muscle function, including FSHD. In addition, Facio

Therapies recently announced its plans to screen chemical libraries to identify chemical compounds that will boost the expression of proteins known to repress one of the causal genes responsible for FSHD. We may also face competition from numerous companies in the field of RPICs, including several companies that currently market Esbriet (pirfenidone) and Nintedanib, both of which were approved by the FDA for the treatment of ILD in October 2014. Many larger companies, universities and private and public research institutions are also actively engaged in the development of therapeutics to address muscle loss and muscle weakness in a variety of indications.

Many of our competitors have substantially greater financial, technical and other resources, such as larger research and development staff and experienced marketing and manufacturing organizations. Competition may increase further as a result of advances in the commercial applicability of technologies and greater availability of capital for investment in these industries. Our competitors may succeed in developing, acquiring or licensing on an exclusive basis products that are more effective, safer, more convenient or less costly than any product candidate that we may develop, or achieve earlier patent protection, regulatory approval, product commercialization and market penetration than us. Additionally, technologies developed by our competitors may render our potential product candidates uneconomical or obsolete, and we may not be successful in marketing our product candidates against competitors.

Even if we are successful in achieving regulatory approval to commercialize a product candidate faster than our competitors, we may face competition from biosimilars due to the changing regulatory environment. In the United States, the Biologics Price Competition and Innovation Act of 2009 created an abbreviated approval pathway for biological products that are demonstrated to be "highly similar," or biosimilar, to or "interchangeable" with an FDA-approved biological product. This new pathway could allow competitors to reference data from biological products already approved after 12 years from the time of approval. In Europe, the European Commission has granted marketing authorizations for several biosimilars pursuant to a set of general and product class-specific guidelines for biosimilar approvals issued over the past few years. In Europe, a competitor may reference data from biological products already approved, but will not be able to get on the market until ten years after the time of approval. This ten year period will be extended to 11 years if, during the first eight of those ten years, the marketing authorization holder obtains an approval for one or more new therapeutic indications that bring significant clinical benefits compared with existing therapies. In addition, companies may be developing biosimilars in other countries that could compete with our products. If competitors are able to obtain marketing approval for biosimilars referencing our products, our products may become subject to competition from such biosimilars, with the attendant competitive pressure and consequences. Expiration or successful challenge of our applicable patent rights could also trigger competition from other products, assuming any relevant exclusivity period has expired.

Finally, as a result of the expiration or successful challenge of our patent rights, we could face more litigation with respect to the validity or scope of patents relating to our competitors' products. The availability of our competitors' products could limit the demand, and the price we are able to charge, for any products that we may develop and commercialize.

The commercial success of any current or future product candidate will depend upon the degree of market acceptance by physicians, patients, third-party payors and others in the medical community.

Even with the requisite approval from the FDA and comparable foreign regulatory authorities, the commercial success of our product candidates will depend in part on the medical community, patients, and third-party payors accepting our product candidates as medically useful, cost-effective, and safe. Any product that we bring to the market may not gain market acceptance by physicians, patients, third-party payors and others in the medical community. If these products do not achieve an adequate level of acceptance, we may not generate significant product revenue and may not become profitable. The degree of market acceptance of these product candidates, if approved for commercial sale, will depend on a number of factors, including:

- the potential efficacy and potential advantages over alternative treatments;

- the prevalence and severity of any side effects, including any limitations or warnings contained in a product's approved labeling;
- the prevalence and severity of any side effects resulting from the administration of our product candidates by injection;
- the clinical indications for which approval is granted;
- relative convenience and ease of administration;
- the willingness of the target patient population to try new therapies and of physicians to prescribe these therapies;
- the strength of marketing and distribution support and timing of market introduction of competitive products;
- publicity concerning our products or competing products and treatments; and
- the availability of sufficient third-party insurance coverage or reimbursement.

Even if a potential product displays a favorable efficacy and safety profile in preclinical studies and clinical trials, market acceptance of the product will not be known until after it is launched. Our efforts to educate the medical community and third-party payors on the benefits of the product candidates may require significant resources and may never be successful. Such efforts to educate the marketplace may require more resources than are required by the conventional technologies marketed by our competitors, and our competitors may have substantially greater resources or brand recognition to effectively market their products. If our product candidates are approved but fail to achieve an adequate level of acceptance by physicians, patients, third-party payors, and others in the medical community, we will not be able to generate sufficient revenue to become or remain profitable.

The insurance coverage and reimbursement status of newly-approved products is uncertain. Failure to obtain or maintain adequate coverage and reimbursement for new or current products could limit our ability to market those products and decrease our ability to generate revenue.

There is significant uncertainty related to the insurance coverage and reimbursement of newly approved products. In the United States, the principal decisions about reimbursement for new medicines are typically made by the Centers for Medicare & Medicaid Services, or CMS, an agency within the U.S. Department of Health and Human Services, as CMS decides whether and to what extent a new medicine will be covered and reimbursed under Medicare. Private payors often follow CMS with respect to coverage policy and payment limitations in setting their own reimbursement policies. It is difficult to predict what CMS will decide with respect to reimbursement for fundamentally novel products such as ours, as there is no body of established practices and precedents for these new products. Reimbursement agencies in Europe may be more conservative than CMS. For example, a number of cancer drugs have been approved for reimbursement in the United States, but have not been approved for reimbursement in certain European countries. There may be significant delays in obtaining reimbursement for newly approved medicines, and our inability to promptly obtain coverage and profitable payment rates from third-party payors for any approved medicines could have a material adverse effect on our business, prospects, financial condition and results of operations.

Outside the United States, international sales are generally subject to extensive governmental price controls and other market regulations, and we believe the increasing emphasis on cost-containment initiatives in Europe, Canada, and other countries has and will continue to put pressure on the pricing and usage of our product candidates. In many countries, the prices of medical products are subject to varying price control mechanisms as part of national health systems. In general, the prices of medicines under such systems are substantially lower than in the United States. Other countries allow companies to fix their own prices for medicines, but monitor and control company profits. Additional foreign price controls or other changes in pricing regulation could restrict the

amount that we are able to charge for our product candidates. Accordingly, in markets outside the United States, the reimbursement for our products may be reduced compared with the United States and may be insufficient to generate commercially reasonable revenues and profits. Net prices for medicines may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that currently restrict imports of medicines from countries where they may be sold at lower prices than in the United States.

Moreover, increasing efforts by governmental and third-party payors, in the United States and abroad, to cap or reduce healthcare costs may cause such organizations to limit both coverage and level of reimbursement for new products and, as a result, they may not cover or provide adequate payment for our product candidates. We expect to experience pricing pressures in connection with the sale of any of our product candidates, due to the trend toward managed healthcare, the increasing influence of health maintenance organizations and additional legislative changes. The downward pressure on healthcare costs in general, particularly prescription drugs and surgical procedures and other treatments, has become very intense. As a result, increasingly high barriers are being erected to the entry of new products.

If the market opportunities for our product candidates are smaller than we believe they are, our revenues may be adversely affected and our business may suffer. Because the target patient populations of our product candidates are small, we must be able to successfully identify patients and capture a significant market share to achieve and maintain profitability.

We focus our research and product development on treatments for rare diseases. Given the small number of patients who have the diseases that we are targeting, it is critical to our ability to grow and become profitable that we continue to successfully identify patients with these rare diseases. Our projections of both the number of people who have these diseases, as well as the subset of people with these diseases who have the potential to benefit from treatment with our product candidates, are based on our beliefs and estimates. These estimates have been derived from a variety of sources, including the scientific literature, surveys of clinics, patient foundations, or market research, and may prove to be incorrect. New studies may change the estimated incidence or prevalence of these diseases. The number of patients may turn out to be lower than expected. The effort to identify patients with diseases we seek to treat is in early stages, and we cannot accurately predict the number of patients for whom treatment might be possible. Additionally, the potentially addressable patient population for each of our product candidates may be limited or may not be amenable to treatment with our product candidates, and new patients may become increasingly difficult to identify or gain access to, which would adversely affect our results of operations and our business. Further, even if we obtain significant market share for our product candidates, because the potential target populations are very small, we may never achieve profitability despite obtaining such significant market share.

Our target patient populations are relatively small, and there is currently no standard of care treatment directed at some of our target indications, such as FSHD. As a result, the pricing and reimbursement of our product candidates, if approved, is uncertain, but must be adequate to support commercial infrastructure. If we are unable to obtain adequate levels of reimbursement, our ability to successfully market and sell our product candidates will be adversely affected. The manner and level at which reimbursement is provided for services related to our product candidates (e.g., for administration of our product to patients) is also important. Inadequate reimbursement for such services may lead to physician resistance and adversely affect our ability to market or sell our products.

Risks related to our intellectual property

If we are unable to obtain, maintain or protect intellectual property rights related to our product candidates, or if the scope of such intellectual property protection is not sufficiently broad, we may not be able to compete effectively in our markets.

We rely upon a combination of patents, trade secret protection and confidentiality agreements to protect the intellectual property related to our technologies and product candidates. Our success depends in large part on our and our licensors' abilities to obtain and maintain patent and other intellectual property protection in the United States and in other countries for our proprietary technology and product candidates.

We have sought to protect our proprietary position by filing patent applications in the United States and abroad related to our novel technologies and product candidates that are important to our business. This process is expensive and time consuming, and we may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. It is also possible that we will fail to identify patentable aspects of our research and development output before it is too late to obtain patent protection.

The patentability of inventions, and the validity, enforceability and scope of patents in the biotechnology and pharmaceutical fields involves complex legal and scientific questions and can be uncertain. As a result, patent applications that we own or in-license may not issue as patents with claims that cover our product candidates, or at all, in the United States or in foreign countries for many reasons. For example, there is no assurance that we were the first to invent or the first to file patent applications in respect of the inventions claimed in our patent applications or that our patent applications claim patentable subject matter. We may also be unaware of potentially relevant prior art relating to our patents and patent applications, and this prior art, if any, may be used by third parties as grounds to seek to invalidate a patent or to prevent a patent from issuing from a pending patent application. Even if patents do successfully issue and even if such patents disclose aspects of our product candidates, third parties may challenge their validity, enforceability or scope, which may result in such patents being narrowed or invalidated. Furthermore, even if they are unchallenged, our patents and patent applications may not adequately protect our intellectual property, provide exclusivity for our product candidates or prevent others from designing around our claims. If the breadth or strength of protection provided by the patents and patent applications we hold, license or pursue with respect to our product candidates is threatened, it could threaten our ability to commercialize our product candidates. Further, if we encounter delays in our clinical trials, the period of time during which we could market any of our product candidates under patent protection, if approved, would be reduced. Since patent applications in the United States and most other countries are confidential for a period of time after filing, we cannot be certain that we were the first to file any patent application related to our product candidates. Changes to the patent laws in the United States and other jurisdictions could also diminish the value of our patents and patent applications or narrow the scope of our patent protection. Any of these outcomes could impair our ability to prevent competition from third parties, which may have an adverse impact on our business.

If the patent applications we own or have in-licensed that relate to our programs or product candidates do not issue as patents, if their breadth or strength of protection is threatened, or if they fail to provide exclusivity for our product candidates, it could dissuade companies from collaborating with us to develop product candidates, and threaten our ability to commercialize future products. We cannot offer any assurances about which, if any, patents will issue, the breadth of any such patents or whether any issued patents will be found invalid and unenforceable or will be threatened by third parties. Any successful opposition to these patents or any other patents owned by or licensed to us could deprive us of rights necessary for the successful commercialization of any product candidates that we may develop. In addition, patents have a limited term. In the United States, the natural expiration of a patent is generally 20 years after it is filed. Although various extensions may be available, the life of a patent, and the protection it affords, is limited. Even if a patent does issue for any of our pending patent applications, possible delays in regulatory approvals could mean that the period of time during which we could market a product candidate under patent protection could be reduced from what we generally would expect. Since patent applications in the United States and most other countries are

confidential for a period of time after filing, and some remain so until issued, we cannot be certain that we were the first to file any patent application related to a product candidate. Furthermore, if third parties have filed such patent applications, an interference proceeding in the United States can be initiated by a third party to determine who was the first to invent any of the subject matter covered by the patent claims of our applications. Even if patents covering aspects of our product candidates are obtained, once the patent life has expired for a product, we may be open to competition from generic medications.

In addition to the protection afforded by patents, we rely on trade secret protection and confidentiality agreements to protect proprietary know-how that is not patentable or that we elect not to patent, processes for which patents are difficult to enforce and any other elements of our product candidate discovery and development processes that involve proprietary know-how, information or technology that is not covered by patents. However, trade secrets can be difficult to protect. We seek to protect our proprietary technology and processes, in part, by entering into confidentiality agreements with our employees, consultants, scientific advisors and contractors. We also seek to preserve the integrity and confidentiality of our data and trade secrets by maintaining physical security of our premises and physical and electronic security of our information technology systems, but it is possible that these security measures could be breached. Although we expect all of our employees and consultants to assign their inventions to us, and all of our employees, consultants, advisors and any third parties who have access to our proprietary know-how, information or technology to enter into confidentiality agreements, we cannot provide any assurances that all such agreements have been duly executed or that our trade secrets and other confidential proprietary information will not be disclosed or that competitors will not otherwise gain access to our trade secrets or independently develop substantially equivalent information and techniques. For example, any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Misappropriation or unauthorized disclosure of our trade secrets could impair our competitive position and may have a material adverse effect on our business. Additionally, if the steps we take to maintain the confidentiality of our trade secrets are inadequate, we may have insufficient recourse against third parties for misappropriating our proprietary information and processes. In addition, others may independently discover our trade secrets and proprietary information. For example, the FDA, as part of its Transparency Initiative, is currently considering whether to make additional information publicly available on a routine basis, including information that we may consider to be trade secrets or other proprietary information, and it is not clear at the present time how the FDA's disclosure policies may change in the future, if at all.

If we are unable to prevent material disclosure of the non-patented intellectual property related to our technologies to third parties, and there is no guarantee that we will have any such enforceable trade secret protection, we may not be able to establish or maintain a competitive advantage in our market, which could materially adversely affect our business, results of operations and financial condition.

Further, the laws of some foreign countries do not protect proprietary rights to the same extent or in the same manner as the laws of the United States. As a result, we may encounter significant problems in preventing third parties from practicing our inventions in countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions.

Claims that our product candidates or the sale or use of our future products infringe the patent or other intellectual property rights of third parties could result in costly litigation or could require substantial time and money to resolve, even if litigation is avoided.

Our commercial success depends in part on our avoiding infringement of the patents and proprietary rights of third parties. There is a substantial amount of litigation, both within and outside the United States, involving patent and other intellectual property rights in the biotechnology and pharmaceutical industries, including patent infringement lawsuits, interferences, oppositions and inter partes reexamination proceedings before the United States Patent and Trademark Office, or USPTO, and corresponding foreign patent offices. Numerous U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in the fields in

which we are pursuing development candidates. As the biotechnology and pharmaceutical industries expand and more patents are issued, the risk increases that our product candidates may be subject to claims of infringement of the patent rights of third parties.

Third parties may assert that we are employing their proprietary technology without authorization. There may be third-party patents or patent applications with claims to materials, formulations, methods of manufacture or methods for treatment related to the use or manufacture of our product candidates. Because patent applications can take many years to issue, there may be currently pending patent applications which may later result in issued patents that our product candidates may infringe. In addition, third parties may obtain patents in the future and claim that use of our technologies infringes upon these patents. If any third-party patents were held by a court of competent jurisdiction to cover the manufacturing process of any of our product candidates, any molecules formed during the manufacturing process or any final product itself, the holders of any such patents may be able to block our ability to commercialize such product candidate unless we obtained a license under the applicable patents, or until such patents expire.

Similarly, if any third-party patents are held by a court of competent jurisdiction to cover aspects of our formulations, processes for manufacture or methods of use, the holders of any such patents may be able to block our ability to develop and commercialize the applicable product candidate unless we obtain a license or until such patent expires. In either case, such a license may not be available on commercially reasonable terms or at all.

Parties making claims against us may obtain injunctive or other equitable relief, which could effectively block our ability to further develop and commercialize one or more of our product candidates. Defense of these claims, regardless of their merit, would involve substantial litigation expense and would be a substantial diversion of employee resources from our business. In the event of a successful claim of infringement against us, we may have to pay substantial damages, including treble damages and attorneys' fees for willful infringement, pay royalties, redesign our infringing products or obtain one or more licenses from third parties, which may not be able to be obtained on reasonable commercial terms or at all, or require substantial time and monetary expenditure.

We may not be successful in obtaining or maintaining necessary rights to our Physiocrine therapeutic product candidates and processes for our development pipeline through acquisitions and in-licenses.

We believe that we have rights to intellectual property, through licenses from third parties and under patents that we own, that is necessary or useful to develop our product candidates. Because our programs may involve additional product candidates that may require the use of proprietary rights held by third parties, the growth of our business will likely depend in part on our ability to acquire, in-license or use these proprietary rights. In addition, our product candidates may require specific formulations to work effectively and efficiently and these rights may be held by others. We may be unable to acquire or in-license any compositions, methods of use, processes or other third-party intellectual property rights from third parties that we identify on reasonable commercial terms or at all. The licensing and acquisition of third-party intellectual property rights is a competitive area, and a number of more established companies are also pursuing strategies to license or acquire third-party intellectual property rights that we may consider attractive. These established companies may have a competitive advantage over us due to their size, cash resources and greater clinical development and commercialization capabilities.

We sometimes collaborate with U.S. and foreign academic institutions to accelerate our preclinical research or development under written agreements with these institutions. These institutions may provide us with an option to negotiate a license to the institution's rights in technology resulting from the collaboration. Regardless of any such right of first negotiation for intellectual property, we may be unable to negotiate a license within the specified time frame or under terms that are acceptable to us. If we are unable to do so, the institution may offer the intellectual property rights to other parties, potentially blocking our ability to pursue our program.

In addition, companies that perceive us to be a competitor may be unwilling to assign or license rights to us. We also may be unable to license or acquire third-party intellectual property rights on terms that would allow us to make an appropriate return on our investment. If we are unable to successfully obtain rights to required third-party intellectual property rights, our business, financial condition and prospects for growth could suffer.

If we fail to comply with our obligations in the agreements under which we license intellectual property rights from third parties or otherwise experience disruptions to our business relationships with our licensors, we could lose license rights that are important to our business.

We are a party to a number of intellectual property license agreements that are important to our business and expect to enter into additional license agreements in the future. Our existing license agreements impose, and we expect that future license agreements will impose, various diligence, milestone payment, royalty and other obligations on us. If we fail to comply with our obligations under these agreements, or we are subject to a bankruptcy, the licensor may have the right to terminate the license, in which event we would not be able to market products covered by the license. For example, under the terms of the license agreements that we may enter into pursuant to our amended and restated research funding and option agreement with The Scripps Research Institute, or TSRI, TSRI has the right to terminate the license under various circumstances, including our failure to make payments to TSRI when due, our default in our indemnification and insurance obligations under the agreement, our failure to meet diligence obligations, as determined by TSRI, our underreporting or underpayment of amounts due to TSRI, our conviction of a felony related to the manufacture, use or sale of licensed products, services or processes and our institution of any challenges to the validity or enforceability of any of the licensed patents.

We may need to obtain licenses from third parties to advance our research or allow commercialization of our product candidates, and we have done so from time to time. We may fail to obtain any of these licenses at a reasonable cost or on reasonable commercial terms, if at all. In that event, we may be required to expend significant time and resources to develop or license replacement technology. If we are unable to do so, we may be unable to develop or commercialize the affected product candidates, which could harm our business significantly. We cannot provide any assurances that third-party patents do not exist which might be enforced against our current product candidates or future products, resulting in either an injunction prohibiting our sales, or, with respect to our sales, an obligation on our part to pay royalties or other forms of compensation to third parties.

In some cases, patent prosecution of our licensed technology is controlled by the licensor. Under the license agreements that we may enter into pursuant to our amended and restated research funding and option agreement with TSRI, TSRI is responsible for the prosecution and maintenance of the licensed patent rights, subject to our right to be consulted and to be informed of the progress of patent applications, patents and related submissions. If our licensors fail to obtain and maintain patent or other protection for the proprietary intellectual property we license from them, we could lose our rights to the intellectual property or our exclusivity with respect to those rights, and our competitors could market competing products using such intellectual property. In certain cases, we may control the prosecution of patents resulting from licensed technology. In the event we breach any of our obligations related to such prosecution, we may incur significant liability to our licensors. Licensing of intellectual property is of critical importance to our business and involves complex legal, business and scientific issues and is complicated by the rapid pace of scientific discovery in our industry. Disputes may arise regarding intellectual property subject to a license agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- the extent to which our technology and processes infringe on intellectual property of the licensor that is not subject to the license agreement;
- the sublicensing of patent and other rights under our collaborative development relationships;
- our diligence obligations under the license agreement and what activities satisfy those diligence obligations;
- the ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and us and our sublicensees or partners, if any; and

- the priority of invention of patented technology.

If disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on acceptable terms, we may be unable to successfully develop and commercialize the affected product candidates.

We may become involved in lawsuits to protect or enforce our patents or the patents of our licensors, which could be expensive, time-consuming and unsuccessful.

Competitors may infringe or otherwise violate our patents, the patents of our licensors or our other intellectual property rights. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time-consuming. Any claims that we assert against perceived infringers could also provoke these parties to assert counterclaims against us alleging that we infringe their intellectual property rights. In addition, in an infringement proceeding, a court may decide that a patent of ours or our licensors is not valid, is unenforceable or is not infringed, or may refuse to stop the other party from using the technology at issue on the grounds that our patents do not cover the technology in question. An adverse result in any litigation or defense proceedings could put one or more of our patents at risk of being invalidated or interpreted narrowly and could put our patent applications at risk of not issuing.

Interference or derivation proceedings provoked by third parties or brought by us may be necessary to determine the priority of inventions or other matters of inventorship with respect to our patents or patent applications or those of our licensors. We may also become involved in other proceedings, such as re-examination or opposition proceedings, before the USPTO or its foreign counterparts relating to our intellectual property or the intellectual property rights of others. An unfavorable outcome in any such proceedings could require us to cease using the related technology or to attempt to license rights to it from the prevailing party, or could cause us to lose valuable intellectual property rights. Our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms, if any license is offered at all. Our defense of litigation or interference proceedings may fail and, even if successful, may result in substantial costs and distract our management and other employees. We may not be able to prevent, alone or with our licensors, misappropriation of our intellectual property rights, particularly in countries where the laws may not protect those rights as fully as in the United States. In addition, the uncertainties associated with litigation could have a material adverse effect on our ability to raise the funds necessary to continue our clinical trials, continue our research programs, license necessary technology from third parties, or enter into development partnerships that would help us bring our product candidates to market. We may also become involved in disputes with others regarding the ownership of intellectual property rights. For example, we jointly develop intellectual property with certain parties, and disagreements may therefore arise as to the ownership of the intellectual property developed pursuant to these relationships. If we are unable to resolve these disputes, we could lose valuable intellectual property rights.

Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation. There could also be public announcements of the results of hearings, motions or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a material adverse effect on the price of our common stock.

We may be subject to claims that our employees, consultants or independent contractors have wrongfully used or disclosed confidential information of third parties or that our employees have wrongfully used or disclosed alleged trade secrets of their former employers.

We employ individuals who were previously employed at universities or other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that our employees, consultants and independent contractors do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or our employees, consultants or independent

contractors have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of any of our employee's former employer or other third parties. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel, which could adversely impact our business. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees.

We may be subject to claims challenging the inventorship or ownership of our patents and other intellectual property.

Although we are not currently experiencing any claims challenging the inventorship of our patents or ownership of our intellectual property, we may in the future be subject to claims that former employees, collaborators or other third parties have an ownership interest in our patents or other intellectual property. For example, we may have inventorship disputes arise from conflicting obligations of consultants or others who are involved in developing our product candidates. Litigation may be necessary to defend against these and other claims challenging inventorship or ownership. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, valuable intellectual property. Such an outcome could have a material adverse effect on our business. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees.

Obtaining and maintaining our patent protection depends on compliance with various procedural, document submission, fee payment and other requirements imposed by governmental patent agencies, and our patent protection could be reduced or eliminated for non-compliance with these requirements.

Periodic maintenance fees, renewal fees, annuity fees and various other governmental fees on patents or applications will be due to be paid to the USPTO and various governmental patent agencies outside of the United States in several stages over the lifetime of the patents or applications. We have systems in place to remind us to pay these fees, and we employ an outside firm and rely on our outside counsel to pay these fees due to non-U.S. patent agencies. The USPTO and various non-U.S. governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process. We employ law firms and other professionals to help us comply, and in many cases, an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with the applicable rules. However, there are situations in which non-compliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, our competitors might be able to enter the market and this circumstance would have a material adverse effect on our business.

Issued patents covering our product candidates could be found invalid or unenforceable if challenged in court.

If we or one of our licensors initiated legal proceedings against a third party to enforce a patent covering one of our product candidates, the defendant could counterclaim that the patent covering our product candidate is invalid or unenforceable. In patent litigation in the United States, defendant counterclaims alleging invalidity or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, including lack of novelty, obviousness or non-enablement. Grounds for an unenforceability assertion could be an allegation that someone connected with prosecution of the patent withheld relevant information from the USPTO, or made a misleading statement, during prosecution. Third parties may also raise similar claims before administrative bodies in the United States or abroad, even outside the context of litigation. Such mechanisms include re-examination, post grant review, and equivalent proceedings in foreign jurisdictions (e.g., opposition proceedings). Such proceedings could result in revocation or amendment to our patents in such a way that they no longer cover our product candidates. The outcome following legal assertions of invalidity and unenforceability is unpredictable. With respect to the validity question, for example, we cannot be

certain that there is no invalidating prior art, of which we and the patent examiner were unaware during prosecution. If a defendant were to prevail on a legal assertion of invalidity or unenforceability, we would lose at least part, and perhaps all, of the patent protection on our product candidates. Such a loss of patent protection would have a material adverse impact on our business.

Changes in patent law could diminish the value of patents in general, thereby impairing our ability to protect our products.

As is the case with many other biotechnology companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biotechnology industry involve both technological and legal complexity, and is therefore obtaining, maintaining and enforcing biotechnology patents is costly, time-consuming and inherently uncertain. In addition, recent legislative and judicial developments in the United States and elsewhere have in some cases removed the protection afforded to patent owners, made patents more difficult to obtain, or increased the uncertainty regarding the ability to obtain, maintain and enforce patents. For example, Congress has recently passed, and the United States is currently implementing, wide-ranging patent reform legislation, and may pass further patent reform legislation in the future. Recent U.S. Supreme Court rulings have narrowed the scope of patent protection available in certain circumstances and weakened the rights of patent owners in certain situations. For example, in a recent case, *Association for Molecular Pathology v. Myriad Genetics, Inc.*, the U.S. Supreme Court held that certain claims to naturally occurring substances are not patentable. Although we do not believe that any of the patents owned or licensed by us will be found invalid based on this decision, we cannot predict how future decisions by the courts, the U.S. Congress, or the USPTO may impact the value of our patents. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents generally, once obtained. Depending on decisions and actions by the U.S. Congress, the federal courts, the USPTO and their respective foreign counterparts, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to maintain and enforce our existing patents and patents that we might obtain in the future.

Recent patent reform legislation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the validity or defense of our issued patents.

On September 16, 2011, the Leahy-Smith America Invents Act, or the Leahy-Smith Act, was signed into law. The Leahy-Smith Act includes a number of significant changes to U.S. patent law, including provisions that affect the way patent applications will be prosecuted and may also affect patent litigation. The USPTO is currently developing regulations and procedures to govern administration of the Leahy-Smith Act, and many of the substantive changes to patent law associated with the Leahy-Smith Act, and in particular, the first to file provisions, were enacted March 16, 2013. Although it is not clear what, if any, impact the Leahy-Smith Act will have on the operation of our business, the Leahy-Smith Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents, all of which could have a material adverse effect on our business and financial condition.

We have not yet registered trademarks for a commercial trade name for Resolaris and failure to secure such registrations could adversely affect our business.

We have not yet registered any trademarks for a commercial trade name for Resolaris. During trademark registration proceedings, we may receive rejections. Although we would be given an opportunity to respond to those rejections, we may be unable to overcome such rejections. In addition, in the USPTO and in comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and to seek to cancel registered trademarks. Opposition or cancellation proceedings have been filed and may in the future be filed against certain of our trademarks, and our trademarks may not survive such proceedings. Moreover, any name we propose to use with our product candidates in the United States must be approved by the FDA, regardless of whether we have registered it, or applied to register it, as a trademark. The FDA typically conducts a review of proposed product names, including an evaluation of potential for confusion

with other product names. If the FDA objects to any of our proposed proprietary product names, we may be required to expend significant additional resources in an effort to identify a suitable substitute name that would qualify under applicable trademark laws, not infringe the existing rights of third parties and be acceptable to the FDA.

We may not be able to protect our intellectual property rights throughout the world.

Filing, prosecuting and defending patents on product candidates in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. In addition, the laws of some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the United States. Consequently, we may not be able to prevent third parties from practicing our inventions in all countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products and further, may export otherwise infringing products to territories where we have patent protection, but enforcement is not as strong as that in the United States. These products may compete with our products and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents, trade secrets and other intellectual property protection, particularly those relating to biotechnology products, which could make it difficult for us to stop the infringement of our patents or marketing of competing products in violation of our proprietary rights generally. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business, could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate and the damages or other remedies awarded, if any, may not be commercially meaningful. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

Risks related to our business operations

Our future success depends on our ability to retain key employees, consultants and advisors and to attract, retain and motivate qualified personnel.

We are highly dependent on principal members of our executive team listed under “Management” located elsewhere in this prospectus, the loss of whose services may adversely impact the achievement of our objectives. Additionally, our principal financial and accounting officer is a consultant and we may face conflicts of interest as he allocates his time across various interests. While we have entered into employment agreements with each of our other executive officers, any of them could leave our employment at any time, as all of our employees are “at will” employees. Recruiting and retaining other qualified employees, consultants and advisors for our business, including scientific and technical personnel, will also be critical to our success. There is currently a shortage of skilled executives in our industry, which is likely to continue. As a result, competition for skilled personnel is intense and the turnover rate can be high. We may not be able to attract and retain personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for individuals with similar skill sets. In addition, failure to succeed in preclinical studies or clinical trials may make it more challenging to recruit and retain qualified personnel. The inability to recruit or loss of the services of any executive, key employee, consultant or advisor may impede the progress of our research, development and commercialization objectives. Furthermore, many of our employees have become or will soon become vested in a substantial amount of stock or number of stock options. Our employees may be more likely to leave us if the shares they own or the shares underlying their vested options have significantly appreciated in value relative to

the original purchase prices of the shares or the exercise prices of the options, or if the exercise prices of the options that they hold are significantly below the market price of our common stock. Further, our employees' ability to exercise those options and sell their stock in a public market after the closing of this offering may result in a higher than normal turnover rate.

We are subject to a variety of risks associated with international operations that could materially adversely affect our business.

We currently conduct research activities through our majority-owned Hong Kong subsidiary, Pangu BioPharma Limited, in collaboration with the Hong Kong University of Science and Technology and maintain a representative office for this subsidiary in China. Additionally, we are currently conducting our Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD in the European Union, and the supply of Resolaris for our clinical trials is currently produced in India by a third-party manufacturer. If any of our product candidates are approved for commercialization outside of the United States, we expect to either use our own sales organization or selectively enter into agreements with third parties to market our products on a worldwide basis or in more limited geographical regions. We are, and we expect that we will continue to be, subject to a variety of risks related to international operations, including:

- different regulatory requirements for approval of drugs and biologics in foreign countries;
- reduced or uncertain protection for intellectual property;
- unexpected changes in tariffs, trade barriers and regulatory requirements;
- economic weakness, including inflation, or political instability in particular foreign economies and markets;
- compliance with tax, employment, immigration and labor laws for employees living or traveling abroad; and
- foreign currency fluctuations, which could result in reduced revenues, and other obligations incident to doing business in another country.

Any failure to continue our international operations or to commercialize our product candidates outside of the United States may impair our ability to generate revenues and harm our business, prospects and results of operations.

We will need to expand our organization and we may experience difficulties in managing this growth, which could disrupt our operations.

We have recently increased the size of our management team and as of April 1, 2015, we had 49 full-time employees. As we continue our Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD, prepare for additional clinical trials of Resolaris and expand our other clinical development activities, as well as begin our operations as a public company, we expect to increase our full-time employee base and to hire more consultants and contractors. In addition to certain members of our management team being relatively new to our company, our management may need to divert a disproportionate amount of its attention away from our day-to-day activities and devote a substantial amount of time to managing these growth activities. We may not be able to effectively manage the expansion of our operations, which may result in weaknesses in our infrastructure, operational mistakes, loss of business opportunities, loss of employees and reduced productivity among remaining employees. Our expected growth could require significant capital expenditures and may divert financial resources from other projects, such as the conduct of additional clinical activities for Resolaris and the development of additional product candidates. If our management is unable to effectively manage our growth, our expenses may increase more than expected, our ability to generate or grow revenues could be reduced, and we may not be able to implement our business strategy. Our future financial performance and our ability to develop and commercialize product candidates and compete effectively will depend, in part, on our ability to effectively manage any future growth.

We may use our financial and human resources to pursue a particular business strategy, research program or product candidate and fail to capitalize on strategies, programs or product candidates that may be more profitable or for which there is a greater likelihood of success.

Because we have limited resources, we may forego or delay pursuit of certain strategic opportunities or opportunities with certain programs or product candidates or for indications that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. In addition, we may elect to pursue a research, clinical or commercial strategy that ultimately does not yield the results that we desire. Our spending on current and future research and development programs for product candidates may not result in any commercially viable products. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through strategic collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate, or we may allocate internal resources to a product candidate in a therapeutic area or market in which it would have been more advantageous to enter into a partnering arrangement. Any failure to allocate resources or capitalize on strategies in a successful manner will have an adverse impact on our business.

Our employees, principal investigators, consultants and commercial partners may engage in misconduct or other improper activities, including non-compliance with regulatory standards and requirements and insider trading.

We are exposed to the risk of fraud or other misconduct by our employees, principal investigators, consultants and commercial partners. Misconduct by these parties could include intentional failures to comply with the regulations of the FDA and non-U.S. regulators, provide accurate information to the FDA and non-U.S. regulators, comply with healthcare fraud and abuse laws and regulations in the United States and abroad, report financial information or data accurately or disclose unauthorized activities to us. In particular, sales, marketing and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, misconduct, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Such misconduct could also involve the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions and cause serious harm to our reputation. We intend to adopt, prior to the completion of this offering, a code of conduct applicable to all of our employees, but it is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to comply with these laws or regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, including the imposition of significant fines or other sanctions.

We face potential product liability, and, if successful claims are brought against us, we may incur substantial liability and costs. If the use of our product candidates harms patients, or is perceived to harm patients even when such harm is unrelated to our product candidates, our regulatory approvals could be revoked or otherwise negatively impacted and we could be subject to costly and damaging product liability claims.

The use of our product candidates in clinical trials and the sale of any products for which we obtain marketing approval exposes us to the risk of product liability claims. Product liability claims might be brought against us by patients, healthcare providers, pharmaceutical companies or others selling or otherwise coming into contact with our products. There is a risk that our product candidates may induce adverse events. If we cannot successfully defend against product liability claims, we could incur substantial liability and costs. In addition, regardless of merit or eventual outcome, product liability claims may result in:

- impairment of our business reputation;
- withdrawal of clinical trial participants;

- costs due to related litigation;
- distraction of management's attention from our primary business;
- substantial monetary awards to patients or other claimants;
- the inability to commercialize our product candidates; and
- decreased demand for our product candidates, if approved for commercial sale.

We carry product liability insurance for our clinical trials covering $5.0 million per occurrence and up to $5.0 million in the aggregate, subject to certain deductibles and exclusions. Although we believe the amount of our insurance coverage is typical for companies similar to us in our industry, we may not have adequate insurance coverage or be able to maintain insurance coverage at a reasonable cost or in sufficient amounts to protect us against losses due to liability. If and when we obtain marketing approval for product candidates, we intend to expand our insurance coverage to include the sale of commercial products; however, we may be unable to obtain product liability insurance on commercially reasonable terms or in adequate amounts. On occasion, large judgments have been awarded in class action lawsuits based on drugs or medical treatments that had unanticipated adverse effects. A successful product liability claim or series of claims brought against us could cause our stock price to decline and adversely affect our reputation and, if judgments exceed our insurance coverage, could adversely affect our results of operations and business.

Patients with the diseases targeted by our product candidates are often already in severe and advanced stages of disease and may have both known and unknown significant pre-existing and potentially life-threatening health risks. During the course of treatment, patients may suffer adverse events, including death, for reasons that may be related to our product candidates. Such events could subject us to costly litigation, require us to pay substantial amounts of money to injured patients, delay, negatively impact or end our opportunity to receive or maintain regulatory approval to market our products, or require us to suspend or abandon our commercialization efforts. Even in a circumstance in which we do not believe that an adverse event is related to our products, the investigation into the circumstance may be time-consuming or inconclusive. These investigations may interrupt our sales efforts, delay our regulatory approval process in other countries, or impact and limit the type of regulatory approvals our product candidates receive or maintain. As a result of these factors, a product liability claim, even if successfully defended, could have a material adverse effect on our business, financial condition or results of operations.

If we fail to comply with environmental, health and safety laws and regulations, we could become subject to fines or penalties or incur costs that could have a material adverse effect on the success of our business.

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our operations involve the use of hazardous and flammable materials, including chemicals and biological materials. Our operations also produce hazardous waste products. We generally contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials. In the event of contamination or injury resulting from our use of hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties.

Although we maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees resulting from the use of hazardous materials or other work-related injuries, this insurance may not provide adequate coverage against potential liabilities. In addition, we may incur substantial costs in order to comply with current or future environmental, health and safety laws and regulations. These current or future laws and regulations may impair our research, development or production efforts. Failure to comply with these laws and regulations also may result in substantial fines, penalties or other sanctions.

We are subject to anti-corruption laws in the jurisdictions in which we operate.

We are subject to a number of anti-corruption laws, including the U.S. Foreign Corrupt Practices Act, or the FCPA, and various other anti-corruption laws. The FCPA generally prohibits companies and their intermediaries from making improper payments to foreign officials for the purpose of obtaining or keeping business and/or other benefits. Our business relies on approvals and licenses from government and regulatory entities, and as a result, we are subject to certain elevated risks associated with interactions with these entities. Although our employee handbook strictly forbids gifts to government employees, to date we have not developed formal policies and procedures governing the interactions of employees with government entities to mitigate these risks. If we are not in compliance with anti-corruption laws and other laws governing the conduct of business with government entities (including local laws), we may be subject to criminal and civil penalties and other remedial measures, which could harm our reputation and have a material adverse impact on our business, financial condition, results of operations and prospects. Any investigation of any actual or alleged violations of such laws could also harm our reputation or have an adverse impact on our business, prospects, financial condition and results of operations.

We will incur significant increased costs as a result of operating as a public company, and our management will be required to devote substantial time to new compliance initiatives.

As a public company, we will incur significant legal, accounting and other expenses that we did not incur as a private company. In addition, the Sarbanes-Oxley Act of 2002, or Sarbanes-Oxley Act, as well as rules subsequently implemented by the Securities and Exchange Commission, or SEC, and The Nasdaq Global Market have imposed various requirements on public companies. In July 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act, or the Dodd-Frank Act, was enacted. There are significant corporate governance and executive compensation related provisions in the Dodd-Frank Act that require the SEC to adopt additional rules and regulations in these areas such as "say on pay" and proxy access. Recent legislation permits smaller "emerging growth companies" to implement many of these requirements over a longer period and up to five years from the pricing of this offering. We intend to take advantage of this legislation but cannot guarantee that we will not be required to implement these requirements sooner than budgeted or planned and thereby incur unexpected expenses. Stockholder activism, the current political environment and the current high level of government intervention and regulatory reform may lead to substantial new regulations and disclosure obligations, which may lead to additional compliance costs and impact the manner in which we operate our business in ways we cannot currently anticipate. Our management and other personnel will need to devote a substantial amount of time to these compliance initiatives. Moreover, these rules and regulations will increase our legal and financial compliance costs and will make some activities more time-consuming and costly. For example, we expect these rules and regulations to make it more difficult and more expensive for us to obtain director and officer liability insurance and we may be required to incur substantial costs to maintain our current levels of such coverage.

Unfavorable global economic conditions could adversely affect our business, financial condition or results of operations.

Our results of operations could be adversely affected by general conditions in the global economy and in the global financial markets. The recent global financial crisis caused extreme volatility and disruptions in the capital and credit markets. A severe or prolonged economic downturn, such as the recent global financial crisis, could result in a variety of risks to our business, including inability to raise additional capital when needed on acceptable terms, if at all. A weak or declining economy could also strain our manufacturers, possibly resulting in supply disruption. Any of the foregoing could harm our business and we cannot anticipate all of the ways in which the current economic climate and financial market conditions could adversely impact our business.

We or the third parties upon whom we depend may be adversely affected by earthquakes, droughts, floods, fires or other natural disasters and our business continuity and disaster recovery plans may not adequately protect us from a serious disaster.

We are located in San Diego, California, and our clinical supply of Resolaris is currently produced in India. We currently anticipate that if Resolaris receives marketing approval, commercial production may take place in the United States and/or the United Kingdom. Some of these geographic locations have in the past experienced natural disasters, including severe earthquakes. Earthquakes, droughts, floods, fires, disease epidemics or other natural disasters could severely disrupt our operations, and have a material adverse effect on our business, results of operations, financial condition and prospects. If a natural disaster, power outage or other event occurred that prevented us from using all or a significant portion of our facilities, that damaged critical infrastructure, such as the manufacturing facilities of our third-party contract manufacturers, or that otherwise disrupted operations, it may be difficult or, in certain cases, impossible for us to continue our business for a substantial period of time. The disaster recovery and business continuity plans we have in place currently are limited and are unlikely to prove adequate in the event of a serious disaster or similar event. We may incur substantial expenses as a result of the limited nature of our disaster recovery and business continuity plans, as well as limits on our insurance coverage, which could have a material adverse effect on our business, prospects, financial condition and results of operations.

Risks related to this offering and ownership of our common stock

An active trading market for our common stock may not develop.

Prior to this offering, there has not been a public market for our common stock. An active trading market for our common stock may not develop or be sustained following this offering. You may not be able to sell your shares quickly or at the market price if trading in our common stock is not active. The initial public offering price for the shares will be determined by negotiations between us and the representative of the underwriters and may not be indicative of prices that will prevail in the trading market.

The market price of our common stock may be highly volatile, and you may not be able to resell your shares at or above the initial public offering price.

The market price of our common stock is likely to be volatile. Our stock price could be subject to wide fluctuations in response to a variety of factors, including the following:

- adverse results or delays in preclinical studies or clinical trials;
- the imposition of a clinical hold on our product candidates or our inability to cause the clinical hold to be lifted;
- any delay in filing an IND or BLA for any of our product candidates and any adverse development or perceived adverse development with respect to the FDA's review of that IND or BLA;
- failure to develop successfully and commercialize our product candidates;
- the perception of limited market sizes or pricing for our product candidates;
- failure by us or our licensors to prosecute, maintain or enforce intellectual property rights covering our product candidates and processes;
- changes in laws or regulations applicable to future products;
- inability to obtain adequate product supply for our product candidates or the inability to do so at acceptable prices;
- adverse regulatory decisions;
- introduction of new products, services or technologies by our competitors;
- inability to obtain additional funding;

- failure to meet or exceed financial or operational projections we may provide to the public;
- failure to meet or exceed the financial or operational projections of the investment community;
- the perception of the pharmaceutical industry by the public, legislatures, regulators and the investment community;
- significant acquisitions, strategic partnerships, joint ventures or capital commitments by us or our competitors;
- disputes or other developments relating to proprietary rights, including patents, litigation matters and our ability to obtain patent protection for our technologies;
- additions or departures of key scientific or management personnel;
- significant lawsuits, including patent or stockholder litigation;
- if securities or industry analysts do not publish research or reports about our business, or they issue an adverse or misleading opinion regarding our stock;
- changes in the market valuations of similar companies;
- general market or macroeconomic conditions;
- sales of our common stock by us or our stockholders in the future; and
- trading volume of our common stock.

In addition, companies trading in the stock market in general, and The Nasdaq Global Market in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of these companies. Broad market and industry factors may negatively affect the market price of our common stock, regardless of our actual operating performance.

Our executive officers, directors, principal stockholders and their affiliates own a significant percentage of our stock and will be able to exert significant control over matters submitted to stockholders for approval.

Our executive officers, directors, five percent stockholders and their affiliates beneficially own approximately 80% of our voting stock and, upon closing of this offering, that same group will beneficially own approximately % of our outstanding voting stock (assuming no exercise of the underwriters' option to purchase additional shares). Therefore, even after this offering, these stockholders will have the ability to influence us through their ownership positions and may be able to determine all matters requiring stockholder approval. For example, these stockholders, acting together, may be able to control elections of directors, amendments of our organizational documents, or approval of any merger, sale of assets, or other major corporate transaction. This may prevent or discourage unsolicited acquisition proposals or offers for our common stock that you may believe are in your best interest as one of our stockholders.

We are an "emerging growth company," and we cannot be certain if the reduced reporting requirements applicable to emerging growth companies will make our common stock less attractive to investors.

We are an "emerging growth company," as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. For as long as we continue to be an emerging growth company, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act reduced disclosure obligations regarding executive compensation in this prospectus and our periodic reports and proxy statements and exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved. We could be an emerging growth company for up to five years, although circumstances could cause us to lose that status earlier, including if the market value of our common stock held

by non-affiliates exceeds $700.0 million as of any June 30 before that time or if we have total annual gross revenue of $1.0 billion or more during any fiscal year before that time, in which cases we would no longer be an emerging growth company as of the following December 31 or, if we issue more than $1.0 billion in non-convertible debt during any three-year period before that time, we would cease to be an emerging growth company immediately. Even after we no longer qualify as an emerging growth company, we may still qualify as a "smaller reporting company" which would allow us to take advantage of many of the same exemptions from disclosure requirements, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act and reduced disclosure obligations regarding executive compensation in this prospectus and our periodic reports and proxy statements. We cannot predict if investors will find our common stock less attractive because we may rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our stock price may be more volatile.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards and, therefore, will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

You will incur immediate and substantial dilution in the book value of your shares.

Investors purchasing shares of common stock in this offering will pay a price per share that substantially exceeds the pro forma book value per share of our tangible assets after subtracting our liabilities. As a result, investors purchasing shares of common stock in this offering will incur immediate dilution of $ per share, based on the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, and our pro forma net tangible book value as of December 31, 2014. For information on how the foregoing amounts were calculated, see "Dilution." To the extent shares are issued under outstanding options or warrants, or pursuant to the conversion of convertible debt, investors will incur further dilution. As a result of the dilution to investors purchasing shares in this offering, investors may receive significantly less than the purchase price paid in this offering, if anything, in the event of our liquidation.

Sales of a substantial number of shares of our common stock in the public market could cause our stock price to fall.

If our existing stockholders sell, or indicate an intention to sell, substantial amounts of our common stock in the public market after the lock-up and other legal restrictions on resale discussed in this prospectus lapse, the market price of our common stock could decline. Based upon the number of shares of common stock outstanding on an as-converted basis as of December 31, 2014, and including the shares of common stock issuable upon the conversion of the shares of our Series E redeemable convertible preferred stock issued in March 2015, upon the closing of this offering, we will have outstanding a total of shares of common stock, assuming no exercise of the underwriters' option to purchase additional shares and no exercise of outstanding warrants and options. Of these shares, as of the date of this prospectus, approximately shares of our common stock, plus any shares sold upon exercise of the underwriters' option to purchase additional shares, will be freely tradable, without restriction, in the public market immediately following this offering, except for any shares purchased in this offering by certain of our stockholders or held by our "affiliates" as that term is defined under Rule 144 of the Securities Act of 1933, as amended, or the Securities Act. The underwriters, however, may, in their sole discretion and under the terms of the lock-up agreements, permit our officers, directors and other stockholders who are subject to the lock-up agreements to sell shares prior to the expiration of the lock-up agreements.

The lock-up agreements pertaining to this offering will expire 180 days from the date of this prospectus. After the lock-up agreements expire, based upon the number of shares of common stock outstanding on an as-converted basis as of December 31, 2014, and including the shares of common stock issuable upon the conversion of the shares of our Series E redeemable convertible preferred stock issued in March 2015, up to an

additional shares of common stock will be eligible for sale in the public market, of which are held by directors, executive officers and other affiliates and will be subject to Rule 144 under the Securities Act.

In addition, as of December 31, 2014, shares of common stock that are either subject to outstanding options, reserved for future issuance under our equity incentive plans or subject to outstanding warrants will become eligible for sale in the public market to the extent permitted by the provisions of various vesting schedules, the lock-up agreements and Rule 144 and Rule 701 under the Securities Act. If these additional shares of common stock are sold, or if it is perceived that they will be sold, in the public market, the market price of our common stock could decline.

After this offering, the holders of approximately shares of our common stock will be entitled to rights with respect to the registration of their shares under the Securities Act, subject to the lock-up agreements described above. Registration of these shares under the Securities Act would result in the shares becoming freely tradable without restriction under the Securities Act, except for shares purchased by affiliates. Any sales of securities by these stockholders could have a material adverse effect on the market price of our common stock.

Future sales and issuances of our common stock or rights to purchase common stock, including pursuant to our equity incentive plans, could result in additional dilution of the percentage ownership of our stockholders and could cause our stock price to fall.

We will need additional capital in the future to continue our planned operations. To the extent we raise additional capital by issuing equity securities, our stockholders may experience substantial dilution. We may sell common stock, convertible securities or other equity securities in one or more transactions at prices and in a manner we determine from time to time. If we sell common stock, convertible securities or other equity securities in more than one transaction, investors may be materially diluted by subsequent sales. These sales may also result in material dilution to our existing stockholders, and new investors could gain rights superior to our existing stockholders.

Pursuant to our 2015 Stock Option and Incentive Plan, or the 2015 Plan, we are authorized to grant stock options and other equity-based awards to our employees, directors and consultants. The number of shares available for future grant under the 2015 Plan will automatically increase each year by up to % of all shares of our capital stock outstanding as of December 31 of the prior calendar year, subject to the ability of our board of directors to take action to reduce the size of the increase in any given year. Currently, we plan to register the increased number of shares available for issuance under the 2015 Plan each year. If our board of directors elects to increase the number of shares available for future grant by the maximum amount each year, our stockholders may experience additional dilution, which could cause our stock price to decline.

If securities analysts do not publish research or reports about our business or if they publish negative evaluations of our stock, the price of our stock could decline.

The trading market for our common stock will rely in part on the research and reports that industry or financial analysts publish about us or our business. We may never obtain research coverage by industry or financial analysts. If no or few analysts commence coverage of us, the trading price of our stock would likely decrease. Even if we do obtain analyst coverage, if one or more of the analysts covering our business downgrade their evaluations of our stock, the price of our stock could decline. If one or more of these analysts cease to cover our stock, we could lose visibility in the market for our stock, which in turn could cause our stock price to decline.

We could be subject to securities class action litigation.

In the past, securities class action litigation has often been brought against a company following a decline in the market price of its securities. This risk is especially relevant for us because pharmaceutical companies have experienced significant stock price volatility in recent years. If we face such litigation, it could result in substantial costs and a diversion of management's attention and resources, which could harm our business.

We have broad discretion in the use of the net proceeds from this offering and may not use them effectively.

Our management will have broad discretion in the application of the net proceeds from this offering, including for any of the purposes described in the section entitled "Use of Proceeds," and you will not have the opportunity as part of your investment decision to assess whether the net proceeds are being used appropriately. Because of the number and variability of factors that will determine our use of the net proceeds from this offering, their ultimate use may vary substantially from their currently intended use. The failure by our management to apply these funds effectively could harm our business. Pending their use, we may invest the net proceeds from this offering in short-term, investment-grade, interest-bearing securities. These investments may not yield a favorable return to our stockholders.

Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited.

We have incurred substantial losses during our history, we do not expect to become profitable in the near future and we may never achieve profitability. Unused losses generally are available to be carried forward to offset future taxable income, if any, until such unused losses expire. Under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, if a corporation undergoes an "ownership change," generally defined as a greater than 50% change (by value) in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards, or NOLs, and other pre-change tax attributes (such as research tax credits) to offset its post-change taxable income or taxes may be limited. We completed an analysis through September 7, 2011, and determined that on November 30, 2006 an ownership change occurred, for which we have adjusted our NOL and research and development tax credit carryforwards. We may have experienced an ownership change subsequent to September 7, 2011, and we may also experience ownership changes in the future as a result of this offering or subsequent shifts in our stock ownership, some of which may be outside of our control. As a result, our ability to use our pre-change NOLs to offset U.S. federal taxable income may be subject to limitations, which could potentially result in increased future tax liability to us. In addition, at the state level, there may be periods during which the use of NOLs is suspended or otherwise limited, which could accelerate or permanently increase state taxes owed.

We do not intend to pay dividends on our common stock, and therefore any returns will be limited to the value of our stock.

We have never declared or paid any cash dividends on our common stock. We anticipate that we will retain future earnings for the development, operation and expansion of our business and do not anticipate declaring or paying any cash dividends for the foreseeable future. Any return to stockholders will therefore be limited to the appreciation of their stock.

Provisions in our amended and restated certificate of incorporation and bylaws, as well as provisions of Delaware law, could make it more difficult for a third party to acquire us or increase the cost of acquiring us, even if doing so would benefit our stockholders or remove our current management.

Our amended and restated certificate of incorporation, amended and restated bylaws and Delaware law contain or will contain provisions that may have the effect of delaying or preventing a change in control of us or changes in our management. Our amended and restated certificate of incorporation and bylaws, which will become effective upon the closing of this offering, include provisions that:

- authorize "blank check" preferred stock, which could be issued by our board of directors without stockholder approval and may contain voting, liquidation, dividend and other rights superior to our common stock;
- create a classified board of directors whose members serve staggered three-year terms;
- specify that special meetings of our stockholders can be called only by our board of directors, the chairperson of our board of directors, our chief executive officer or our president;

- prohibit stockholder action by written consent;
- establish an advance notice procedure for stockholder approvals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to our board of directors;
- provide that our directors may be removed only for cause;
- provide that vacancies on our board of directors may be filled only by a majority of directors then in office, even though less than a quorum;
- specify that no stockholder is permitted to cumulate votes at any election of directors;
- expressly authorize our board of directors to modify, alter or repeal our amended and restated bylaws; and
- require supermajority votes of the holders of our common stock to amend specified provisions of our amended and restated certificate of incorporation and amended and restated bylaws.

These provisions, alone or together, could delay or prevent hostile takeovers and changes in control or changes in our management.

In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which limits the ability of stockholders owning in excess of 15% of our outstanding voting stock to merge or combine with us.

Any provision of our amended and restated certificate of incorporation or amended and restated bylaws or Delaware law that has the effect of delaying or deterring a change in control could limit the opportunity for our stockholders to receive a premium for their shares of our common stock, and could also affect the price that some investors are willing to pay for our common stock.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus, including the sections entitled "Prospectus Summary," "Risk Factors," "Management's Discussion and Analysis of Financial Condition and Results of Operations" and "Business," contains forward-looking statements that are based on our management's belief and assumptions and on information currently available to our management. Although we believe that the expectations reflected in these forward-looking statements are reasonable, these statements relate to future events or our future operational or financial performance, and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by these forward-looking statements. Forward-looking statements in this prospectus include, but are not limited to, statements about:

- the success, cost and timing of our clinical trials, including our ongoing and planned Phase 1b/2 trials of Resolaris, and whether the results of our trials will be sufficient to support domestic or foreign regulatory approvals;
- the likelihood and timing of regulatory approvals for Resolaris and any of our other product candidates;
- our ability to identify and discover additional product candidates;
- whether our existing capital resources and the net proceeds from this offering will be sufficient to enable us to complete any particular portion of our planned clinical development of Resolaris;
- our ability to obtain, maintain, defend and enforce intellectual property rights protecting our product candidates;
- our estimates of our expenses, ongoing losses, future revenue, capital requirements and our needs for or ability to obtain additional financing;
- performance of third-party service providers and independent contractors upon whom we rely to conduct our clinical trials and to manufacture our product candidates or certain components of our product candidates;
- our ability to develop sales and marketing capabilities or to enter into strategic partnerships to develop and commercialize Resolaris or any of our other product candidates;
- the timing and success of the commercialization of Resolaris or any of our other product candidates;
- the rate and degree of market acceptance of our product candidates;
- the size and growth of the potential markets for our product candidates and our ability to serve those markets;
- regulatory developments in the United States and foreign countries;
- the success of competing therapies that are or may become available;
- our ability to attract and retain key scientific or management personnel;
- our expectations regarding the period during which we qualify as an emerging growth company under the Jumpstart Our Business Startups Act of 2012; and
- our use of the proceeds from this offering.

In some cases, you can identify forward-looking statements by terminology such as "may," "will," "should," "expects," "intends," "plans," "anticipates," "believes," "estimates," "predicts," "potential," "continue" or the negative of these terms or other comparable terminology. These statements are only predictions. You should not place undue reliance on forward-looking statements because they involve known and unknown risks, uncertainties and other factors, which are, in some cases, beyond our control and which could materially affect results. Factors that may cause actual results to differ materially from current expectations include, among other

things, those listed under "Risk Factors" and elsewhere in this prospectus. If one or more of these risks or uncertainties occur, or if our underlying assumptions prove to be incorrect, actual events or results may vary significantly from those implied or projected by the forward-looking statements. No forward-looking statement is a guarantee of future performance. You should read this prospectus and the documents that we reference in this prospectus and have filed with the Securities and Exchange Commission as exhibits to the registration statement, of which this prospectus is a part, completely and with the understanding that our actual future results may be materially different from any future results expressed or implied by these forward-looking statements.

The forward-looking statements in this prospectus represent our views as of the date of this prospectus. We anticipate that subsequent events and developments will cause our views to change. However, while we may elect to update these forward-looking statements at some point in the future, we have no current intention of doing so except to the extent required by applicable law. You should therefore not rely on these forward-looking statements as representing our views as of any date subsequent to the date of this prospectus.

USE OF PROCEEDS

We estimate that the net proceeds to us from the sale of shares of common stock in this offering will be approximately $ million based upon an assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. If the underwriters' option to purchase additional shares in this offering is exercised in full, we estimate that our net proceeds will be approximately $ million, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

A $1.00 increase (decrease) in the assumed initial public offering price of $ per share would increase (decrease) the net proceeds to us from this offering by approximately $ million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of one million in the number of shares offered by us would increase (decrease) the net proceeds to us from this offering by approximately $ million, assuming the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The principal purposes of this offering are to obtain additional capital to support our operations, to establish a public market for our common stock and to facilitate our future access to the public markets. We intend to use the net proceeds from this offering as follows:

- approximately $ million to fund our ongoing Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD through completion of the third cohort and the initiation of up to two additional cohorts, and to conduct additional studies to evaluate the safety, tolerability and extended treatment of FSHD;
- approximately $ million to fund portions of additional Phase 1b/2 clinical trials of Resolaris in early onset FSHD, LGMD and an additional indication, such as ILD;
- approximately $ million to fund the initiation of potential Phase 3 or pivotal clinical trials of Resolaris in adult patients with FSHD;
- approximately $ million to advance other research, discovery and development activities; and
- the remainder for working capital and other general corporate purposes, including funding the costs of operating as a public company.

In December 2011, in connection with our facility lease, we issued a $2.0 million subordinated convertible unsecured promissory note to the venture arm of our landlord, BioMed Realty, L.P. which was subsequently transferred to its affiliate, BMV Direct RE LP. The note bears interest at an annual rate of 8.0% and matures at the earlier of (i) May 2015, (ii) a liquidation event, and (iii) the closing of an initial firm commitment underwritten public offering of our common stock pursuant to a registration statement under the Securities Act, unless previously converted. At any time prior to maturity, the holder may elect to convert the principal outstanding under the promissory note into shares of our Series D redeemable convertible preferred stock at the price of $2.662 per share, and upon conversion, all accrued interest would be forgiven. We may use a portion of the proceeds from this offering to repay the principal and accrued interest under the note, equal to approximately $2.5 million as of December 31, 2014, assuming the note holder does not elect, on or prior to the date of completion of this offering, to forgive all accrued interest under the note and convert the $2.0 million in principal under the note into 751,314 shares of our Series D redeemable convertible preferred stock in accordance with the terms described above.

We may also use a portion of the net proceeds to in-license, acquire, or invest in additional businesses, technologies, products, or assets. Although we have no specific agreements, commitments, or understandings with respect to any in-license or acquisition, we evaluate such opportunities and engage in related discussions

with other companies from time to time. As of the date of this prospectus, we cannot predict with certainty all of the particular uses for the net proceeds from this offering. The amounts and timing of our actual expenditures may vary significantly from our expectations depending upon numerous factors, including the progress of our research and development efforts, the progress of our clinical trials, our operating costs and capital expenditures and the other factors described under "Risk Factors" in this prospectus. Accordingly, we will retain the discretion to allocate the net proceeds of this offering among the identified uses described above, and we reserve the right to change the allocation of the net proceeds among the uses described above.

Pending these uses, we intend to invest the net proceeds in investment grade instruments, certificates of deposit or direct or guaranteed obligations of the U.S. government, or hold the net proceeds as cash.

DIVIDEND POLICY

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all available funds and any future earnings, if any, to fund the development and expansion of our business and we do not anticipate paying any cash dividends in the foreseeable future. Any future determination to pay dividends will be made at the discretion of our board of directors.

CAPITALIZATION

The following table sets forth our cash, cash equivalents and investment securities and capitalization as of December 31, 2014:

- on an actual basis;
- on a pro forma basis to give effect to (i) the filing and effectiveness of our amended and restated certificate of incorporation in March 2015, (ii) the issuance and sale of 68,166,894 shares of our Series E redeemable convertible preferred stock in March 2015 for aggregate gross proceeds of approximately $76.3 million, (iii) the conversion of all outstanding shares of our redeemable convertible preferred stock into an aggregate of 129,492,356 shares of common stock at a rate of one share of redeemable convertible preferred stock into one share of common stock, except for our Series E redeemable convertible preferred stock, for which the conversion rate is one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, immediately prior to the completion of this offering, and the resultant reclassification of our redeemable convertible preferred stock to stockholders' equity (deficit), (iv) the adjustment of our outstanding warrants to purchase redeemable convertible preferred stock into warrants to purchase 206,581 shares of our common stock, and the resultant reclassification of our preferred stock warrant liabilities to additional paid-in capital, a component of stockholders' equity (deficit); and (v) our repayment in cash, upon the completion of this offering, of approximately $2.5 million in principal and accrued interest as of December 31, 2014 under a convertible promissory note issued to an affiliate of our landlord, assuming the note holder does not elect, on or prior to the date of completion of this offering, to forgive all accrued interest under the note and convert the $2.0 million in principal under the note into 751,314 shares of our Series D redeemable convertible preferred stock, which would convert into 751,314 shares of common stock upon the completion of this offering; and
- on a pro forma as adjusted basis to give further effect to (i) the filing and effectiveness of our amended and restated certificate of incorporation and (ii) our sale in this offering of shares of common stock at an assumed initial public offering price of $ per share (the midpoint of the range set forth on the cover page of this prospectus), after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

You should read the following table together with "Management's Discussion and Analysis of Financial Condition and Results of Operations," "Description of Capital Stock," and the consolidated financial statements and related notes appearing elsewhere in this prospectus.

	As of December 31, 2014		
	Actual	Pro Forma	Pro Forma As Adjusted (1)
	(in thousands, except share and per share data)		
Cash, cash equivalents and investment securities	$15,853	$ 89,647	$
Capitalization:			
Commercial bank debt (including current portion)	$ 8,276	$ 8,276	$
Convertible promissory notes (including accrued interest)	2,485	—	
Warrant liabilities	319	—	
Redeemable convertible preferred stock, $0.001 par value; 75,772,871 shares authorized; 73,487,415 shares issued and outstanding, actual; no shares issued and outstanding, pro forma and pro forma as adjusted	95,619	—	

	As of December 31, 2014		
	Actual	Pro Forma	Pro Forma As Adjusted (1)
	(in thousands, except share and per share data)		
Stockholders' equity (deficit):			
Preferred stock, $0.001 par value; no shares authorized, issued and outstanding, actual and pro forma; shares authorized and no shares issued and outstanding, pro forma as adjusted	—	—	
Common stock, $0.001 par value; 95,500,000 shares authorized and 7,237,571 shares issued and outstanding, actual; 185,000,000 shares authorized and 136,729,927 shares issued and outstanding, pro forma; shares authorized and shares issued and outstanding, pro forma as adjusted	7	137	
Additional paid-in capital	19,203	191,290	
Stockholder note receivable	(69)	(69)	
Accumulated deficit	(110,151)	(110,151)	
Total stockholders' equity (deficit)	(91,010)	81,207	
Total capitalization	$ 15,689	$ 89,483	$

(1) A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the amount of cash, cash equivalents and investment securities, additional paid-in capital, total stockholders' equity (deficit) and total capitalization by approximately $ million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of one million shares in the number of shares offered by us would increase (decrease) cash, cash equivalents and investment securities, additional paid-in capital, total stockholders' equity (deficit) and total capitalization by approximately $ million, assuming the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. The pro forma as adjusted information discussed above is illustrative only and will be adjusted based on the actual public offering price and other terms of this offering determined at pricing.

The information set forth in the table excludes:

- 12,047,225 shares of common stock issuable upon the exercise of stock options outstanding as of December 31, 2014 at a weighted average exercise price of $0.58 per share;
- 206,581 shares of common stock issuable upon the exercise of warrants outstanding as of December 31, 2014 at a weighted average exercise price of $1.82 per share, which warrants prior to the completion of this offering are exercisable to purchase redeemable convertible preferred stock; and
- the issuance of 953,228 shares of common stock to The Scripps Research Institute on March 31, 2015;
- 2,388,777 shares of common stock issuable upon the exercise of stock options granted to employees, directors and consultants subsequent to December 31, 2014 at a weighted average exercise price of $1.15 per share;
- 10,527,447 shares of common stock reserved for future issuance under our 2014 Stock Plan; and
- shares of common stock reserved for future issuance under the 2015 Plan, which will become effective immediately prior to the completion of this offering.

DILUTION

If you invest in our common stock in this offering, your interest will be diluted to the extent of the difference between the public offering price per share of our common stock and the pro forma net tangible book value per share of our common stock immediately after this offering.

As of December 31, 2014, we had a historical net tangible book deficit of $(91.0) million, or $(12.57) per share of common stock, based on 7,237,571 shares of common stock outstanding at December 31, 2014. Our historical net tangible book value per share represents the amount of our total tangible assets less total liabilities and redeemable convertible preferred stock, divided by the total number of shares of common stock outstanding as of December 31, 2014.

On a pro forma basis, after giving effect to (i) the issuance and sale of 68,166,894 shares of our Series E redeemable convertible preferred stock in March 2015 for aggregate gross proceeds of approximately $76.3 million, (ii) the conversion of all outstanding shares of our redeemable convertible preferred stock into an aggregate of 129,492,356 shares of common stock at a rate of one share of redeemable convertible preferred stock into one share of common stock, except for our Series E redeemable convertible preferred stock, for which the conversion rate is one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, immediately prior to the completion of this offering, and the resultant reclassification of our redeemable convertible preferred stock to stockholders' equity (deficit) and (iii) the adjustment of our outstanding warrants to purchase redeemable convertible preferred stock into warrants to purchase 206,581 shares of our common stock, and the resultant reclassification of our preferred stock warrant liabilities to additional paid-in capital, a component of stockholders' equity (deficit), our pro forma net tangible book value as of December 31, 2014 would have been approximately $81.2 million, or approximately $0.59 per share of our common stock.

After giving further effect to our sale of shares of common stock in this offering at an assumed initial public offering price of $ per share (the midpoint of the price range set forth on the cover page of this prospectus), and after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us, our pro forma as adjusted net tangible book value as of December 31, 2014 would have been approximately $ million, or approximately $ per share. This amount represents an immediate increase in pro forma net tangible book value of $ per share to our existing stockholders and an immediate dilution in pro forma net tangible book value of approximately $ per share to new investors participating in this offering. The following table illustrates this dilution:

Assumed initial public offering price per share		$
Historical net tangible book deficit per share	$(12.57)	
Pro forma increase in historical net tangible book deficit per share	13.16	
Pro forma net tangible book value per share	0.59	
Increase in pro forma net tangible book value per share attributable to investors participating in this offering		
Pro forma as adjusted net tangible book value per share after this offering		
Dilution per share to new investors participating in this offering		$

A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the pro forma as adjusted net tangible book value by $ per share and the dilution to new investors by $ per share, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated expenses payable by us. Similarly, each increase (decrease) of one million shares in the number of shares offered by us would increase (decrease) the pro forma as adjusted net tangible book value by $ per share and the dilution to new investors by $

per share, assuming the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated expenses payable by us. If the underwriters exercise their option to purchase additional shares of common stock in this offering in full, the pro forma as adjusted net tangible book value would be $ per share, and the dilution in pro forma net tangible book value per share to investors in this offering would be $ per share.

The following table summarizes, on a pro forma basis, as of December 31, 2014, the difference between the number of shares of common stock purchased from us, the total consideration paid to us and the average price per share paid by existing stockholders and by new investors in this offering at an assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, before deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

	Shares Purchased		Total Consideration		Average Price Per Share
	Number	Percent	Amount	Percent	
	(in thousands, except share and per share amounts)				
Existing stockholders		%	$	%	$
New investors					
Total		100%	$	100%	

The above discussion and tables are based on 136,729,927 shares of common stock issued and outstanding as of December 31, 2014, which includes the conversion of all outstanding shares of redeemable convertible preferred stock, including the shares of our Series E redeemable convertible preferred stock issued in March 2015, into an aggregate of 129,492,356 shares of common stock immediately prior to the completion of this offering and excludes:

- 12,047,225 shares of common stock issuable upon the exercise of stock options outstanding as of December 31, 2014 at a weighted average exercise price of $0.58 per share;
- 206,581 shares of common stock issuable upon the exercise of warrants outstanding as of December 31, 2014 at a weighted average exercise price of $1.82 per share, which warrants prior to the completion of this offering are exercisable to purchase redeemable convertible preferred stock;
- the issuance of 953,228 shares of common stock to The Scripps Research Institute on March 31, 2015;
- 2,388,777 shares of common stock issuable upon the exercise of stock options granted to employees, directors and consultants subsequent to December 31, 2014 at a weighted average exercise price of $1.15 per share;
- 10,527,447 shares of common stock currently available for future issuance under our 2014 Stock Plan;
- 751,314 shares of common stock issuable upon the conversion of 751,314 shares of Series D redeemable convertible preferred stock that may be issued under a convertible promissory note issued to an affiliate of our landlord, if the noteholder elects to convert the note in accordance with its terms; and
- shares of common stock reserved for future issuance under the 2015 Plan, which will become effective immediately prior to the completion of this offering.

A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the total consideration paid by new investors by approximately $ million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of one million shares in the number of shares offered by us would increase (decrease) the total consideration paid by new

investors by approximately $ million, assuming the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

To the extent that outstanding options and warrants are exercised, or the holder of our convertible promissory note elects to convert the note into shares of our Series D redeemable convertible preferred stock, you will experience further dilution. In addition, we may choose to raise additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. To the extent that additional capital is raised through the sale of equity or convertible debt securities, the issuance of these securities may result in further dilution to our stockholders.

SELECTED CONSOLIDATED FINANCIAL DATA

You should read the following selected historical consolidated financial data below together with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and the financial statements, related notes and other financial information included elsewhere in this prospectus. The selected consolidated financial data in this section are not intended to replace the financial statements and are qualified in their entirety by the consolidated financial statements and related notes included elsewhere in this prospectus.

The selected consolidated statement of operations data for the years ended December 31, 2013 and 2014 and the selected consolidated balance sheet data as of December 31, 2014 are derived from our audited consolidated financial statements appearing elsewhere in this prospectus. Our historical results are not necessarily indicative of results that may be expected in the future.

	Years Ended December 31,	
	2013	2014
	(in thousands, except share and per share data)	
Statements of Operations Data:		
Operating expenses:		
Research and development	$ 13,832	$ 16,777
General and administrative	5,710	6,777
Total operating expenses	19,542	23,554
Loss from operations	(19,542)	(23,554)
Other income (expense)	(472)	(796)
Net loss	(20,014)	(24,350)
Accretion to redemption value of redeemable convertible preferred stock	(1,637)	(416)
Net loss attributable to common stockholders	$ (21,651)	$ (24,766)
Net loss per share attributable to common stockholders, basic and diluted (1)	$ (3.57)	$ (3.73)
Weighted average shares outstanding, basic and diluted (1)	6,067,342	6,635,778
Pro forma net loss per share attributable to common stockholders, basic and diluted (unaudited) (1)		$ (0.30)
Pro forma weighted average shares outstanding, basic and diluted (unaudited) (1)		80,123,193

(1) See Note 2 to our audited consolidated financial statements included elsewhere in this prospectus for an explanation of the method used to calculate the historical and pro forma net loss per share, basic and diluted, and the number of shares used in the computation of the per share amounts.

	As of December 31,	
	2013	2014
	(in thousands)	
Consolidated Balance Sheet Data:		
Cash, cash equivalents and investment securities	$ 36,457	$ 15,853
Total assets	39,786	20,644
Preferred stock warrant liabilities	207	319
Convertible promissory note	2,000	2,000
Working capital	31,814	6,396
Commercial bank debt, net of current portion	4,158	5,142
Redeemable convertible preferred stock	93,165	95,619
Accumulated deficit	(85,801)	(110,151)
Noncontrolling interest	2,414	—
Total stockholders' deficit	(66,082)	(91,010)

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

You should read the following discussion and analysis of our financial condition and results of operations together with our consolidated financial statements and related notes and other financial information appearing elsewhere in this prospectus. Some of the information contained in this discussion and analysis or set forth elsewhere in this prospectus, including information with respect to our plans and strategy for our business and related financing, includes forward-looking statements that involve risks and uncertainties. As a result of many factors, including those factors set forth in the "Risk Factors" section of this prospectus, our actual results could differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis.

Overview

We engage in the discovery and clinical development of innovative medicines for patients suffering from severe, rare diseases using our knowledge of Physiocrine biology, a newly discovered set of physiological modulators. We have discovered approximately 300 Physiocrines, a class of naturally occurring human proteins that we believe promote homeostasis, a fundamental process of restoring stressed or diseased tissue to a healthier state. By leveraging our discovery engine and our knowledge of rare diseases, we aim to build a proprietary pipeline of novel product candidates with the potential to treat severe, rare diseases characterized by immune dysregulation. We plan to independently commercialize our Physiocrine-based therapeutics.

In the first quarter of 2014, we completed a double-blind, placebo-controlled Phase 1 clinical trial of Resolaris, our lead development candidate from our discovery engine, in which we assessed its safety and tolerability in 32 healthy subjects. Resolaris was shown to be well tolerated at all doses tested, and no serious adverse events were reported. Based on the favorable clinical safety, tolerability, pharmacokinetic and immunogenicity profile of Resolaris in this trial, we decided to advance Resolaris into clinical trials of patients affected by rare myopathies with an immune component. We are currently conducting a multi-national exploratory Phase 1b/2 clinical trial of Resolaris in the European Union in adult patients with facioscapulohumeral muscular dystrophy, or FSHD, a severe, rare genetic myopathy in which immune cells invade diseased muscle, and for which there are no approved treatments. Subject to our interactions with regulatory authorities and patient enrollment in accordance with our clinical development plans, we expect to report initial results from this clinical trial in the fourth quarter of 2015 or early 2016.

Since our inception in 2005, we have devoted substantially all of our resources to the therapeutic application of Physiocrines, including the preclinical development of and clinical trials for Resolaris, the creation, licensing and protection of related intellectual property and the provision of general and administrative support for these operations. We have not generated any revenue from product sales and, to date, have funded our operations primarily with the aggregate proceeds of $171.9 million from the private placement of redeemable convertible preferred stock and convertible promissory notes, $10.0 million of commercial bank debt and a $2.0 million convertible promissory note issued to our landlord.

We have never been profitable and have incurred net losses in each annual and quarterly period since our inception. Our net losses were $20.0 million and $24.4 million for the years ended December 31, 2013 and 2014, respectively. As of December 31, 2014, we had an accumulated deficit of $110.2 million.

Substantially all of our net losses resulted from costs incurred in connection with our development of and clinical trials for Resolaris, our other research and development programs and from general and administrative costs associated with our operations. We expect to continue to incur significant expenses and increasing operating losses for the foreseeable future, at least until we apply for and receive regulatory approval for

Resolaris or another product candidate and generate substantial revenues from its commercialization, if ever. Our net losses may fluctuate significantly from quarter to quarter and year to year, depending on the nature and extent of our research and development expenses and clinical trials. We expect our expenses will increase substantially in connection with our ongoing activities as we:

- conduct clinical trials of Resolaris and any additional product candidates we may develop;
- continue our research and product development efforts;
- manufacture preclinical study and clinical trial materials;
- expand, protect and maintain our intellectual property portfolio;
- seek regulatory approvals for our product candidates that successfully complete clinical trials;
- hire additional staff, including clinical, operational, financial and technical personnel to execute on our business plan and create additional infrastructure to support our operations as a public company; and
- implement operational, financial and management systems.

We do not expect to generate any revenues from product sales unless and until we successfully complete development and obtain regulatory approval for one or more of our product candidates, which we expect will take at least a number of years. If we obtain regulatory approval for any of our product candidates, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution. Accordingly, we will need to raise substantial additional capital beyond the expected net proceeds from this offering. The amount and timing of our future funding requirement will depend on many factors, including the pace and results of our preclinical and clinical development efforts and the timing and nature of the regulatory approval process for our product candidates. We anticipate that we will seek to fund our operations through public or private equity or debt financings or other sources. However, we may be unable to raise additional funds or enter into such other arrangements when needed on favorable terms or at all. Our failure to raise capital or enter into such other arrangements when needed would have a negative impact on our financial condition and ability to develop our product candidates.

Financial Operations Overview

Organization and Business; Principles of Consolidation and Affiliates

We conduct substantially all of our activities through aTyr Pharma, Inc., a Delaware corporation, at our facility in San Diego, California. aTyr Pharma, Inc. was incorporated in the state of Delaware in September 2005. The consolidated financial statements include the accounts of aTyr Pharma, Inc., its 98% majority-owned subsidiary in Hong Kong, Pangu BioPharma Limited, and six variable interest entities, which we refer to as the Affiliates.

In October and November 2011, we established the Affiliates to perform research and development for specified programs. In April 2012, we purchased preferred and common stock of each Affiliate and subsequently issued those shares to each of our stockholders in the form of dividends, in proportion to their relative holdings of aTyr Pharma, Inc. in order to effectuate the spin-out of the Affiliates into stand-alone entities. We entered into nonexclusive license agreements allowing each Affiliate to utilize certain intellectual property owned by us. We also entered into research and development services agreements in our therapeutic program area of interest covered by the respective nonexclusive license agreement with each Affiliate. The working capital of the Affiliates was primarily provided by amounts borrowed from us under convertible promissory note agreements. The Affiliates were not capitalized with sufficient equity to finance their operations and were each therefore considered a variable interest entity, or VIE. In May 2012, the Affiliates commenced operations. The Affiliates had no employees and substantially all of their expenses related to the services provided to them by us, and the expenses related to services provided by us have been eliminated in consolidation. The liquidation preferences

underlying the preferred stock issued by the Affiliates and the convertible promissory notes issued by the Affiliates to us effectively protected stockholders of the Affiliates from absorbing the losses of the Affiliates and, as a result, no losses were allocated to these noncontrolling interests and such losses are included in our consolidated net loss. None of the related parties to the Affiliates individually had the power and benefits to control the Affiliates. Because we were the related party that was most closely associated with each VIE, we have consolidated the six Affiliates for financial reporting purposes.

In the fourth quarter of 2014, the board of directors and stockholders of each of the Affiliates approved the dissolution of each applicable Affiliate in accordance with the laws of its respective jurisdiction of organization. In connection with the dissolution of the Affiliates, the license and operating agreements by and between aTyr Pharma, Inc. and each Affiliate were terminated. Our consolidated financial statements for periods after the effectiveness of the dissolution of the Affiliates will no longer include a noncontrolling interest, and the operating activities that the Affiliates performed prior to dissolution will be continued by aTyr Pharma, Inc.

Research and Development Expenses

To date, our research and development expenses have related primarily to the development of and clinical trials for Resolaris and to research efforts targeting the potential therapeutic application of other Physiocrine- based immuno-modulators in rare disease indications. These expenses consist primarily of:

- salaries and employee-related expenses, including stock-based compensation and benefits for personnel in research and product development functions;
- costs associated with conducting our preclinical, development and regulatory activities, including fees paid to third-party professional consultants, service providers and our scientific, therapeutic and clinical advisory board;
- costs to acquire, develop and manufacture preclinical study and clinical trial materials;
- costs incurred under clinical trial agreements with clinical research organizations, or CROs, and investigative sites;
- costs for laboratory supplies;
- payments related to licensed products and technologies; and
- allocated facilities, depreciation and other allocable expenses.

Research and development costs are expensed as incurred. Clinical trial and other development costs incurred by third parties are expensed as the contracted work is performed. We accrue for costs incurred as the services are being provided by monitoring the status of the trial or project and the invoices received from our external service providers. We adjust our accrual as actual costs become known.

Product candidates in later stages of clinical development generally have higher development costs than those in earlier stages of clinical development, primarily due to the increased size and duration of later-stage clinical trials. We expect that the levels of our research and development expenses will increase during the foreseeable future as we: (i) continue to advance Resolaris in clinical development; (ii) advance our iMod.Fc discovery program; and (iii) engage in additional research, discovery and development activities relating to our discovery engine for therapeutic applications of Physiocrines.

We cannot determine with certainty the timing of initiation, the duration or the completion costs of current or future preclinical studies and clinical trials of our product candidates. At this time, due to the inherently unpredictable nature of preclinical and clinical development and given the early stage of our program, we are unable to estimate with any certainty the costs we will incur or the timelines we will require in the continued development of Resolaris and any other product candidates that we may develop. Clinical and preclinical

development timelines, the probability of success and development costs can differ materially from expectations. We anticipate that we will make determinations as to which product candidates to pursue and how much funding to direct to each product candidate on an ongoing basis in response to the results of ongoing and future preclinical studies and clinical trials, regulatory developments and our ongoing assessments as to each product candidate's commercial potential. In addition, we cannot forecast which product candidates may be subject to future collaborations, when such arrangements will be secured, if at all, and to what degree such arrangements would affect our development plans and capital requirements.

General and Administrative Expenses

General and administrative expenses consist primarily of salaries and related costs for employees in executive, finance and administration, corporate development and administrative support functions, including stock-based compensation expenses and benefits. Other significant general and administrative expenses include accounting and legal services, expenses associated with applying for and maintaining patents, the cost of various consultants, occupancy costs, information systems costs and depreciation.

We anticipate that our general and administrative expenses will substantially increase for the foreseeable future as we increase our headcount to support the continued development of our product candidates and the increased costs of operating as a public company, including expenses related to services associated with maintaining compliance with NASDAQ listing rules and the Securities and Exchange Commission, or SEC, requirements, insurance and investor relations costs. These increases will likely include increased costs related to the hiring of additional personnel and fees to outside consultants, lawyers and accountants, among other expenses.

Other Income (Expense)

Other income (expense) primarily consists of interest income and expense and changes in the fair value of preferred stock warrant liabilities related to warrants we issued in connection with commercial bank debt. We do not expect any further fair value adjustments for these warrants subsequent to our initial public offering, when these liabilities will be reclassified to additional paid-in capital.

Critical Accounting Policies and Significant Judgments and Estimates

Our management's discussion and analysis of financial condition and results of operations is based on our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States, or GAAP. The preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities as of the date of the consolidated financial statements, as well as the reported expenses during the reporting periods. We monitor and analyze these items for changes in facts and circumstances, and material changes in these estimates could occur in the future. We base our estimates on our historical experience and on various other factors we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Changes in estimates are reflected in reported results for the period in which they become known. Actual results may differ materially from these estimates under different assumptions or conditions.

While our significant accounting policies are more fully described in the notes to our consolidated financial statements appearing elsewhere in this prospectus, we believe the following accounting policies related to research and development expense accruals and stock-based compensation are most critical to understanding and evaluating our reported consolidated financial results.

Research and Development Expense Accruals

As part of the process of preparing our consolidated financial statements, we are required to estimate our accrued expenses. This process involves reviewing open contracts and purchase orders, communicating with our personnel to identify services that have been performed on our behalf and estimating the level of service performed and the associated cost incurred for the service when we have not yet been invoiced or otherwise notified of the actual cost. The majority of our service providers invoice us monthly in arrears for services performed or when contractual milestones are met. We make estimates of our accrued expenses as of each balance sheet date in our consolidated financial statements based on facts and circumstances known to us at that time. We periodically confirm the accuracy of our estimates with the service providers and make adjustments if necessary. Examples of estimated accrued research and development expenses include fees paid to investigative sites and CROs in connection with clinical trials; service providers in connection with preclinical development activities; and service providers related to product manufacturing, development and distribution of clinical supplies.

We currently rely on third parties for the clinical development of Resolaris and the manufacture of Resolaris to support our ongoing Phase 1b/2 clinical trial in adult patients with FSHD. We pay these third parties, including consultants, CROs, manufacturers and other service providers, pursuant to contractual arrangements, which may include provisions for time and materials-based payments, project-based fees and milestone payments. We base our accrual for these expenses on our estimates of the services received and efforts expended pursuant to our contractual arrangements. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. There may be instances in which payments made to our service providers will exceed the level of services provided and result in a prepayment of the clinical expense. Payments under some of these contracts depend on factors such as the successful enrollment of patients and the completion of clinical milestones. In accruing service fees, we estimate the time period over which services will be performed and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from our estimate, we adjust the accrual or prepaid accordingly.

Although we do not expect our estimates to be materially different from amounts actually incurred, if our estimates of the status and timing of services performed differs from the actual status and timing of services performed, we may report amounts that are too high or too low in any particular period. To date, there have been no material differences between our estimates and the amounts actually incurred.

Stock-Based Compensation

Stock-based compensation expense represents the grant date fair value of employee stock option grants recognized as expense over the requisite service period of the awards (usually the vesting period) on a straight-line basis, net of estimated forfeitures. For stock option grants with performance-based milestones, the expense is recorded over the service period after the achievement of the milestone is probable or the performance condition is achieved. We estimate the fair value of stock option grants using the Black-Scholes option pricing model. The Black-Scholes option pricing model requires the input of subjective assumptions, including the risk-free interest rate, the expected dividend yield of our common stock, the expected volatility of the price of our common stock, the expected term of the option and the fair value of our common stock. These estimates involve inherent uncertainties and the application of management's judgment. If factors change and different assumptions are used, our stock-based compensation expense could be materially different in the future. See Note 7 to our consolidated financial statements included elsewhere in this prospectus for information concerning certain of the specific assumptions we used in applying the Black-Scholes option pricing model to determine the estimated fair value of our stock options granted in 2013 and 2014.

The following table summarizes information related to stock options we granted from December 6, 2013 through the date of this prospectus:

Grant Date	Number of Common Shares Underlying Options Granted	Exercise Price per Common Share	Estimated Fair Value per Common Share	Reassessed Fair Value per Common Share
December 6, 2013	57,000	$ 0.51	$ 0.51	$ 0.51
March 5, 2014	2,549,861	0.51	0.51	0.85
July 10, 2014	2,061,736	0.51	0.51	1.65
October 10, 2014	611,232	2.23	2.23	N/A
October 24, 2014	770,285	2.23	2.23	N/A
March 31, 2015	2,288,777	1.15	1.15	N/A
April 2, 2015	100,000	1.15	1.15	N/A

The following table summarizes the stock-based compensation expense recognized in our consolidated financial statements:

	Years Ended December 31,	
	2013	2014
	(in thousands)	
Research and development	$ 96	$ 527
General and administrative	59	1,264
Total stock-based compensation expense	$155	$1,791

As of December 31, 2014, the unrecognized stock-based compensation expense related to outstanding employee stock options was $8.0 million and is expected to be recognized as expense over a weighted average period of approximately 4.9 years. The intrinsic value of all outstanding stock options as of December 31, 2014 was approximately $ million, based on the assumed public offering price of $ per share, which is the midpoint of the estimated offering price range set forth on the cover page of this prospectus, of which approximately $ million related to vested options and approximately $ million related to unvested options.

Determination of the Fair Value of Common Stock

We are required to estimate the fair value of the common stock underlying our stock-based awards when performing fair value calculations, which is the most subjective input into the Black-Scholes option pricing model. The fair value of the common stock underlying our stock-based awards was determined on each grant date by our board of directors, taking into account input from management and our most recent independent third-party valuations. All options to purchase shares of our common stock are intended to be granted with an exercise price per share no less than the fair value per share of our common stock underlying those options on the date of grant, based on the information known to us on the date of grant. In the absence of a public trading market for our common stock, on each grant date we develop an estimate of the fair value of our common stock in order to determine an exercise price for the option grants. Our determinations of the fair value of our common stock were made using methodologies, approaches and assumptions consistent with the American Institute of Certified Public Accountants *Audit and Accounting Practice Aid Series: Valuation of Privately Held Company Equity Securities Issued as Compensation*, or the Practice Aid.

Our board of directors considered various objective and subjective factors, along with input from management, to determine the fair value of our common stock, including:

- contemporaneous valuations of our common stock performed by independent third-party valuation specialists;

- our stage of development and business strategy, including the status of research and development efforts of our product candidates, and the material risks related to our business and industry;
- our results of operations and financial position, including our levels of available capital resources;
- the valuation of publicly traded companies in the life sciences and biotechnology sectors, as well as recently completed mergers and acquisitions of peer companies;
- the lack of marketability of our common stock as a private company;
- the prices of our redeemable convertible preferred stock sold to investors in arm's length transactions and the rights, preferences, and privileges of our redeemable convertible preferred stock relative to those of our common stock;
- the likelihood of achieving a liquidity event for the holders of our common stock, such as an initial public offering or a sale of our company, given prevailing market conditions;
- trends and developments in our industry;
- external market conditions affecting the life sciences and biotechnology industry sectors; and
- the composition of, and changes to, our management team and board of directors.

Common Stock Valuation Methodologies and Methods Used to Allocate our Enterprise Value to Classes of Securities

Our valuations were prepared in accordance with the guidelines in the Practice Aid, which prescribes several valuation approaches for setting the value of an enterprise, such as the cost, income and market approaches, and various methodologies for allocating the value of an enterprise to its common stock. The cost approach establishes the value of an enterprise based on the cost of reproducing or replacing the property less depreciation and functional or economic obsolescence, if present. The income approach establishes the value of an enterprise based on the present value of future cash flows that are reasonably reflective of our company's future operations, discounting to the present value with an appropriate risk adjusted discount rate or capitalization rate. The market approach is based on the assumption that the value of an asset is equal to the value of a substitute asset with the same characteristics. Each valuation methodology was considered in our valuations.

The various methods for allocating the enterprise value across our classes and series of capital stock to determine the fair value of our common stock in accordance with the Practice Aid include the following:

- *Current Value Method.* Under the current value method, once the fair value of the enterprise is established, the value is allocated to the various series of preferred and common stock based on their respective seniority, liquidation preferences or conversion values, whichever is greatest.
- *Option Pricing Method, or OPM.* Under the OPM, shares are valued by creating a series of call options with exercise prices based on the liquidation preferences and conversion terms of each equity class. The values of the preferred and common stock are inferred by analyzing these options.
- *Probability-Weighted Expected Return Method, or PWERM.* The PWERM is a scenario-based analysis that estimates the value per share based on the probability-weighted present value of expected future investment returns, considering each of the possible outcomes available to us, as well as the economic and control rights of each share class.

There are significant judgments and estimates inherent in the determination of the fair value of our common stock. These judgments and estimates include assumptions regarding our future operating performance, the time to completing an initial public offering or other liquidity event and the determination of the appropriate valuation methods. If we had made different assumptions, our stock-based compensation expense, net loss and net loss per common share could have been significantly different.

In accordance with the Practice Aid, we considered the various methods described above to determine our enterprise value and for allocating the enterprise value across our classes and series of capital stock to determine the fair value of our common stock at each valuation date.

Our valuations used to determine the exercise price of our December 2013 and March 2014 stock option grants utilized each of the cost and market approaches to determine our enterprise value and the enterprise value was allocated based on both the current value method and the OPM. Our valuations used to determine the exercise price of our July 2014 option grants utilized the cost and market approaches to determine our enterprise value and the enterprise value was allocated based on both the current value method and the OPM. We believed that the OPM and current value method were the most appropriate given the expectation of various potential liquidity outcomes and the difficulty of selecting and supporting appropriate enterprise values given our early stage of development. Our valuation effective September 30, 2014 was used to determine the exercise price of our stock option grants in October 2014 and utilized both the income and market approaches to determine our enterprise value, and the enterprise value was allocated based on the PWERM. We transitioned to the PWERM once we initiated our initial public offering process because we then had greater clarity as to our potential future liquidity events.

Retrospective Reassessment of Fair Value

As part of the preparation of the financial statements necessary for inclusion in the registration statement related to this offering, we reassessed for financial reporting purposes, on a retrospective basis, the fair value of our common stock for each stock option noted in the table above granted between October 1, 2013 and September 30, 2014. For purposes of this reassessment, we evaluated our original inputs and the methodologies used to determine our enterprise value and the methods we used to allocate enterprise value. In consideration of our decision to pursue an initial public offering in the third quarter of 2014, we determined to exclude the impact of the current value method from our determination of the fair value of our common stock for option grants made in 2014. We reassessed the fair value of our common stock for stock options granted on March 5, 2014 from $0.51 per share to $0.85 per share, using a straight-line method between the fair value of our common stock of $0.51 per share on December 31, 2013 and the fair value of our common stock of $1.07 per share on May 31, 2014, because we did not identify any significant internal or external value-generating events between the December 31, 2013 and May 31, 2014 valuation dates. The May 31, 2014 contemporaneous valuation, which was performed by an independent third-party valuation specialist, used the OPM and did not use the current value method.

We reassessed the fair value of our common stock for stock options granted on July 10, 2014 from $0.51 per share to $1.65 per share, using a straight-line method between the fair value of our common stock of $1.07 per share on May 31, 2014 and the fair value of our common stock of $2.23 per share on September 30, 2014, because we did not identify any significant internal or external value-generating events between the May 31, 2014 and September 30, 2014 valuation dates.

Common Stock Valuation as of December 31, 2014

The fair value of our common stock as of December 31, 2014 was $1.48 per share, a decrease of $0.75 per share from $2.23 per share as of September 30, 2014. The December 31, 2014 value was determined on substantially the same basis as our September 30, 2014 valuation. The decrease was driven primarily by our consideration of the pre-money valuation expected in our Series E financing, and also impacted by updated assumptions regarding the increased probability we complete an initial public offering in the near-term and certain other assumptions regarding the timing, value and probability of other scenarios. In March 2015, we sold Series E redeemable convertible preferred stock to predominantly new investors at a purchase price of $1.119 per share.

Following the completion of this offering, our board of directors will determine the fair value of our common stock based on its closing price as reported on the date of grant on the primary stock exchange on which our common stock is traded.

Other Company Information

Net Operating Loss and Research and Development Tax Credit Carryforwards

As of December 31, 2014, we had approximately $47.8 million, $49.8 million, and $5.4 million of net operating loss, or NOL, carryforwards for federal, state, and foreign purposes, respectively, available to offset future taxable income. The federal and state net operating loss carryforwards begin to expire in 2025 and 2016, respectively. The foreign net operating losses carry over indefinitely. As of December 31, 2014, we had federal and state research and development credit carryforwards of approximately $1.4 million, which begin to expire in 2026 for federal purposes and carry over indefinitely for state purposes.

Utilization of the domestic NOL and research and development credit carryforwards may be subject to a substantial annual limitation due to ownership change limitations that may have occurred or that could occur in the future, as required by Section 382 and 383 of the Internal Revenue Code of 1986, as amended, or the Code, as well as similar state and foreign provisions. These ownership changes may limit the amount of NOL and research and development credit carryforwards that can be utilized annually to offset future taxable income and tax, respectively. In general, an "ownership change" as defined by Section 382 of the Code results from a transaction or series of transactions over a three-year period resulting in an ownership change of more than 50% of the outstanding stock of a company by certain stockholders. Since our formation, we have raised capital through the issuance of capital stock on several occasions which on its own or combined with the purchasing stockholders' subsequent disposition of those shares, has resulted in such an ownership change, and could result in an additional ownership change in the future.

Upon the occurrence of an ownership change under Section 382 as outlined above, utilization of the NOL and research and development credit carryforwards become subject to an annual limitation under Section 382 of the Code, which is determined by first multiplying the value of our outstanding stock at the time of the ownership change by the applicable long-term, tax-exempt rate, which could be subject to additional adjustments. Any limitation may result in expiration of a portion of the NOL or research and development credit carryforwards before utilization. We completed an analysis through September 7, 2011, determined that an ownership change occurred on November 30, 2006, and adjusted our NOL and $15,000 of research and development tax credit carryforwards accordingly. Ownership changes that may have occurred subsequent to September 7, 2011, and future ownership changes, including any ownership changes resulting from this offering, may further limit our ability to utilize our remaining tax attributes.

Emerging Growth Company

On April 5, 2012, the Jumpstart Our Business Startups Act of 2012, or the JOBS Act, was enacted. Section 107 of the JOBS Act provides that an "emerging growth company" can take advantage of the extended transition period provided in Section 7(a)(2)(B) of the Securities Act of 1933, or the Securities Act, for complying with new or revised accounting standards. In other words, an "emerging growth company" can delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have irrevocably elected not to avail ourselves of this extended transition period and, as a result, we will adopt new or revised accounting standards on the relevant dates on which adoption of such standards is required for other public companies.

We intend to take advantage of the reduced reporting requirements and to rely on certain other exemptions provided by the JOBS Act. Subject to certain conditions set forth in the JOBS Act, as an "emerging growth company," the exemptions that we may rely on include, without limitation, exemptions from: (i) providing an auditor's attestation report on our system of internal controls over financial reporting pursuant to Section 404(b) of the Sarbanes-Oxley Act and (ii) complying with any requirement that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation or a supplement to the auditor's report providing additional information about the audit and the financial statements, known as the auditor discussion and analysis.

We will remain an "emerging growth company" until the earliest of (i) the last day of the fiscal year in which we have total annual gross revenues of $1 billion or more, (ii) the last day of our fiscal year following the fifth anniversary of the date of the completion of this offering, (iii) the date on which we have issued more than $1 billion in non-convertible debt during the previous three years or (iv) the date on which we are deemed to be a large accelerated filer under the rules of the SEC.

Results of Operations

Comparison of the Years Ended December 31, 2013 and 2014

The following table summarizes our results of operations for the years ended December 31, 2013 and 2014:

	Years Ended December 31,		Increase / (Decrease)
	2013	2014	
	(in thousands)		
Research and development expenses	$13,832	$16,777	$ 2,945
General and administrative expenses	5,710	6,777	1,067
Other income (expense)	(472)	(796)	324

Research and development expenses. Research and development expenses were $13.8 million and $16.8 million for the years ended December 31, 2013 and 2014, respectively. The increase of $2.9 million was due primarily to a $2.2 million increase in regulatory and clinical activities related to the completion of our Phase 1 clinical trial of Resolaris and the initiation of our multi-national Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD in the European Union, a $1.5 million increase related to compensation expenses (including stock-based compensation) as a result of increased headcount across our research and development organization and a $1.0 million increase in pre-clinical expenditures, facilities and other research costs. These increases were offset by a decrease of $1.8 million related to the timing of manufacturing costs incurred in support of various Resolaris clinical development activities.

General and administrative expenses. General and administrative expenses were $5.7 million and $6.8 million for the years ended December 31, 2013 and 2014, respectively. The increase of $1.1 million was due primarily to a $1.2 million increase in personnel costs resulting from increased headcount in our executive leadership team and stock-based compensation and a $0.2 million increase in travel and facility-related expenses, offset by a decrease of $0.3 million related to market studies that did not recur in 2014.

Other income (expense). Other income (expense) was $(0.5) million and $(0.8) million for the years ended December 31, 2013 and 2014, respectively. The increase of $0.3 million in other expense was primarily the result of additional interest expense related to the $5.0 million we borrowed under a loan agreement with Silicon Valley Bank in June 2014 and a $36,000 decrease in other expense related to decreases in the fair value of outstanding warrant liabilities as the underlying preferred stock fair value decreased.

Liquidity and Capital Resources

We have incurred losses and negative cash flows from operations since our inception. As of December 31, 2014, we had an accumulated deficit of $110.2 million and we expect to continue to incur net losses for the foreseeable future. As of December 31, 2014, we had cash, cash equivalents and investments of $15.9 million. We believe that our existing cash, cash equivalents and investments as of December 31, 2014, together with the net proceeds from this offering and the net proceeds from our Series E redeemable convertible preferred stock financing in March 2015, will be sufficient to meet our anticipated cash requirements through at least the next 12 months.

Sources of Liquidity

From our inception through December 31, 2014, we have funded our operations primarily with aggregate proceeds of $95.6 million from the private placement of redeemable convertible preferred stock and convertible promissory notes, $10.0 million of commercial bank debt and a $2.0 million convertible promissory note issued to our landlord. In March 2015, we issued an aggregate of 68,166,894 shares of Series E redeemable convertible preferred stock at a purchase price of $1.119 per share, for aggregate proceeds of $76.3 million.

Debt Financing

In each of July 2013 and June 2014, we borrowed $5.0 million under a $10.0 million loan and security agreement with Silicon Valley Bank, or SVB, which we refer to as the SVB Loan. Beginning in July 2014, we are obligated to make equal payments of principal and interest through the maturity date of June 1, 2017. The interest rate is a per annum fixed rate of 5.0% and 5.88% for the $5.0 million drawn in each of July 2013 and June 2014, respectively. The final payment due in June 2017 includes an additional fee of $0.5 million. The SVB Loan is collateralized by all of our assets, other than our intellectual property, and contains customary affirmative and negative covenants, reporting requirements and events of default. In connection with the SVB Loan, we issued a warrant to purchase 118,624 shares of Series D redeemable convertible preferred stock at an exercise price of $2.529 per share. As of December 31, 2014, we have no available credit under the SVB Loan.

In December 2011, in conjunction with our facility lease, we issued a $2.0 million subordinated convertible unsecured promissory note to the venture arm of our landlord, BioMed Realty, L.P., which was subsequently transferred to its affiliate, BMV Direct RE LP. The convertible note carries an annual interest rate of 8.0% and matures at the earlier of (i) May 2015, (ii) a liquidation event, or (iii) the closing of an initial firm commitment underwritten public offering of our common stock pursuant to a registration statement under the Securities Act, unless previously converted. At any time prior to maturity, the holder may elect to convert the principal outstanding under the promissory note into shares of our Series D redeemable convertible preferred stock at the price of $2.662 per share. Upon conversion, all then accrued interest will be forgiven. As of December 31, 2014, the outstanding principal and accrued interest on the convertible note were $2.0 million and $0.5 million, respectively.

Cash Flows

The following table sets forth a summary of the net cash flow activity for each of the periods set forth below:

	Years Ended December 31,	
	2013	2014
	(in thousands)	
Net cash provided by (used in):		
Operating activities	$(17,311)	$(22,824)
Investing activities	(644)	(2,246)
Financing activities	50,737	2,512
Net increase (decrease) in cash	$ 32,782	$(22,558)

Operating activities. Net cash used in operating activities was $17.3 million and $22.8 million for the years ended December 31, 2013 and 2014, respectively. The net cash used in operating activities in each of these periods was primarily due to our net losses. The primary differences between net cash used in operating activities and our net loss in each period primarily related to non-cash charges for depreciation, stock-based compensation and changes in our prepaid and other assets, accounts payable and accrued expense accounts.

Investing activities. Net cash used in investing activities for the year ended December 31, 2013 was due to our purchases of property and equipment. Net cash used in investing activities for the year ended December 31, 2014 consisted of $0.2 million of property and equipment purchases and $2.0 million of net purchases of investments, consisting primarily of corporate debt and commercial paper.

Financing activities. Net cash provided by financing activities for the year ended December 31, 2013 was $50.7 million and consisted primarily of $38.7 million of net proceeds from the issuance of Series D redeemable convertible preferred stock, $9.5 million of net proceeds from the issuance of convertible notes that were converted into Series D redeemable convertible preferred stock and $2.5 million of net proceeds from the SVB Loan. Net cash provided by financing activities during the year ended December 31, 2014 consisted primarily of $5.0 million of proceeds from the SVB Loan offset by $1.6 million of principal payments on the SVB Loan and $1.0 million of costs paid in connection with our planned initial public offering.

Funding Requirements

We expect our expenses to increase in connection with our ongoing activities, particularly as we continue to advance Resolaris in clinical development, continue our research and development activities with respect to potential Physiocrine-based therapeutics, and seek marketing approval for Resolaris and other product candidates that we may develop. In addition, if we obtain marketing approval for any of our product candidates, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution. We currently have no sales or marketing capabilities and would need to expand our organization to support these activities. Furthermore, upon the completion of this offering, we expect to incur additional costs associated with operating as a public company. Accordingly, we will need to obtain substantial additional funding in connection with our continuing operations. Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement that involves risks and uncertainties, and actual results could vary materially.

Our future capital requirements are difficult to forecast and will depend on many factors, including:

- our ability to initiate, and the progress and results of, our planned clinical trials of Resolaris;
- the scope, progress, results and costs of preclinical development, and clinical trials for our other product candidates;
- the costs, timing and outcome of regulatory review of our product candidates;
- the costs and timing of preparing, filing and prosecuting patent applications, maintaining and enforcing our intellectual property rights and defending any intellectual property-related claims;
- the costs and timing of future commercialization activities, including product manufacturing, marketing, sales and distribution, for any of our product candidates for which we receive marketing approval; and
- the extent to which we acquire or in-license other products and technologies.

Until such time, if ever, as we can generate substantial product revenues, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaborations, strategic partnerships and licensing arrangements. To the extent we raise additional capital through the sale of equity or convertible debt securities, the ownership interest of our stockholders will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our common stockholders. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through collaborations, strategic partnerships or licensing arrangements with third parties, we may have to relinquish valuable rights to our product candidates, our other technologies, future revenue streams or research programs or grant licenses on terms that may not be favorable to us. If we are unable to raise

additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce or terminate our product development or future commercialization efforts or grant rights to develop and market our product candidates even if we would otherwise prefer to develop and market such product candidates ourselves.

Contractual Obligations and Commitments

The following table summarizes our contractual obligations as of December 31, 2014:

		Payments Due by Period			
	Total	Less than 1 Year	1-3 Years	3-5 Years	More than 5 Years
		(in thousands)			
Commercial bank debt, including interest and final payment obligations	$ 9,554	$ 3,622	$5,932	$ —	$ —
Convertible promissory note, including interest	2,544	—	2,544	—	—
Operating lease obligation (1)	1,431	590	841	—	—
Total	$13,529	$ 4,212	$9,317	$ —	$ —

(1) Our operating lease obligations relate to our corporate headquarters in San Diego, California. We lease 17,083 square feet of office and laboratory space under an operating lease that expires in May 2017.

We enter into contracts in the normal course of business with clinical trial sites and clinical supply manufacturing organizations and with vendors for preclinical safety and research studies, research supplies and other services and products for operating purposes. These contracts generally provide for termination after a notice period, and therefore are cancelable contracts and not included in the table of contractual obligations and commitments.

We may have payment obligations under our agreements with The Scripps Research Institute, or TSRI, certain of which are contingent upon future events such as our achievement of specified development, regulatory and commercial milestones, and we are required to make development milestone payments and royalty payments in connection with the sale of products developed under these agreements. As of December 31, 2014, we were unable to estimate the timing or likelihood of achieving the milestones or making future product sales and, therefore, any related payments are not included in the table above.

We are party to an amended and restated research funding and option agreement with TSRI, under which we provide funding to TSRI to conduct certain research activities related to aminoacyl tRNA synthetases. Under the research funding and option agreement, TSRI has granted us options to enter into license agreements to acquire rights and exclusive licenses to develop, make, have made, use, have used, import, have imported, offer to sell, sell and have sold certain licensed products, processes and services based on certain technology arising from the sponsored research activities. Pursuant to the terms of these license agreements, TSRI is entitled to receive tiered royalties as a percentage of net sales, ranging from the low to mid-single digits, with these royalty rates subject to adjustment under certain circumstances. Additionally, we have agreed to pay TSRI a percentage of non-royalty revenue we receive from our sublicensees or partners, with the amount owed decreasing if we enter into the applicable sublicense agreement or partnering agreement after meeting a specified clinical milestone. We are obligated to make payments to TSRI of up to an aggregate of $2.75 million under each license agreement upon the achievement of specific clinical and regulatory milestone events.

Recent Accounting Pronouncements

In June 2014, the Financial Accounting Standards Board, or FASB, issued Accounting Standards Update, or ASU, No. 2014-10, *Development Stage Entities (Topic 915) Elimination of Certain Financial Reporting Requirements, Including an Amendment to Variable Interest Entities Guidance in Topic 810, Consolidation*. This

ASU, among other things: (i) eliminates the requirement to present inception-to-date information on the statements of income, cash flows, and stockholders' equity, (ii) eliminates the need to label the financial statements as those of a development stage entity, (iii) eliminates the need to disclose a description of the development stage activities in which the entity is engaged and (iv) amends FASB ASC 275, *Risks and Uncertainties*, to clarify that information on risks and uncertainties for entities that have not commenced planned principal operations is required. The amendments in ASU No. 2014-10 related to the elimination of Topic 915 disclosures and the additional disclosure for Topic 275 are effective for public companies for annual and interim reporting periods beginning after December 15, 2014. We have early adopted this new guidance for our consolidated financial statements for the year ended December 31, 2013, and therefore have not labeled our consolidated financial statements as those of a development stage entity or included the previously required inception-to-date information.

In August 2014, the FASB issued ASU 2014-15, *Disclosure of Uncertainties about an Entity's Ability to Continue as a Going Concern*. ASU 2014-15 requires management to evaluate relevant conditions, events and certain management plans that are known or reasonably knowable that when, considered in the aggregate, raise substantial doubt about the entity's ability to continue as a going concern within one year after the date that the financial statements are issued, for both annual and interim periods. ASU 2014-15 also requires certain disclosures around management's plans and evaluation, as well as the plans, if any, that are intended to mitigate those conditions or events that will alleviate the substantial doubt. ASU 2014-15 is effective for fiscal years ending after December 15, 2016. We are currently evaluating the impact that the adoption of ASU 2014-15 will have on our consolidated financial statements and related disclosures.

Off-Balance Sheet Arrangements

We did not have during the periods presented, and we do not currently have, any off-balance sheet arrangements, as defined in the rules and regulations of the SEC.

Quantitative and Qualitative Disclosures about Market Risk

Interest Rate Risk

Our primary exposure to market risk is interest income sensitivity, which is affected by changes in the general level of U.S. interest rates. Due to the short-term duration of our investment portfolio and the low-risk profile of our investments, we would not expect our operating results or cash flows to be affected to any significant degree by the effect of a sudden change in market interest rates on our investment portfolio. A 10% change in interest rates on December 31, 2014 would not have had a material effect on the fair market value of our portfolio.

We do not believe that our cash, cash equivalents and investments have significant risk of default or illiquidity. While we believe our cash and cash equivalents do not contain excessive risk, we cannot provide absolute assurance that in the future our investments will not be subject to adverse changes in market value. In addition, we maintain significant amounts of cash and cash equivalents at one or more financial institutions that are in excess of federally insured limits.

Our debt obligations bear interest at fixed rates and therefore have no exposure to changes in interest rates.

Foreign Currency Exchange Risk

We incur expenses, including for CROs and clinical trial sites, outside the United States based on contractual obligations denominated in currencies other than the U.S. dollar, including Pounds Sterling. At the end of each reporting period, these liabilities are converted to U.S. dollars at the then-applicable foreign exchange rate. As a result, our business is affected by fluctuations in exchange rates between the U.S. dollar and

foreign currencies. We do not enter into foreign currency hedging transactions to mitigate our exposure to foreign currency exchange risks. Exchange rate fluctuations may adversely affect our expenses, results of operations, financial position and cash flows. However, to date, these fluctuations have not been significant and a movement of 10% in the U.S. dollar to Pounds Sterling exchange rate would not have a material effect on our results of operations or financial condition.

Effects of Inflation

Inflation generally affects us by increasing our cost of labor, manufacturing, clinical trial, and other research and development and administration costs. We do not believe that inflation has had a material effect on our results of operations or financial condition during the periods presented.

BUSINESS

Overview

We engage in the discovery and clinical development of innovative medicines for patients suffering from severe, rare diseases using our knowledge of Physiocrine biology, a newly discovered set of physiological modulators. We have discovered approximately 300 Physiocrines (*physio* for life and *crine* for specific activity), a class of naturally occurring proteins that we believe promote homeostasis, a fundamental process of restoring stressed or diseased tissue to a healthier state. Physiocrines are extracellular signaling regions of tRNA synthetases, an ancient family of enzymes that catalyze a key step in protein synthesis. We believe that Physiocrines have evolved over time to modulate important cellular pathways by interacting with various types of cells, including immune and stem cells. Approximately 100 of these proteins interact with the immune system, which we believe presents a significant therapeutic opportunity to restore affected tissues to a healthier state through natural immuno-modulation mechanisms. We successfully completed a Phase 1 clinical trial of Resolaris, our first development candidate from our discovery engine, and are currently conducting a multi-national exploratory Phase 1b/2 clinical trial of Resolaris in adult patients with facioscapulohumeral muscular dystrophy, or FSHD, a severe, rare genetic myopathy with an immune component, for which there are currently no approved treatments. By leveraging our discovery engine and our knowledge of rare diseases, we aim to build a proprietary pipeline of novel product candidates with the potential to treat severe, rare diseases characterized by immune dysregulation. We plan to independently commercialize our Physiocrine-based therapeutics.

Our scientists were the first to identify the Resokine pathway (*reso* for restoring skeletal muscle health and *kine* for activity related to cytokines), an extracellular pathway in human skeletal muscle tissue associated with activities arising from various Physiocrine regions of the histidine aminoacyl tRNA synthetase, or HARS. We believe that the Resokine pathway, among its various activities, modulates the immune system to promote tissue homeostasis. We believe the Resokine pathway may play an important role in muscle and lung health. Certain patients with antisynthetase syndrome, a rare auto-immune disease, have antibodies to HARS, which are known as Jo-1 antibodies. These Jo-1 antibody patients often develop two significant clinical manifestations, skeletal inflammatory myopathy and interstitial lung disease, or ILD. We believe that the binding of Jo-1 antibodies, particularly to the immuno-modulatory domain of HARS, or iMod domain, blocks HARS immuno-modulatory functions and results in the muscle and lung disease in these Jo-1 antibody patients.

We are harnessing the Resokine pathway and its association in skeletal muscle with homeostasis to develop Resolaris as a first-in-class therapeutic for patients with severe, rare myopathies with an immune component, or RMICs, for which there are limited or no approved treatments. A myopathy is a disease of skeletal muscle tissue, characterized by muscle fiber deterioration, muscle weakness and often an immune response in the affected muscle tissue. In contrast to most current immunology drugs, which are engineered antagonists of immunological pathways, Resolaris is derived from a naturally occurring protein, HARS, which we believe has the potential to reset the immune system in diseased tissue to a more normal state while maintaining the immune system's activity against exogenous, pathogen-based insults. We observed that stimulation of the Resokine pathway through the introduction of Resolaris and its derivatives in rodent models of both severe inflammation and myopathy led to immuno-modulatory effects. We have shown that stimulation of the Resokine pathway by Resolaris alters immune responses and the expression or release of immune-related proteins from cells in response to inflammation. HARS, which contains the immuno-modulatory domain, is also released from human skeletal muscle. In addition to its immuno-modulatory properties, we believe the Resokine pathway may act on other physiological processes, including processes associated with stem cells, fibrosis and endothelial cells.

Since the identification of the Resokine pathway, we have successfully advanced Resolaris through preclinical development, current Good Manufacturing Practice, or cGMP, manufacturing and an initial Phase 1 clinical trial. In the first quarter of 2014, we completed a double-blind, placebo-controlled Phase 1 clinical trial of Resolaris, in which we assessed its safety and tolerability in 32 healthy subjects. Resolaris was shown to be well tolerated at all doses tested, and no serious adverse events were reported. Based on the favorable clinical safety, pharmacokinetic and immunogenicity profile of Resolaris in this trial, we decided to advance Resolaris into clinical trials of RMIC patients.

We are currently conducting a multi-national exploratory Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD in the European Union. This randomized, double-blind, placebo-controlled trial is designed to evaluate the safety, tolerability, pharmacokinetics and immunogenicity of multiple intravenous doses of Resolaris in adults with FSHD. We also intend to explore pharmacodynamic changes in inflammatory immune responses in skeletal muscle, as assessed by quantitative magnetic resonance imaging, or MRI, and in peripheral blood, as assessed by levels of circulating immune proteins, such as cytokines and muscle enzymes, and *ex vivo* inflammatory immune proteins released from peripheral blood cells. Resolaris will be studied in three dose escalation cohorts (0.3 mg/kg, 1.0 mg/kg and 3.0 mg/kg). In the fourth quarter of 2014, we completed multiple dosing of the patients in the first dose cohort. We are currently dosing patients in the second cohort. Subject to our interactions with regulatory authorities and patient enrollment in accordance with our clinical development plans, we expect to report initial results from this clinical trial in the fourth quarter of 2015 or early 2016.

Our initial therapeutic efforts target severe, rare disease indications in which patients suffer from the immune-related consequences of their genetic disease. We have identified over 20 distinct, molecularly definable RMIC indications, including FSHD and limb-girdle muscular dystrophies, or LGMD, in which we believe Resolaris has the potential to target the immune component of these genetic diseases.

We are also harnessing the Resokine pathway and its potential role in lung disease, specifically ILD, to develop Resolaris as a therapeutic for patients with rare pulmonary diseases with an immune component, or RPICs. ILD is associated with Jo-1 antibody patients and occurs in multiple other clinical settings. We are currently evaluating these other forms of ILD to identify the most appropriate RPIC indication for the initial clinical assessment of augmenting the Resokine pathway with Resolaris.

We have initiated a discovery program to explore varying exposures of the iMod domain of the Resokine pathway through protein engineering. The program seeks to develop a potential therapeutic that we refer to as iMod.Fc. We also believe our proprietary inventory of Physiocrines and their diverse functions have potential therapeutic application in a variety of diseases characterized by tissue dysfunction, including severe diseases of the lung, gut, skin, brain and liver. We intend to leverage our unique understanding of Physiocrines and our broad intellectual property portfolio, which we believe covers this entire class of potential protein therapeutics, to build a pipeline of product candidates that we expect to develop and commercialize independently for the treatment of various rare diseases.

We were founded in 2005 by Paul Schimmel, Ph.D. and Xiang-Lei Yang, Ph.D., two leading aminoacyl tRNA synthetase scientists at The Scripps Research Institute in San Diego, California. Our Executive Chairman and Chief Executive Officer, John D. Mendlein, Ph.D., was formerly the Chief Executive Officer of Adnexus Therapeutics, Inc. (acquired by Bristol-Myers Squibb Company) and Affinium Pharmaceuticals, Ltd. (acquired by Debiopharm Group), and held various roles at Aurora Biosciences Corporation (acquired by Vertex Pharmaceuticals Incorporated). We have assembled an executive team with broad experience in the discovery, development and commercialization of innovative therapeutics, including transformative therapies for rare genetic diseases such as Kalydeco, marketed by Vertex Pharmaceuticals Incorporated for the treatment of cystic fibrosis. We are advised by a Therapeutic Advisory Board and a Scientific Advisory Board, both comprised of leaders in the field of biology for medical applications, including our special advisor in immunology, Bruce Beutler, M.D., recipient of the 2011 Nobel Prize in Physiology or Medicine for his work in immunology. Our key investors include entities affiliated with Alta Partners; Cardinal Partners; Domain Associates; Fidelity Management & Research Company; Polaris Partners and Sofinnova Ventures.

Our Strategy

We aim to capitalize on Physiocrine biology, a new and important area of human biology, to develop first-in-class medicines to treat patients with severe diseases characterized by an immune component. Key elements of our strategy include the following:

- ***Leverage our leadership position in Physiocrine biology to develop and commercialize novel, first-in-class medicines for patients affected by severe, rare diseases with significant unmet need.*** We focus

on patients with severe, rare genetic diseases because we believe that the stimulation of Physiocrine pathways in these patients can restore diseased tissue to a more normal phenotype. Our strategy is to focus initially on indications where current treatment options are limited and our product candidates have the potential to provide transformative therapeutic benefit to patients given the severity of the diseases. We believe our initial focus on rare diseases will allow us to more effectively deploy investor capital for the independent development and commercialization of medicines for the benefit of patients and our stakeholders.

- ***Rapidly and prudently pursue the development and commercialization of Resolaris to treat patients across multiple severe disease indications.*** We intend to expeditiously pursue the development and regulatory approval of Resolaris in multiple RMICs. We are currently evaluating Resolaris in a Phase 1b/2 clinical trial in adult patients with FSHD and expect to report initial results from this clinical trial in the fourth quarter of 2015 or early 2016. In addition, we plan to initiate clinical trials in early onset FSHD and other RMIC indications, including limb-girdle muscular dystrophy. We also intend to evaluate Resolaris in other rare diseases with an immune component, such as RPIC indications. To bolster our clinical understanding of Resolaris, we may additionally evaluate Resolaris in more common diseases with an immune component.
- ***Leverage our discovery engine to build a pipeline of first-in-class Physiocrine medicines to address severe conditions characterized by immune pathway dysfunction or fibrosis.*** Based on our understanding of the biology of Physiocrines, we believe that this class of naturally occurring proteins has the potential to produce therapeutic benefits across a broad range of disease indications associated with an inappropriately amplified immune response, or where fibrosis contributes to disease associated with specific organs. We plan to leverage our discovery engine to identify other Physiocrine pathways of interest and select additional potential product candidates for preclinical and clinical investigation in a variety of disease settings on a tissue-by-tissue basis, which may include severe, currently inadequately treated diseases of the lung and liver.
- ***Retain exclusive worldwide commercial rights to our product candidates to pursue autonomous commercialization.*** We intend to build a pipeline of product candidates, the rights to which we solely own or exclusively license, that we can commercialize independently through a relatively small, dedicated commercial organization focused on patient needs and directed at a limited number of physicians who specialize in the treatment of our target patient populations. While we do not expect to require pharmaceutical partners for commercialization of our product candidates, we may consider partnering for strategic purposes, including to enhance our pipeline efforts.
- ***Expand our knowledge and intellectual property position in Physiocrine biology by emphasizing continuous scientific and business improvements.*** We will continue to aggressively pursue new scientific and therapeutic insights into Physiocrine biology through internally developed *in vivo* and *in vitro* screening systems in conjunction with genetic analysis and disease associations of Physiocrines, as well as in partnership with academic institutions and disease societies. We intend to leverage our leadership position in this field to broaden our intellectual property positions both in our most advanced programs and for additional therapeutic applications of Physiocrines. We will continue to vigorously prosecute and defend our patent portfolio, as well as exploit our proprietary position to strategically advance our business.
- ***Build a world class organization oriented to patients and focused on rigorous scientific, clinical and industrial advancements.*** We have assembled a world class team with industry-recognized expertise in biology, medicine and the commercialization of innovative and important therapeutics. We intend to continue to build on our leadership position in Physiocrine and immunology-based therapeutics and to grow an organization and culture dedicated to the development and commercialization of medicines with the potential to positively transform the lives of patients with severe, rare diseases. We intend to maintain and expand our relationships with key opinion leaders, patient advocacy groups and other business partners, and to solicit input from payors and others in the healthcare industry, to identify and develop our product opportunities and to design our development programs in order to maximize the availability of our product candidates to patients.

Our Founding Principles

We embrace the following principles:

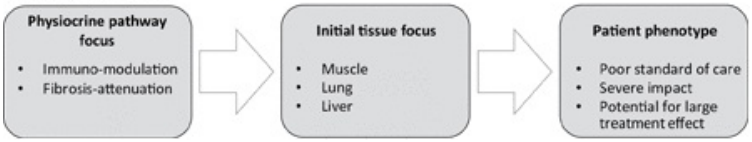
- We understand disease never takes a day off. Transformational science never sleeps in order to make meaningful medicines.
- With relentless determination, we aim to discover life-changing therapies for people with grave maladies where others fall short.
- We aim to develop medicines by orchestrating important physiological processes using novel biological and therapeutic mechanisms.
- We recruit and retain remarkable people to actualize our aspiration to achieve industry-admired results in all aspects of our business.
- We galvanize our teams using shared principles to accomplish our collective mission to make meaningful medicines with the potential to provide positive outcomes to patients and our stakeholders.

Our Pipeline—A New Set of Treatment Mechanisms for Patients

We believe that, as the first and only company engaged in the clinical development of therapeutics based on Physiocrine biology, we are positioned to develop and commercialize a pipeline based on a novel class of protein therapeutics, protected by intellectual property rights that we own or exclusively license, that modulate important physiological processes. Below are summaries of our product development pipeline and discovery engine process:

(1) The expected timing of the anticipated next milestones for our clinical programs for Resolaris in FSHD, LGMD and RPIC is based on our current estimates and is subject to change based upon a variety of factors discussed in this prospectus, including in the section entitled "Risk Factors."

Discovery Engine Process



Our research suggests that Physiocrines act through basic mechanisms of innate and adaptive immunity, as well as other pathways, in a way that is distinct from existing classes of protein therapeutics. We believe Physiocrines have evolved, among other things, to balance the immune system, resolving inflammation naturally, in contrast to currently available immuno-modulatory therapeutics, which are engineered inhibitors of pro-inflammatory pathways. We intend to harness these mechanisms of Physiocrines to benefit patients with severe diseases in ways that we believe have advantages over traditional antibody and small molecule approaches.

Physiocrines: Harnessing a Newly Discovered Source of Innovative Therapeutics

The Promise of Physiocrine-Based Medicines in Promoting Homeostasis

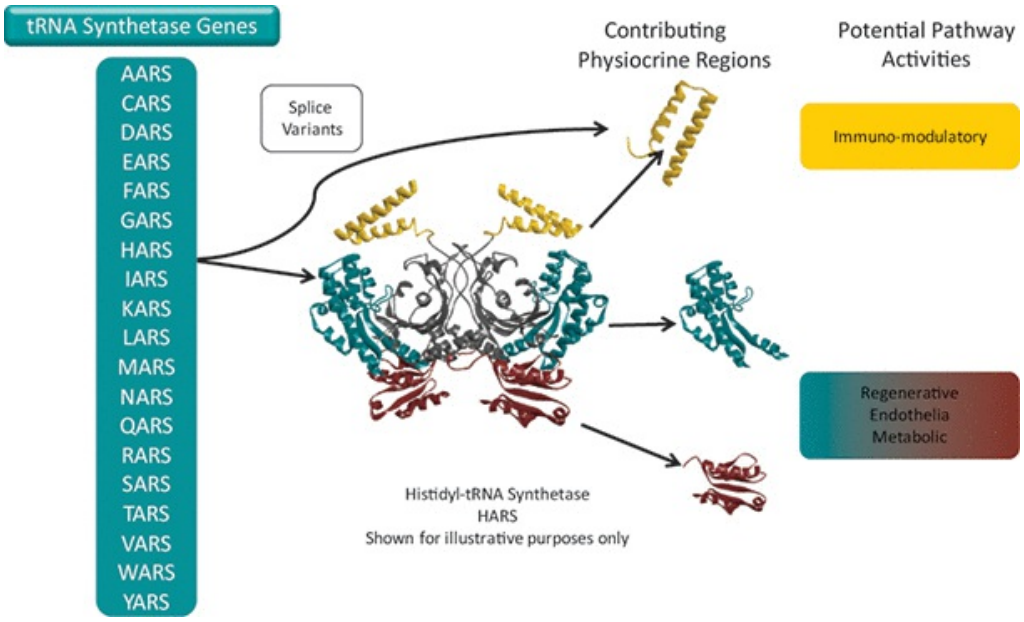
Homeostasis, or the coordinated regulation of tissues within the body, is fundamental to the maintenance of the overall health of an organism and a key feature of multicellular life. Lack of homeostasis can lead to disease and death. The process of homeostasis was first described in 1865 by the French physiologist Claude Bernard and Walter Cannon later coined the term. In the 150 years since this discovery, many proteins associated with homeostatic pathways have been discovered, ranging from insulin to erythropoietin, or EPO.

Using our knowledge of bioinformatics, sequencing, proteomics and structural biology, we identified Physiocrines, a novel class of proteins that are present as biologically active signaling regions of the tRNA synthetases, an ancient protein family. We believe that Physiocrines are involved in orchestrating homeostatic activities to help the body restore diseased or damaged tissue to a healthier state. We have observed that certain Physiocrines exhibit previously undescribed extracellular activities that are involved in restoring and regulating tissues to promote health. We believe that physiological perturbations, such as stress or changes in physiological state, alter or induce the release of Physiocrines from cells or platelets in the human body. Physiocrines have been observed to be released from a wide variety of cells, including in response to such stimuli as starvation-induced apoptotic stress or the introduction of certain cellular ligands, including tumor necrosis factor alpha and vascular endothelial growth factor.

Physiocrine Biology Overview

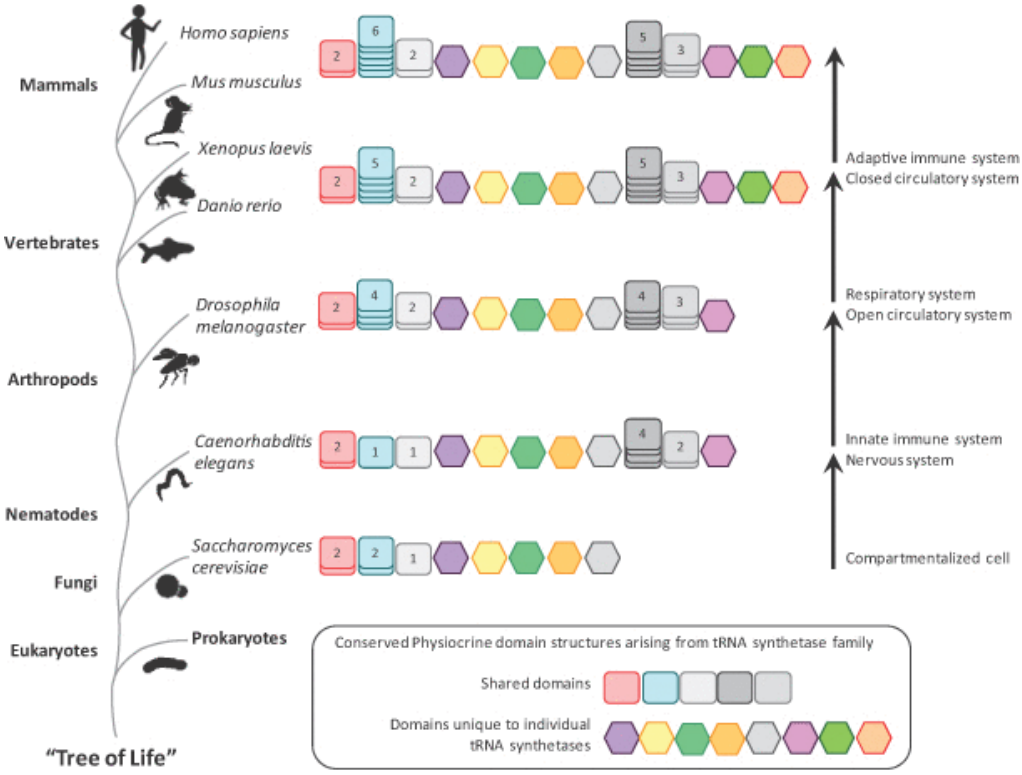
The Discovery of Physiocrines

In 1999, our founder, Dr. Paul Schimmel, published in *Science* a structural and functional description of extracellular signaling regions of a specific aminoacyl tRNA synthetase. tRNA synthetases are an ancient family of enzymes that were generally thought to only be involved in protein synthesis. Since Dr. Schimmel's discovery, numerous papers have been published on the alternative activities of tRNA synthetases. We refer to the extracellular signaling regions of tRNA synthetases illustrated in the figure below, along with other later-discovered or splice variant regions of tRNA synthetases, as Physiocrines. A splice variant is a variation of a gene transcript.



There are 20 known human cytosolic tRNA synthetases, each coding for one of the 20 amino acids. Amino acids, when bonded together, form full-length functional proteins. There are about 15 potential Physiocrines on average per tRNA synthetase, including Physiocrine regions in a full length tRNA synthetase protein, splice variants from a tRNA synthetase gene, or proteolytic fragments from a full length protein. We believe Physiocrines interact with various proteins important in extracellular activities, including G protein-coupled receptors, cytokine receptors, tyrosine kinase receptors and extracellular matrix proteins.

Our founding mandate was to focus on the systematic interrogation of the tRNA synthetase gene family through bioinformatics and structural analysis. Our research, along with that of The Scripps Research Institute, revealed that although the genetic sequence of each of the 20 tRNA synthetase genes changed at multiple times over four billion years by the genetic mutation of tRNA synthetases, including the insertion of DNA sequences, protein synthesis, however, as characterized by tRNA synthetase activity, remained relatively unchanged over that period of time. As illustrated in the figure below, the structural diversity of proteins resulting from the inserted genetic material increased as living organisms became more complex and as fundamental physiological systems, including immunological, stem cell, muscular, circulatory, respiratory and neural systems, developed.



The results of this research suggested to us that tRNA synthetases retained a core function in protein synthesis over four billion years, while developing other important and diverse physiological functions associated with Physiocrines. We believe these functions could serve as a source of therapeutics directed at stimulating pathways involved in the restoration of homeostasis.

The Function of Physiocrines in Fundamental Pathways of Life

Based on the research suggesting that Physiocrines are potentially important modulators of cellular pathways, we hypothesized that Physiocrines may play roles in such fundamental processes as immunology, stem cell biology, neurology, vascular biology, skeletal muscle biology, hepatic (liver) biology and metabolic biology. To test this, we expressed and purified over 200 Physiocrine regions across the family of 20 tRNA synthetase genes and evaluated these purified Physiocrines in numerous cell-based assays to determine their activity in several important human physiological pathways. Some of the data were published in July 2014 in *Science*, with

the data categorized according to important areas of biology. The table below describes several key areas of biology in which Physiocrines may present therapeutic opportunities:

Cellular Pathways	Number of Physiocrines	Potential Therapeutic Applications
Immunology	99	Rare Diseases with an Immune Component, Auto-immune Disorders, Oncology and Fibrosis
Stem Cells	129	Regenerative Medicine, Fibrosis and Oncology
Neurology	34	Neurodegenerative Diseases
Vascular	35	Cardiovascular Diseases, Oncology and Immunology
Skeletal Muscle	130	Skeletal Muscle Diseases
Hepatic	76	Liver Fibrosis
Metabolic	22	Diabetes and Obesity

Our current research includes efforts to understand the relationship of various Physiocrine pathways to health and disease and the potential for a particular Physiocrine pathway to provide a valuable therapeutic intervention point. In addition, various independent research sites across the world are conducting genetic analysis of DNA from patients with rare phenotypes and mutations to tRNA synthetases. Laboratories are also investigating the connection between tRNA synthetases and various cancers and auto-immune diseases.

Physiocrine Pathways as Therapeutic Intervention Points

Our Initial Focus on Immuno-Modulation

Many important therapeutics act in connection with physiological pathways, including growth factor and differentiation pathway agonists, such as insulin and erythropoietin, or EPO; growth factor pathway antagonists, such as vascular endothelial growth factor antagonists; immune pathway antagonists, such as tumor necrosis factor antagonists; immune pathway agonists, such as interferon; and metabolic pathway modulators, such as glucagon-like peptide-1 (GLP-1). We are initially focused on the application of Physiocrines to immuno-modulation in rare diseases. We selected immuno-modulation as our initial area of focus for the following reasons:

- We believe immunology plays a significant role in most diseases, including genetic diseases;
- A number of Physiocrines have been shown to be differentially expressed in immune cells;
- A large number of Physiocrine pathways appear to relate to immunology, as at least seven different tRNA synthetase proteins are associated with certain immune-driven diseases; and
- Approximately 100 Physiocrines have demonstrated activity in various cell-based assays related to immunological pathways.

Additionally, we focus our immuno-modulator development efforts on indications that represent severe, rare diseases, particularly genetically based diseases, because:

- Our scientific understanding of Physiocrines as immuno-modulators intersected with multiple rare diseases;
- We believe patients with rare genetic diseases often face challenges related to the responses of their immune systems to changes in tissues that are caused by their genetic mutations; and
- We believe the pathological immuno-phenotypes in rare diseases present an opportunity for us to therapeutically intervene with greater impact.

Advantages of Physiocrine-Based Therapeutics

Most current immunological drugs are engineered antagonists of immunological pathways, typically acting to lower elevated immune responses resulting from disease, as in the case of monoclonal antibodies acting

against circulating signaling molecules, such as cytokines. Although these signaling molecules may be up-regulated in disease, their natural levels and fluctuations have evolved to include non-disease functions of the immune system, mediating a wide range of physiological activities, as opposed to evolving to cause or contribute to disease. Our discovery and development efforts focus on therapeutics derived from naturally occurring proteins. We believe that Physiocrines have naturally evolved to reset the immune system to control or reduce tissue damage while maintaining the immune system's activity against exogenous pathogen based insults, and may possess the following advantages over engineered antagonists of immunological pathways:

- As proteins designed by nature to reset the immune system, Physiocrines may provide a unique mechanism to improve patient outcomes through their activity in either a single or multiple pathways;
- Physiocrines have the potential to reset the immune system across multiple pathways at the level of an immune cell, rather than lowering the levels of a single immune protein like most engineered antagonists;
- Physiocrines may potentially act as agonists at the level of the immune cell to reduce pro-inflammatory effects and induce resolution of immune activity or inflammation;
- The therapeutic effects of Physiocrines may persist even after the Physiocrines have been cleared from circulation; and
- Physiocrines present the potential for fewer, if any, immuno-suppressive effects, as compared to engineered antagonistic immuno-modulators.

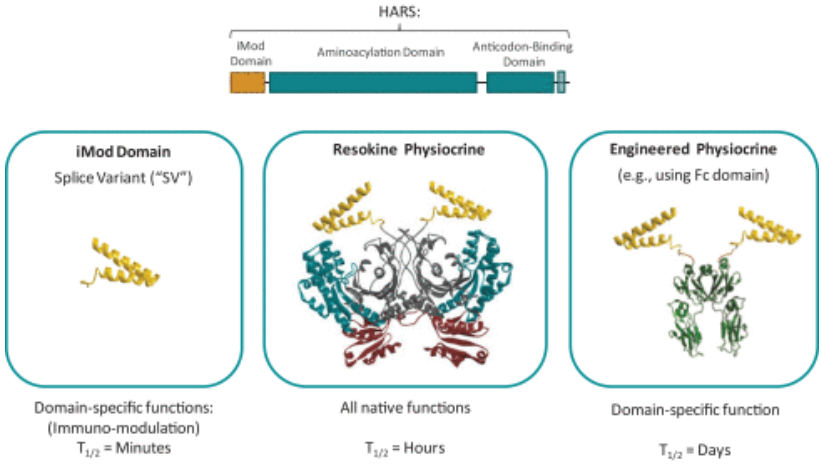
The Resokine Pathway and Resolaris, Our First Clinical Product Candidate

Identification of the Resokine Pathway through In Vivo Screening Approaches

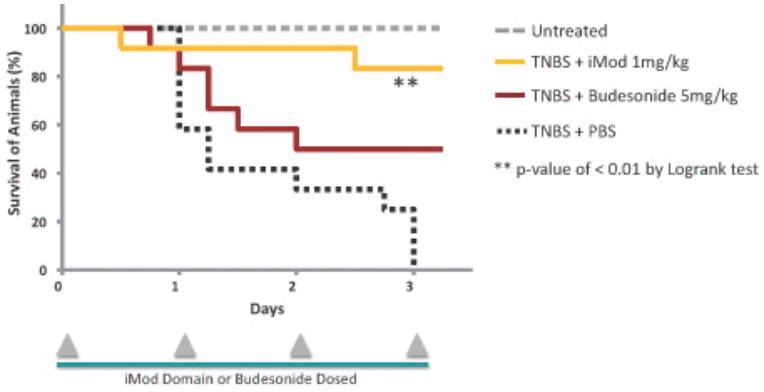
Our scientists discovered the Resokine pathway in human skeletal muscle using our *in vivo* screening systems in models of severe inflammation, combined with our knowledge of the effects of antibody binding to a specific tRNA synthetase in a population of patients with a particular rare myopathy. The Resokine pathway encompasses physiological activities, including potential immuno-modulatory and other muscle health activities, arising from various Physiocrine regions of the histidine aminoacyl tRNA synthetase, or HARS. Animal studies and human pathophysiological data have shown that antibody-based blockade of the Resokine pathway may lead to muscle tissue deterioration and immune cell invasion.

First Demonstration of a Region of HARS as an Immuno-modulator

We conducted *in vivo* screening activities of a splice variant from HARS that we identified in our deep sequencing studies, which we refer to as the immuno-modulatory domain, or iMod domain, of HARS. The figure below depicts the iMod domain and other forms of HARS:



For our studies of the iMod domain, we selected a rodent model of severe immune cell activity or inflammation induced by the administration of trinitrobenzene sulfonic acid, or TNBS, in which the inflammation is thought to be driven by excessive T-cell involvement in the gut, leading to the death of the study animals. Animals administered the iMod domain survived longer than those given either the vehicle control phosphate buffer solution, or PBS, or an approved drug control (Budesonide) ($p<0.01$), demonstrating the potential activity of the iMod domain as an immuno-modulator of excessive T-cell involvement. The results of this study are summarized in the graph below:

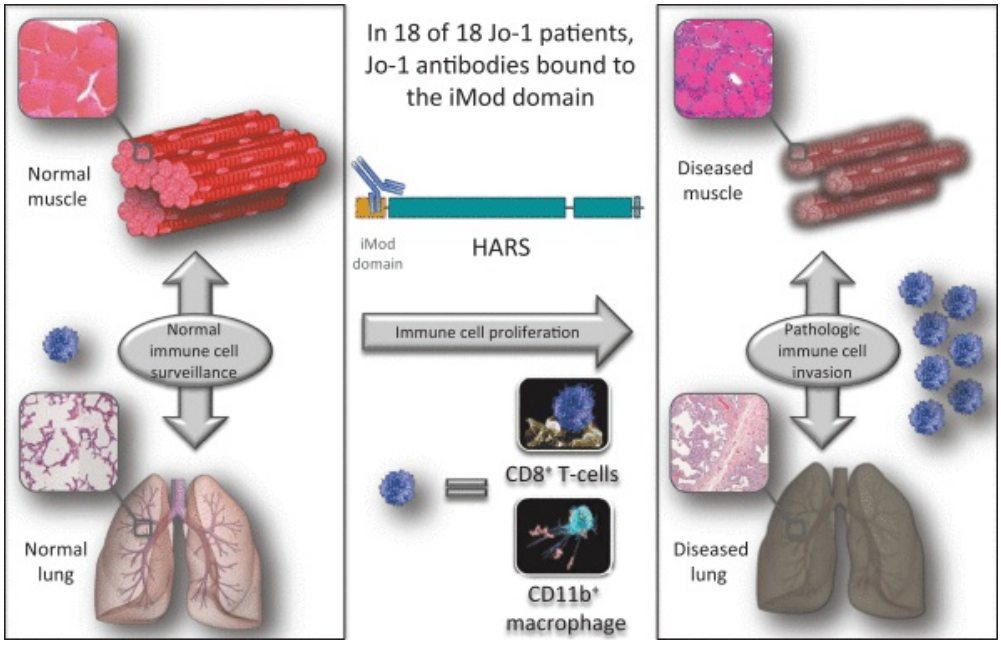


Additionally, we have demonstrated in the same rodent model of inflammation in the gut that at least two other related molecules, Resolaris and iMod.Fc, both of which are derived from HARS and contain the iMod domain, are active in models of excessive T-cell involvement. Based on these observations, we believe that blockade of the activity of the iMod domain may contribute to excessive or inappropriate T-cell involvement in immune-driven diseases.

Evidence of the Role of the Resokine Pathway in Rare Muscle and Lung Diseases

In 1983, Matthews and Bernstein published in *Nature* the observation that patients with a rare myopathy possessed antibodies to a single tRNA synthetase, HARS. Since then, it has been observed that patients with auto-antibodies to HARS (but not antibodies to the other 19 tRNA synthetases in the same patients) can develop both a debilitating myopathy characterized by weakness and skeletal muscle loss, and interstitial lung disease, or ILD, both of which are characterized by T-cell invasion. Numerous research laboratories have verified the existence of anti-HARS antibodies, or Jo-1 antibodies, as one of the manifestations of the auto-immune disease, anti-synthetase syndrome.

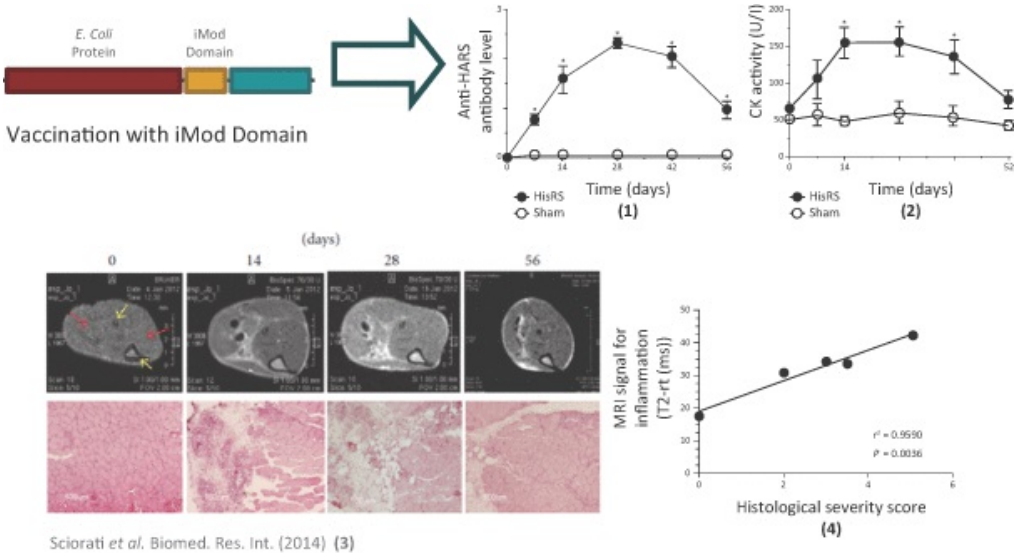
Based on these observations, we chose to study the potential link between HARS antibodies and muscle disease in anti-synthetase syndrome patients with Jo-1 antibodies. Our scientists obtained serum samples from 18 of these patients to determine whether the Jo-1 antibodies specifically bound to the iMod domain. We determined that in each of the 18 Jo-1 antibody positive patients studied, a significant portion of Jo-1 antibody binding was to the iMod domain, compared to binding to other regions of HARS. We believe that in these patients, the binding of Jo-1 antibodies to the iMod domain blocked the immuno-modulatory properties of the iMod domain, therefore contributing to their myopathy and ILD. Independent laboratories have also observed in unrelated studies that the iMod domain is the primary antibody binding region in Jo-1 antibody patients with anti-synthetase syndrome. The figure below illustrates the potential connection between Jo-1 antibody binding to the iMod domain and T-cell involvement in diseased muscle and lung tissue.



Additional Confirmatory Studies of the Blockade of the Resokine Pathway in Animals

We have conducted studies that suggest that antibody blockade of the Resokine pathway contributes to immune cell invasion in skeletal muscle and lung tissue. Recently published animal studies by a third party laboratory are consistent with our findings. In particular, in 2014, Sciorati *et al*. published on the effect in rat skeletal muscle of antibodies to the iMod domain produced by vaccination, generating additional evidence that the Resokine pathway plays a role in skeletal muscle health and the immune system. The Sciorati study

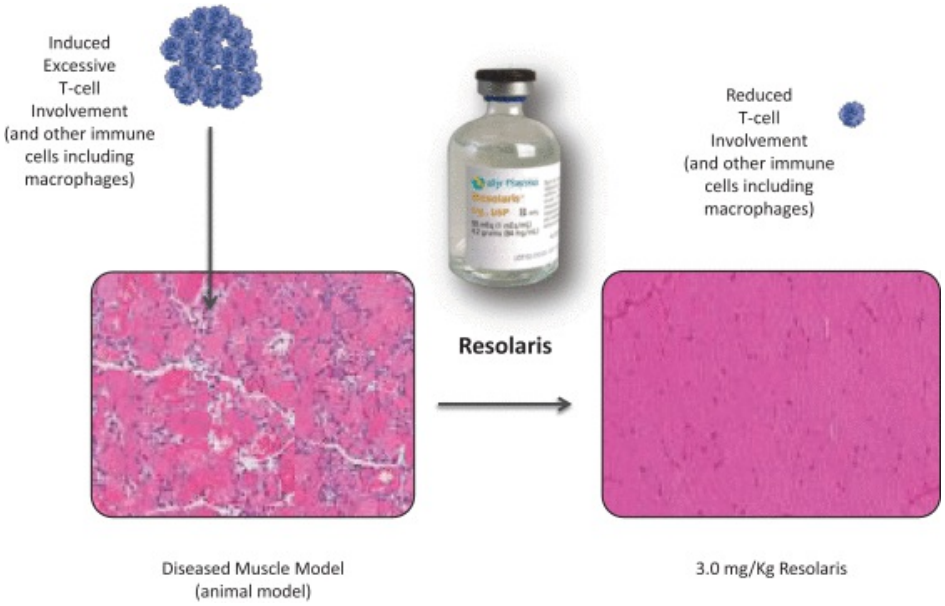
demonstrated: (1) antibody generation to the iMod domain of HARS; (2) levels of creatine kinase, or CK, a biomarker of muscle destruction, increased in relation to antibody levels; (3) antibodies to the iMod domain correlated with an increase in muscle inflammation, as observed by magnetic resonance imaging, or MRI; and (4) the MRI signal corresponded to muscle destruction, as judged by histology. These data are illustrated in the figures below:



The data generated by Sciorati *et al*. are consistent with our conclusions that the Resokine pathway was reduced or blocked in Jo-1 antibody patients as a result of antibodies against the iMod domain.

Altering Excessive T-cell Invasion in Preclinical Studies of Resolaris in Skeletal Muscle

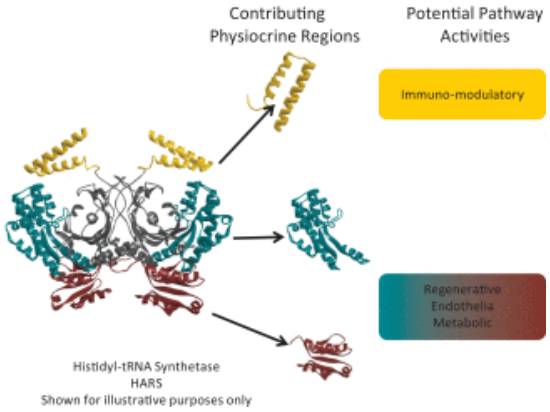
We also tested Resolaris in a rodent model in which statins, which are known to induce myopathies in humans and rodents, were administered to induce a severe, aggressive myopathy. In the study, rats were administered statins for two weeks, and at Day 8, treatment with Resolaris was started. After a week of daily treatment with Resolaris, we observed a dose dependent change in the histologic phenotype of the treated animals, from excessive immune cell invasion to nearly normal histology and immune cell levels, as compared to animals in the control group, as shown in the figure below:



Resolaris Mechanism of Action: T-cell Modulation and Other Potential Pathways

Our *in vivo* studies suggest that stimulation of the Resokine pathway through or with Resolaris combats pathophysiological changes in three established animal models of excessive T-cell involvement in which approved drugs have been tested. Our *in vitro* studies of Resolaris suggest that at least one of the activities of Resolaris includes a direct action on T-cells to reduce, but not completely block, cytokine release. This reduction also lasts for at least 24 hours after Resolaris has been removed from the T-cells. This suggests that the pharmacodynamic effect of Resolaris *in vivo* could be longer than the pharmacokinetics of the protein. It also suggests that there is at least one T-cell associated receptor for Resolaris, such as a cytokine or chemokine receptor. We observed Resolaris' effect on human T-cells by monitoring IL-2 levels over time.

Additional cell-based assays show that specific regions of Resolaris may harbor additional activities similar to Physiocrine regions from the HARS protein, including those illustrated in the figure below. We are currently conducting additional studies regarding non-immuno-modulatory activities that may relate to the mechanism of action of Resolaris.



Additionally, we have looked for direct antagonist activities of Resolaris on certain cytokines. Resolaris does not appear to act as a direct ligand antagonist, but rather appears to act more globally at the level of immune cells and potentially other cell types. HARS is also released directly from human skeletal muscle *in vitro*, and blocking HARS with antibodies after stimulated release by insulin-like growth factor, or IGF-1, reduces the effect of IGF-1 in muscle differentiation.

Resolaris for the Treatment of Multiple Rare Myopathies with an Immune Component (RMICs)

Overview

We are developing Resolaris as a first-in-class intravenous protein therapeutic for the treatment of rare myopathies with an immune component, or RMICs. We have identified over 20 distinct, molecularly definable RMIC indications that we believe Resolaris has the potential to treat. In each of these indications, skeletal muscle tissue exhibits dysfunction and becomes subject to immune cell invasion, which contributes to the loss of function and deterioration of the muscle tissue. RMIC patients generally present with three common characteristics:

- expression of aberrant protein (in the case of genetically based RMIC indications);
- immune cell invasion; and
- muscle cell damage and deterioration.

In normal muscle, muscle mass and function require a balance between muscle cell stress and damage and muscle cell regeneration and growth. The immune system helps maintain this balance by "cleaning up" damaged muscle cells after muscle damage and during the healing process. In RMIC diseases, the balance is tipped to favor chronic pathophysiological muscle deterioration and persistent immune cell invasion. In genetically based RMIC diseases, aberrant protein expression often occurs, as in the case of FSHD patients with inappropriate expression of a protein not normally expressed in muscle. As discussed above, *in vivo* rodent models of skeletal muscle deterioration and immune cell invasion have shown that Resolaris can combat immune cell invasion into the muscle and muscle deterioration. Conversely, experiments in rodents have shown that antibody blockade of the Resokine pathway can lead to immune cell invasion and muscle tissue deterioration.

We intend to harness the body's power to restore skeletal muscle after stress or damage in the development of Resolaris for RMIC patients who have limited or no approved treatment options. We believe Resolaris can offer a

potential multi-pharmacologic therapeutic, synergystically modulating multiple pathways important to muscle health. Our proprietary position for Resolaris includes an issued U.S. patent covering the composition of matter of Resolaris, as well as various patent applications relating to specific methods of use of Resolaris and related proteins.

Resolaris: Potential Specific Therapeutic Applications in RMICs

We believe Resolaris will provide therapeutic benefit to patients in RMIC indications characterized by excessive immune cell involvement, particularly a type of T-cell known as CD8 T-cells and macrophages. Dysregulated immune cell invasion can cause and exacerbate muscle damage and stress. For example, CD8 T-cells have been observed to contribute to muscle damage by the release of proteins that destroy or damage skeletal muscle cells. The table below describes RMIC indications in which the relationship between diseased muscle and the immune system has been observed by others, which we believe may be addressed by the proposed mechanism of action of Resolaris.

Disease Area	Type of RMIC	Molecular Definition of Disease (Estimated U.S. Population)	Immune Features	Potential Resolaris Mechanism of Action
Rare myopathies with an immune component (RMIC)	Genetic	Facioscapulohumoral muscular dystrophy, or FSHD (19,000) 3 genetic forms*	CD8 T-cell infiltration Macrophage infiltration Pro-inflammatory cytokine production, including: MCP-1, IL-6 and IL-12	In preclinical models *in vivo*, Resolaris reduces (i) the infiltration and accumulation of CD8 T-cells; (ii) the expression of cytokines, including MCP-1, IL-6 and others; and (iii) biomarkers, such as MMP9. *In vitro* studies using Resolaris also demonstrate reduction of a variety of pro-inflammatory cytokines, including IFN gamma and IL-17A, as well as the activity of pro-inflammatory macrophages.
		Limb-girdle muscular dystrophy, or LGMD (16,000) >20 genetic forms*	T-cell infiltration	
		Duchenne muscular dystrophy, or DMD (5,600-18,000) >50 genetic forms*	CD8 T-cell infiltration Macrophage infiltration MMP9, TIMP1, TNFα	
		>10 undisclosed muscular dystrophies	To be determined	
	Autoimmune	Sporadic Inclusion Body Myositis, or sIBM (3,400)	CD8 T-cell infiltration Macrophage infiltration Pro-inflammatory cytokine production, including MCP-1	
		Myositis with at least one molecular marker (such as auto-antibodies)		

* By use of the term "genetic form," we mean a molecularly defined marker that includes (1) changes in a chromosome structure, (2) different genes that are mutated or (3) a single gene with multiple points of mutation.

Legend:
IL-6: Interleutin-6
IL-12: Interleutin-12
MCP-1: Monocyte Chemotactic Protein 1
MMP9: Matrix Metallopeptidase 9
TIMP1: Tissue Inhibitor of Metalloproteinase-1
TNF-α: Tumor Necrosis Factor alpha

Resolaris: Our Clinical Development Program

We are discovering and developing protein based therapeutics leveraging the novel extra-cellular functions of tRNA synthetases to restore and maintain tissue homeostasis. The initial Physiocrine-based therapeutic from our discovery pipeline, Resolaris, has entered clinical development. We are pursuing a clinical development strategy that not only will inform the therapeutic potential of RMIC and RPIC indications but will also inform the therapeutic potential of Physiocrine-based therapeutics as a class. The strategy has as its foundation the extensive evaluation of the safety and tolerability of the administration of Physiocrine-based therapeutics to human subjects.

We successfully completed a single ascending dose Phase 1 clinical trial in healthy subjects of Resolaris, our first development candidate from our discovery engine for therapeutic applications of Physiocrines. We are currently conducting a multi-national Phase 1b/2 clinical trial of Resolaris in adult patients with facioscapulohumeral muscular dystrophy, or FSHD, a severe, rare genetic myopathy in which immune cells invade diseased skeletal muscle, for which there are currently no approved treatments.

We intend to initiate, in the third quarter of 2015, a clinical trial to assess the safety, tolerability, and biological and clinical activity of Resolaris in early onset FSHD patients. We intend to initiate, in the fourth quarter of 2015, a clinical trial to assess the safety, tolerability, and biological and clinical activity of Resolaris in a second RMIC population, LGMD patients. Finally, we intend to initiate, in the first half of 2016, a clinical trial to assess the safety, tolerability, and biological and clinical activity of Resolaris in an RPIC patient population.

Phase 1 Clinical Trial in Healthy Subjects

In the first quarter of 2014, we completed a single ascending dose Phase 1 clinical trial of Resolaris to assess its safety and tolerability in healthy subjects. The planning and design of the trial were guided by the principles that this trial would be the first time that a Physiocrine has been administered to a human subject, and that the therapeutic use of immuno-modulatory drugs are often characterized by poor tolerability and common safety concerns. In particular, we designed this trial as a double-blind, placebo-controlled study in order to rigorously assess safety and tolerability, such as injection site reactions or systemic reactions, and to assess the pharmacokinetics, or PK, immunogenicity and biological activity of single doses of Resolaris in humans. In this trial, 32 healthy adult subjects were randomized to receive a 30 minute intravenous infusion of either placebo or a single dose of 0.1 mg/kg, 0.3 mg/kg, 1.0 mg/kg, or 3.0 mg/kg of Resolaris. Participants were randomly assigned to receive Resolaris or placebo on a 3:1 basis so that within each of the four cohorts, six subjects received Resolaris and two subjects received placebo, and overall, 24 healthy subjects were dosed with Resolaris and eight healthy subjects were dosed with placebo.

Resolaris was found to be well tolerated in all dose cohorts in our Phase 1 clinical trial. There were no serious adverse events or deaths, and the incidence of individual treatment emergent adverse events, or TEAEs, among all groups was low, with no relationship to Resolaris dose level. All TEAEs observed in the trial were mild in intensity and transient, and resolved without treatment-related pathological effects. TEAEs that were considered possibly related to Resolaris were predominantly nervous system symptoms, including single cases of dizziness, headache, and drowsiness. No local tolerability issues related to Resolaris were observed.

We observed no significant changes from normal in over 30 cytokine and other immune-related protein assays after administration of 0.1 mg/kg, 0.3 mg/kg, 1.0 mg/kg, and 3.0 mg/kg of Resolaris in these healthy individuals. These results are consistent with the observed role of the Resokine pathway in resolving inflammation. Systemic exposure and C_{max} were dose proportional, mean total systemic clearance was low and the volume of distribution was small, resulting in a terminal half-life in plasma of approximately three to six hours across all dose levels. Low titer anti-drug antibodies were observed in five subjects out of 24 after administration of Resolaris. One subject out of 24 had similar low titer anti-drug antibodies prior to the administration of Resolaris. The PK of Resolaris was not altered in these subjects. Based on the favorable PK,
safety, tolerability and immunogenicity profile of Resolaris in our Phase 1 clinical trial in healthy subjects, we have advanced Resolaris into clinical development in RMIC patients.

Resolaris in Facioscapulohumoral Muscular Dystrophy (FSHD)

The process of selecting the first RMIC indication for our Resolaris program involved several steps. First, both genetic and autoimmune forms of RMIC were considered. Then, diseases with high unmet need (no treatment options), severe progressive disease manifestations and clear evidence of an immune component were selected for further exploration. Those in which the muscle tissue itself and the circulation clearly reflect the immune dysregulation were prioritized, with those whose immune pathogenesis overlapped with Resolaris activity rising to top of the list. These prioritized diseases included several distinct genetic myopathies.

Based on the indication selection process described above, we elected to first pursue FSHD, a rare genetic myopathy in which immune cells invade diseased skeletal muscle and for which there are no approved treatments. The primary clinical phenotype of FSHD is debilitating skeletal muscle deterioration and weakness. The symptoms of FSHD develop in an asymmetric pattern, starting with the face and upper body to the lower body and progressing in a “muscle by muscle” fashion. This is in contrast to other genetic myopathies such as Duchenne muscular dystrophy that usually affect groups of muscles concurrently and symmetrically. These symptoms include musculoskeletal abnormalities such as abnormal protrusion of the shoulder blades or exaggerated bend of the lower spine and, often as the disease progresses, difficulty standing upright, lifting objects, reaching above shoulder level or using the shoulders to support various activities of daily life. Patients also suffer pelvic girdle and lower limb weakness, resulting in progressive difficulty arising from a seated position. Importantly, most patients eventually develop profound weakness in the lower leg and cannot manage to lift the foot of the affected side appropriately. This condition results in frequent falls and related injuries. In addition to debilitating muscle weakness, FSHD patients often experience severe fatigue, muscle deterioration and pain. While FSHD can manifest at any age, the onset of symptoms in many patients occurs before the age of 18. We refer to this patient population as early onset FSHD. Within this early onset population are individuals with symptom onset at less than five years of age, with progression in disease prior to age ten. These individuals have the most severe muscle symptoms and significant extra-muscular manifestations such as auditory deficits and retinal complications that may result in vision loss. This sub-group of early onset patients are often referred to as having “infantile onset” FSHD.

While estimates of FSHD prevalence vary, studies exploring the topic have identified average prevalence rates of approximately one in 17,000. Applying this rate to the U.S. population, as of November 1, 2014, yields a domestic FSHD population of approximately 19,000. The disease is typically diagnosed by the presence of a characteristic pattern of muscle weakness and other clinical symptoms, as well as through genetic testing of the number of repeats of a specific DNA sequence at the end of Chromosome 4. In normal, unaffected individuals this chromosomal region has from 11 to 100 repeats of the applicable DNA sequence. Patients with late or adult onset FSHD typically have only one to ten of these repeats. The most severe form of FSHD is associated with three or fewer repeats. The term FSHD1 is used to delineate patients in which the genetic basis relates to the deletion of these repeats at the end of Chromosome 4. Another form of the disease, FSHD2, occurs in approximately 5% of FSHD patients, and is caused by mutations in the gene *SCHMD1* located on Chromosome 18 of the applicable DNA sequence. In both FSHD1 and FSHD2, the genetic abnormality results in the expression of genes that are normally silent or inactive in skeletal muscle. Consequently, an unusual profile of proteins is produced, which has been linked to FSHD skeletal muscle pathology.

The FSHD immuno-pathology includes an infiltrative inflammatory process (usually dominated by CD8 T-cells and macrophages) that can also be observed by MRI in individual skeletal muscles that are in the early stages of disease. Longitudinal MRI studies in FSHD have recently shown that these muscle by muscle inflammatory changes directly precede the fatty infiltration that characterizes individual muscles that have been affected for a longer period of time. Once this fatty infiltration has progressed to a certain stage in the affected muscle, however, the level of inflammation as detected by MRI decreases. The degree of fatty infiltration correlates with a commonly used measure of functional status, the FSHD clinical severity score.

The inflammatory immune response in FSHD is reflected in individuals with FSHD through activated immune cells and elevated levels of immune and skeletal muscle proteins present in the circulation. Peripheral blood mononuclear cells from individuals with evidence of muscle inflammation also show evidence of activation in cell culture by spontaneously releasing high amounts of immune proteins into the culture medium compared to controls.

There are currently no approved treatments for FSHD. The standard of care in management of the disease includes physical therapy and, in the presence of severe muscle weakness, orthotic devices or surgical interventions may be needed to maintain musculoskeletal stability.

Phase 1b/2 Clinical Trial

In the third quarter of 2014, we initiated a multi-national Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD in the European Union. The randomized, double-blind, placebo-controlled trial is designed to evaluate the safety, tolerability, PK and immunogenicity of multiple intravenous doses of Resolaris in adults 18 to 65 years of age with FSHD. We also intend to explore pharmacodynamics, or PD, changes in inflammatory immune responses in skeletal muscle, as assessed by quantitative MRI, and in peripheral blood, as assessed by measures of circulating immune proteins such as cytokines and muscle enzymes and *ex vivo* inflammatory immune proteins released from peripheral blood cells. We initially received regulatory clearance to proceed with our trial at clinical sites in France, Italy and the Netherlands. These sites were selected based on their clinical expertise and their leadership and expertise in MRI as an assessment tool for FSHD patients. Additionally, in January 2015, we received clearance from the FDA to initiate our Phase 1b/2 clinical trial of Resolaris in adult patients with FSHD in the United States, subject to a partial clinical hold that prohibits the evaluation of Resolaris at doses higher than 3.0 mg/kg. We do not expect the partial clinical hold to have a material impact on the timeline for this clinical trial because we currently do not plan to evaluate Resolaris doses higher than 3.0 mg/kg in the United States.

Resolaris will be studied in three dose escalation cohorts (0.3 mg/kg, 1.0 mg/kg and 3.0 mg/kg). An independent Data Monitoring Board, or DMB, will meet to review the clinical data from each cohort, and will provide us with a recommendation regarding advancement into the next cohort. In each cohort, patients will be randomized to receive Resolaris or placebo at a ratio of 3:1. Patients in the first two cohorts will be dosed over a period of one month, and patients in the third cohort will be dosed over a period of three months. We enrolled a total of four patients in the first cohort and eight patients in the second cohort, and expect to enroll eight patients in the third cohort. In the fourth quarter of 2014, we completed multiple dosing of the patients in the first dose cohort. We are currently dosing patients in the second cohort. Starting with the second cohort, inclusion criteria included the presence of at least one skeletal muscle in the lower extremities displaying an inflammatory immune response by MRI. Our protocol for this trial includes the option to initiate up to two additional cohorts comprised of 12 patients each. We intend, either through study specific extensions or a dedicated clinical trial protocol, to evaluate the safety, tolerability and clinical activity of extended treatment of FSHD patients with Resolaris.

Subject to our interactions with regulatory authorities and patient enrollment in accordance with our clinical development plans and following our receipt of unblinded clinical safety, MRI and PD data from all three cohorts, we expect to report initial results from the trial in the fourth quarter of 2015 or early 2016.

In parallel with conducting our initial clinical trial in adults with FSHD, we are finalizing our plans to evaluate Resolaris in a multi-center, international trial of patients with early onset FSHD. This trial will be designed to assess the safety, tolerability, PK, immunogenicity, PD and clinical effectiveness of multiple intravenous doses of Resolaris in patients with early onset FSHD. Subject to our interactions with regulatory authorities, we expect to initiate this clinical trial in the third quarter of 2015.

In the first quarter of 2015, the European Commission granted orphan medicinal product designation for Resolaris (ATYR1940) for the treatment of FSHD following a positive opinion by the EMA's Committee of Orphan Medicinal Products. We have filed an application in the United States for orphan drug designation for Resolaris (ATYR1940) for the treatment of FSHD with the FDA.

Resolaris in Other RMIC Indications

In addition to FSHD, we plan to address other genetic diseases in which immune cells invade diseased muscle. We plan to commence clinical trials of Resolaris in at least one form of limb-girdle muscular dystrophy, or LGMD, in adult patients in the fourth quarter of 2015.

LGMD is a broad term used to describe over 20 rare genetic myopathies. The mutations typically create abnormal, malfunctioning proteins. These diseases are linked by the common distribution of their muscle weakness (e.g., predominantly in the proximal limb muscles and the pelvic and shoulder girdle muscles). As is the case with FSHD patients, some LGMD patients typically suffer from:

- skeletal muscle weakness or compromised function in identifiable, specific muscles;
- skeletal muscle immune cell invasion in identifiable, specific muscles; and
- skeletal muscle deterioration in identifiable, specific muscles with insufficient muscle regeneration.

The LGMD disorders stem from deficits in proteins that are important for muscle integrity. In some forms, the affected muscles can be more fragile than normal muscle and are easily damaged, even in the setting of everyday stress. The associated immune cell invasion and muscle deterioration can be seen locally in muscle tissue by biopsy or imaging techniques, such as MRI. The muscle deterioration is also reflected systemically, with patients often displaying elevated levels of muscle proteins in their blood (e.g., CK) or urine (e.g., myoglobin).

The age of onset of certain forms of LGMD is usually between ten and 30, with both genders affected equally. The disease inevitably gets worse over time, although progression is more rapid in some patients. The disease commonly leads to dependence on a wheelchair within twenty to thirty years of symptom onset, but there is high inter-patient variability, with some patients maintaining mobility. LGMD may eventually weaken the respiratory muscles, leading to illness or early death due to complications from this secondary manifestation. Individuals with cardiac involvement may succumb to heart failure.

No definitive treatments exist for any of the over 20 forms of LGMD. Clinical management is directed to prolong survival and improve quality of life, including avoiding obesity, promoting physical therapy and stretching exercises, using mechanical aids to help ambulation and mobility, surgical intervention for orthopedic complications, using respiratory aids when indicated, monitoring for cardiomyopathy in LGMD types with cardiac involvement, and social and emotional support and stimulation.

We are in the process of evaluating the various genetic forms of LGMD in order to select genetic forms that we believe will be most amenable to treatment with Resolaris, based on factors such as the characteristics of the associated immuno-pathology in skeletal muscle. Subject to our selection of one or more genetic forms of LGMD for clinical evaluation, we may apply for orphan designation for Resolaris in an LGMD indication in one or more territories, which may include the United States and Europe.

Resolaris Non-Muscle Indication Set: Rare Pulmonary Diseases with an Immune Component (RPICs)

The Resokine pathway may play an important role in lung health. We believe the Resokine pathway plays a role in the regulation of tissue homeostasis with respect to immune cell invasion and residence. Jo-1 antibody patients often develop ILD, a pathophysiologic state that involves inflammation and fibrosis of the alveoli, distal airways and septal interstitium of the lungs, includes various patterns of lung pathology and is associated with markedly impaired lung function. We have observed that Jo-1 antibodies isolated from these patients bind to a region of HARS (Resokine) that we believe harbors immuno-modulatory activity with various immune cells.

ILD develops in approximately 85% of anti-synthetase patients with Jo-1 antibodies to Resokine. It can include the presence of focal immune cell infiltrates and an acinar pattern of involvement on chest computed tomography (CT) scan, lymphocytic predominance on broncho-alveolar lavage and lymphocytic invasion of alveolar and interstitial lung tissues on biopsy, and can advance to fibrosis. The pathological patterns in Jo-1 antibody ILD include cellular and fibrotic forms of non-specific interstitial pneumonitis, usual interstitial pneumonitis and diffuse alveolar damage. The development of ILD in Jo-1 antibody patients, particularly the acute severe forms of the disease, portends high morbidity and mortality. Elevations in a number of circulating immune proteins are observed in Jo-1 antibody associated ILD including interferon (IFN)-inducible chemokines CXCL9, or MIG, and CXCL10 or IP10, IL-8 and IL-6.

ILD occurs in other settings such as rare genetic disorders, environmental exposures, as a side effect of certain therapeutics and as a manifestation of certain connective tissue disorders. Among these forms of ILD, we have identified several that result in severe and progressive lung disease and share immune-pathophysiology features that overlap with our demonstrated Resolaris activities. We have classified these disorders as rare pulmonary diseases with an immune component, or RPIC. Examples of RPICs include idiopathic non-specific interstitial pneumonias, idiopathic pulmonary fibrosis, lymphocytic interstitial pneumonia, bleomycin (the chemotherapeutic agent)-induced pulmonary fibrosis, and ILD in the setting of systemic sclerosis, or scleroderma, and sarcoidosis. A number of circulating immune proteins are observed in these diseases that overlap with Resolaris activity. These include IP-10, MCP1, IL-8 and IL-6.

To test our hypothesis that augmenting the Resokine pathway has therapeutic potential in ILD, we have recently generated data in a mouse model of lung inflammation and pulmonary fibrosis. The mouse equivalent of Resolaris has shown promising therapeutic activity in this bleomycin-induced model which has been used previously in the development of therapeutics for different forms of ILD, including the drug pirfenidone, or Esbriet, which was approved by the FDA in October 2014 for the treatment of idiopathic pulmonary fibrosis. We noted that Resolaris administration attenuated the radiographic and histological manifestations of pathophysiology in this model when it was dosed therapeutically. These mouse Resolaris pharmacology data, along with data discussed above delineating our immuno-modulatory activity in other settings, provide pre-clinical evidence supporting the therapeutic potential of Resolaris for the treatment of ILD.

We are currently evaluating the most appropriate RPIC indication for the initial clinical evaluation of augmenting the Resokine pathway in lung via Resolaris. We are focusing on forms of ILD in which the lung involvement (and circulating biomarkers) appear to be amenable to the activities that we have observed for Resolaris preclinically or what we have gleaned from Jo-1 antibody patients. The initial trial in our clinical development plan in RPIC will evaluate the safety, tolerability, and biological and clinical activity of Resolaris in ILD patients and may use specific patterns of lung involvement by high resolution CT, or HRCT, to guide our efforts. In addition to safety measures, biological activity will likely be assessed by the monitoring of circulating cytokines such as IP-10, Il-6 and MCP-1. Clinical effects will be assessed thru several indices including pulmonary function tests, and measures of pulmonary gas exchange including diffusion capacity for the lung of carbon monoxide, or DLCO. We intend to initiate a clinical trial of Resolaris in a form of ILD in the first half of 2016. The data obtained in this initial ILD trial will inform further development of therapeutics leveraging the Resokine pathway in RPICs.

Our Preclinical Immuno-Modulatory Domain Program from the Resokine Pathway: iMod.Fc

We have initiated a discovery program to leverage our knowledge of the Resokine pathway to varying exposure and activity of the iMod domain through protein engineering. The program seeks to develop a potential therapeutic that we refer to as iMod.Fc, which would possess only the N-terminal immuno-modulatory activity of Resokine. We have conducted a series of experiments to understand how various product form modifications enhance exposure of the iMod domain. Fc fusion proteins have been successfully commercialized previously by others to enhance exposure while enabling biological activity. We explored this approach by fusing the immunoglobin Fc with one iMod domain, which can form a dimer. Enbrel and Zaltrap are commercialized examples of immunoglobulin Fc fusion proteins.

Our Fc fusion experiments have begun to delineate how to enhance the exposure of the iMod domain of Resokine while maintaining activity and provide insights into this domain harboring immuno-modulatory activity. Initial experiments have indicated that Fc fusion proteins can increase exposure and maintain iMod domain activity. We have generated results in a mouse model of lung inflammation and fibrosis for one iMod.Fc molecule that are encouraging. The increased exposure of this iMod.Fc allowed efficacy from a weekly dosing paradigm, as opposed to daily dosing, at a lower dose than needed for non-Fc fused Physiocrine controls.

Currently we are producing our iMod.Fc molecules in E. coli. This is in contrast to other marketed Fc fusion therapeutics that are manufactured in CHO cells.

Our Discovery Engine for Therapeutic Applications of Physiocrines: Lung and Liver Focused

We plan to leverage our discovery engine to identify other Physiocrine pathways of interest and select additional potential product candidates for preclinical and clinical investigation in a variety of disease settings. The engine that drives our discovery efforts is based on our scientific investigation of Physiocrine pathways and their proteins, coupled with a process of identifying disease indications that may benefit from a Physiocrine therapeutic. Through a combination of deep sequencing and bioinformatics panning, augmented by proteomic analysis, we identified over 300 naturally occurring Physiocrines. We then expressed and purified over 200 of these Physiocrines. Our strategy for identifying function and potential indications begins with developing a series of phenotypic assays for *in vitro* evaluations of function. Many of our purified Physiocrines were evaluated in numerous cell-based phenotypic assays that encompassed 14 distinct human cell types. In July 2014, a publication in *Science* described a portion of the results from our research, along with the research of our collaborators at Scripps La Jolla, Scripps Florida, Stanford University and the Hong Kong University of Science and Technology.

A key step in the discovery engine requires mining data from rare disease patients and linking this to the data generated in our phenotypic profiling experiments either *in vitro* or *in vivo*. For example, with HARS we studied published reports regarding Jo-1 antibody patients, also known as anti-synthetase patients. These clinical phenotypes led us to consider additional roles that extracellular HARS plays in muscle and lung. Thus, Resolaris, a HARS derivative, was evaluated in a number of *in vivo* pharmacology models that portray immune-driven inflammatory processes, including myopathy. The ability to restore homeostasis in multiple pharmacology models prompted us to catalog a number of rare myopathies that are immune driven as indications for therapeutic intervention with Resolaris.

We believe our strategy of understanding Physiocrine function by using *in vivo* experiments early and often while using patient data to focus this *in vivo* exploration has been validated by Resolaris. Additionally, we believe our discovery engine can be applied to other members of the Physiocrine class to help identify additional indications that may benefit from therapeutic intervention with Physiocrines.

We believe the biology of Physiocrines presents a novel protein therapeutic development opportunity based on the modulation of important physiological processes applicable to multiple diseases. This “pathway” approach or “physiology first” paradigm as we call it, which leverages the understanding of a basic physiological process, has been used successfully to create some of the most important therapeutics in such diverse areas as oncology

and ophthalmology. Given the breadth of our discoveries, we currently focus on Physiocrine pathways related to immune and regeneration responses to explore for product candidates with rare disease applications.

Discovery Programs in Lung and Liver

In addition, we believe some Physiocrine pathways may relate to fibrosis. Fibrosis is the formation of excess fibrous connective tissue in an organ or tissue in a reparative or reactive physiological process. Immune cells and their secreted molecules have been shown to play a critical role in the fibrotic process in a number of human tissues, including liver and lung. Persistent or unregulated inflammation is a hallmark of many chronic diseases, and is implicated in the development of fibrosis. Extracellular factors such as cytokines and chemokines act in the development of fibrosis by activating and recruiting inflammatory cells to developing fibrotic lesions.

As described previously, Resolaris had shown activity in *in vivo* pharmacology models of lung inflammation and pulmonary fibrosis. We are using this same model to evaluate other Physiocrine molecules in our pipeline. This coupled with ongoing functional knockout studies will be used to prioritize active Physiocrines and novel pathways for further studies.

Immune-mediated processes are also thought to be a driver in various forms of liver fibrosis. A connection between Physiocrines and fibrosis has also been demonstrated in functional knockout studies. In these experiments, conducted at aTyr, antibodies to individual mouse Physiocrines were induced in mice and the phenotypes related to the absence of the Physiocrine or blockade of its pathway were observed. Mice with antibodies to specific Physiocrines developed liver fibrosis and impaired liver function, as measured by decreased glycogen content, decreased albumin:globulin ratio and other functional features.

These experiments demonstrate that the blockade of Physiocrine pathways in rodents resulted in an *in vivo* phenotype characterized by immune cell infiltration or fibrotic disease in the lung or the liver. These data support the concept that Physiocrines may have the potential to inhibit, limit or otherwise regulate immune cell activity in both the lung and the liver, as well as the subsequent development of fibrosis in these tissues. Accordingly, we are continuing to investigate certain Physiocrines for potential therapeutic applications in both lung and liver indications.

Other Potential Discovery Programs

We have applied our discovery engine to identify a variety of medical conditions that we believe may be due to altered Physiocrine function, and are associated with mutations of members of the tRNA synthetase gene family, as set forth in the table below:

tRNA Synthetase Gene	Type of Mutation	Phenotype
AARS	Heterozygous (two forms)	CMT2N
	Heterozygous	Sporadic Axonal CMT
	Heterozygous	dHMN/CMT Variant
DARS	Compound Heterozygous	Hypomyelination
	Homozygous (two forms)	Hypomyelination
GARS	Heterozygous (three forms)	dSMA-V
	Heterozygous (two forms)	CMT2D/dSMA-V
	Heterozygous (two forms)	CMT2D
	Heterozygous (two forms)	CMT2
	Heterozygous	CMT2D/dHMN-V
	Heterozygous (three forms)	dHMN
	Compound Heterozygous	Non-Compaction Cardiomyopathy
HARS	Homozygous	Usher Syndrome
	Heterozygous	Peripheral Neuropathy
KARS	Compound Heterozygous	CMTRIB
	Homozygous (two forms)	Deafness
LARS	Homozygous	Infantile Liver Failure (ILFS1)
MARS	Compound Heterozygous	Infantile Liver Failure (ILFS2)
	Heterozygous	CMT2A1
	Compound Heterozygous	Hereditary Spastic Paraplegia
QARS	Compound Heterozygous (two forms)	Microcephaly
RARS	Compound Heterozygous (three forms)	Hypomyelination
YARS	Heterozygous (three forms)	DI-CMTC

Legend:

"_"ARS	=	"amino acid code" Aminoacyl tRNA synthetase. Alanine is represented by the letter A, hence alanine aminoacyl tRNA synthetase is abbreviated to AARS.
CMT	=	Charcot-Marie-Tooth Disease
CMT2A1	=	Charcot-Marie-Tooth Disease Type 2A1
CMT2D	=	Charcot-Marie-Tooth Disease Type 2D
CMT2N	=	Charcot-Marie-Tooth Disease Type 2N
CMTRIB	=	Intermediate Charcot-Marie-Tooth Disease B
dHMN	=	Distal Hereditary Motor Neuropathies
DI-CMTC	=	Intermediate Charcot-Marie-Tooth Disease C
dSMA-V	=	Distal Spinal Muscular Atrophy Type V

In addition, the following table summarizes research published regarding a variety of medical conditions that appear to be associated with autoantibodies targeting various tRNA synthetases (See Solomon, J., et al., (2011) Myositis-related interstitial lung disease and anti-synthetase syndrome, J. Bras. Pneumol. (2011) 37(1) 100-109):

tRNA synthetase target	Anti-tRNA synthetase antibody	# Patients Studied	% with Muscle Inflammation	% with Lung involvement
HARS	Jo-1	308	78-100	84
AARS	PL-12	69	60	95
TARS	PL-7	21	84	84
IARS	OJ	9	100	55
NARS	KS	6	0	100
GARS	EJ	1	100	100
FARSA, FARSB	ZO	1	100	100

Competition

The biotechnology and pharmaceutical industries are intensely competitive. We will face competition with respect to Resolaris and any other protein therapeutics we may develop or commercialize in the future from pharmaceutical companies, biotechnology companies and universities and other research institutions. Our competitors may have substantially greater financial, technical and other resources, such as larger research and development staff and experienced marketing and manufacturing organizations. Additional mergers and acquisitions in the biotechnology and pharmaceutical industries may result in even more resources being concentrated in our competitors. Competition may increase further as a result of advances in the commercial applicability of technologies and greater availability of capital for investment in these industries. Our competitors may succeed in developing, acquiring or licensing on an exclusive basis drug products that are more effective or less costly than any product candidate that we may develop.

Although we believe we are the only company engaged in the discovery and development of therapeutics based on Physiocrine pathways, we are aware of other companies that are developing products that could compete as treatments for our targeted indications, as described below.

In the area of RMICs, we expect to face competition from a number of companies, academic institutions and other organizations, including Akashi Therapeutics, Inc., BioMarin Pharmaceutical Inc., Catabasis Pharmaceuticals, Inc., FibroGen Inc., F. Hoffmann-La Roche AG, Milo Biotechnology, LLC., Nobelpharma Co.Ltd., Novartis AG, Pfizer, Inc., PTC Therapeutics, Inc., Sarepta Therapeutics, Inc. and Ultragenyx Pharmaceuticals, that are engaged in the clinical development of therapeutics to address muscle loss and muscle weakness in a variety of indications. More specifically, while there are currently no approved products for the treatment of FSHD, Acceleron Pharma Inc. is developing a clinical candidate, ACE-083, a locally acting protein therapeutic designed to increase muscle mass and strength in patients with neuromuscular disorders and other diseases characterized by a loss of muscle function, including FSHD. In addition, Facio Therapies recently announced its plans to screen chemical libraries to identify chemical compounds that will boost the expression of proteins known to repress one of the causal genes responsible for FSHD. In the area of LGMD, we are aware of a number of academic institutions engaged in the clinical development of therapeutics, including Genethon, a not-for-profit research laboratory created by the Association Française contre les Myopathies, or French Muscular Dystrophy Association, which has completed an experimental Phase 1 clinical trial in LGMD 2C using gene therapy; Nationwide Children's Hospital, which is currently conducting a Phase 1/2a clinical trial of an AAV vector to transport the alpha-sarcoglycan gene into muscles in in LGMD 2D; and NeuroGen Brain and Spine Institute in India, which is currently conducting a Phase 1 clinical trial in an unspecified form of LGMD using stem cell therapy.

In the area of RPICs, including ILD, we expect to face competition from pirfenidone, which is marketed by several companies worldwide, including InterMune Inc. (acquired by F. Hoffmann-La Roche AG Roche), Shionogi Ltd. and GNI Group Ltd., as well as nintedanib, a small molecule tyrosine-kinase inhibitor marketed

by Boehringer Ingelheim, both of which were approved by the FDA in October 2014. We are also aware of a number of companies engaged in the clinical development of therapeutics for lung diseases, including Astra Zeneca plc., Biogen Inc., Bristol-Myers Squibb, FibroGen Inc., Gilead Sciences Inc., Promedior, Inc. and Sanofi S. A.

Research and License Agreements

The Scripps Research Institute

We are party to an amended and restated research funding and option agreement with The Scripps Research Institute, or TSRI. Under the agreement, we provide funding to TSRI to conduct certain research activities related to aminoacyl tRNA synthetases. The agreement renews automatically for successive 12 month periods starting on May 31st of each year unless we provide written notice of our desire to terminate the agreement at least 30 days prior to the end of the applicable 12-month period. Under the agreement, the parties agree to update the amount of annual funding for such successive 12-month periods as mutually agreed in good faith by the parties. We have the right to terminate the agreement at any time upon six months' written notice, and TSRI has the right to terminate the agreement if we fail to make any payment under the agreement within ten days of being notified by TSRI that such payment is overdue. Additionally, each party may terminate the agreement in the event of an uncured material breach by the other party or for insolvency of the other party.

Under the amended and restated research funding and option agreement, TSRI has granted us options to enter into license agreements to acquire rights and exclusive licenses to develop, make, have made, use, have used, import, have imported, offer to sell, sell and have sold certain licensed products, processes and services based on certain technology arising from the sponsored research activities. Pursuant to the terms of these license agreements, TSRI is entitled to receive tiered royalties as a percentage of net sales, ranging from the low to mid-single digits, with these royalty rates subject to increase if we challenge the validity or enforceability of any of the licensed patent rights under certain circumstances. The royalty rates are subject to reduction to the extent we need to obtain any rights from third parties to make, use, or sell the licensed products, processes or services, subject to a minimum floor in the single digits. Additionally, we have agreed to pay TSRI a percentage of non-royalty revenue we receive from our sublicensees or partners, with the amount owed decreasing if we enter into the applicable sublicense or partnering agreement after meeting a specified clinical milestone. In addition, we are obligated to make payments to TSRI of up to an aggregate of $2.75 million under each license agreement upon the achievement of specific clinical and regulatory milestone events.

Under the terms of the license agreements, we are obligated to use commercially reasonable efforts and diligence to develop and commercialize licensed products, processes and services and to obtain regulatory approvals as necessary.

We may terminate the license agreements upon mutual agreement with TSRI or unilaterally upon 90 days' notice, and TSRI has the right to terminate the agreements under certain circumstances, including our uncured material breach of the agreements and if TSRI determines that we are not engaged in research, development, manufacturing, marketing or sublicensing activities reasonably appropriate to put the licensed patents into commercial use, and to make the licensed subject matter reasonably available to the public, in the countries covered by the license.

Pangu Biopharma

In October 2007, we formed our Hong Kong subsidiary, Pangu BioPharma Limited, or Pangu BioPharma, a company registered in Hong Kong, to collaborate with the Hong Kong University of Science and Technology, or HKUST, on the discovery and development of aminoacyl tRNA synthetase protein therapeutics. We hold 98% of the outstanding shares of Pangu BioPharma, and a subsidiary of HKUST holds the remaining outstanding shares. Beginning in July 2008, Pangu BioPharma, in collaboration with HKUST, entered into a series of three research grant agreements with the Government of the Hong Kong Special Administrative Region to carry out research in

the discovery and development of Physiocrines. In December 2014, Pangu BioPharma renewed its annual joint research agreement with a subsidiary of HKUST, under which Pangu BioPharma agrees to fund research to be performed in 2015 under the agreement by the subsidiary of HKUST with respect to development of aminoacyl tRNA synthetase protein therapeutics. Pangu BioPharma is the sole beneficial owner of all resulting intellectual property rights from the research performed under these agreements, subject to the right of HKUST's subsidiary to use certain background intellectual property of HKUST in conducting the research and, in the event Pangu BioPharma applies for individual funding of any work under the research programs, compliance with the terms and conditions of any written agreement covering ownership of such funded works. Pangu BioPharma funds the annual research on a quarterly basis. Either party may terminate the agreement during the annual period upon an uncured breach of the agreement by the other party. We are also party to a license agreement with Pangu BioPharma, pursuant to which Pangu BioPharma has granted us an exclusive, royalty-bearing license (with a right to sublicense) in and to certain of Pangu BioPharma's solely and jointly owned patent rights and know-how to research, develop, manufacture, use, import, export, distribute, offer for sale, sell and have sold products incorporating such patent rights and know-how for any therapeutic, prognostic or diagnostic use throughout the world.

Patents and Proprietary Rights

We strive to protect the proprietary technologies that we believe are important to our business, including seeking and maintaining patent protection intended to cover the composition of matter of our product candidates, their methods of use, related technology and other inventions that are important to our business. As of March 31, 2015, we own, or have exclusive licenses to, 24 issued U.S. and foreign patents and over 230 pending U.S. and foreign patent applications, with predicted expiration dates ranging from 2026 to 2034. In addition to patent protection, we also rely on trade secrets and careful monitoring of our proprietary information to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection.

Our success will depend significantly on our ability to obtain and maintain patent and other proprietary protection for commercially important technology, inventions and know-how related to our business, defend and enforce our patents, maintain our licenses to use intellectual property owned by third parties, preserve the confidentiality of our trade secrets and operate without infringing the valid and enforceable patents and other proprietary rights of third parties. We also rely on know-how, continuing technological innovation and in-licensing opportunities to develop, strengthen, and maintain our proprietary position in the field of Physiocrine therapeutics.

A third party may hold intellectual property, including patent rights, which is important or necessary to the development of our products. It may be necessary for us to use the patented or proprietary technology of third parties to commercialize our products, in which case we would be required to obtain a license from these third parties on commercially reasonable terms, or our business could be harmed, possibly materially.

We plan to continue to expand our intellectual property estate by filing patent applications directed to new methods of treatment, therapeutics and additional new product forms thereof with new therapeutic or pharmacokinetic properties. Specifically, we seek patent protection in the United States and internationally for novel compositions of matter covering our protein therapeutics, next generation product forms and the use of these compositions in a variety of therapies.

The patent positions of biopharmaceutical companies like us are generally uncertain and involve complex legal, scientific and factual questions. In addition, the coverage claimed in a patent application can be significantly reduced before the patent is issued, and its scope can be reinterpreted after issuance. Consequently, we do not know whether any of our product candidates will be protectable or remain protected by enforceable patents. We cannot predict whether the patent applications we are currently pursuing will issue as patents in any particular jurisdiction or whether the claims of any issued patents will provide sufficient proprietary protection from competitors. Any patents that we hold may be challenged, circumvented or invalidated by third parties.

Because patent applications in the United States and certain other jurisdictions are maintained in secrecy for 18 months, and since publication of discoveries in the scientific or patent literature often lags behind actual discoveries, we cannot be certain of the priority of inventions covered by pending patent applications. Moreover, we may have to participate in interference proceedings declared by the United States Patent and Trademark Office, or USPTO, or a foreign patent office to determine priority of invention or in post-grant challenge proceedings, such as oppositions, that challenge priority of invention or other features of patentability. Such proceedings could result in us incurring substantial costs, even if the eventual outcome is favorable to us.

The patent portfolios for our most advanced programs are summarized below.

Resolaris. Our Resolaris patent portfolio is comprised of a number of patent families and includes U.S. Patent No. 8,835,387 covering Resolaris, which issued on September 16, 2014 and is predicted to expire in 2033. This patent family is jointly owned by us and Pangu Biopharma. Patent applications in the same family as U.S. Patent No. 8,835,387 are pending in a variety of worldwide jurisdictions, including the United States, Australia, Brazil, Canada, China, Europe, India, Japan, Korea, Mexico, New Zealand, Russia and South Africa. The Resolaris patent portfolio also encompasses additional issued patents and pending patent applications that cover Resolaris and related proteins; these patents and patent applications are wholly owned by us. This second patent family includes Australian Patent No. 2010327926, which issued August 21, 2014, and related applications that are pending in the United States, Australia, Canada, Europe, China, Japan, and Hong Kong. Patents that issue from these applications, if any, are expected to expire in 2030. Also included with the Resolaris patent portfolio are pending patent applications to specific methods of use of Resolaris and related proteins, and disease polymorphisms of HARS. These applications have been filed in the United States as U.S. provisional applications and in some cases under the Patent Cooperation Treaty, or PCT. U.S. provisional applications may be used to establish non-provisional U.S. applications, PCT applications and other national filings worldwide. PCT applications are eligible for filing in most worldwide jurisdictions, including the United States. If issued, these patents are predicted to expire between 2033 and 2034.

iMod.Fc. Our iMod.Fc patent portfolio, which covers derivatives of Resokine, including the iMod domain, related splice variants, and next-generation product forms with modified therapeutic activity or pharmacokinetic characteristics, is comprised of a number of patent families and includes U.S. Patent No. 8,404,242, and U.S. Patent No 8,753,638, which issued on March 26, 2013 and June 17, 2014, respectively, and are expected to expire in 2031 and 2030. This patent family is jointly owned by us and Pangu Biopharma, and includes pending applications in United States, Australia, Canada, Europe, China, Japan, and Hong Kong. The iMod.Fc patent family also includes patent applications filed on related splice variants of HARS. This patent family includes applications that are pending in the United States, Australia, Canada, Europe, China, India, Japan, Korea, New Zealand, Russia and Hong Kong. This patent family is jointly owned by us, and our subsidiary Pangu Biopharma. Also included within the iMod.Fc patent portfolio are pending applications to specific product forms of iMod.Fc, Resolaris and other HARS splice variants which include patent families to Fc fusion proteins, pegylated forms and variants with substituted D amino acids. These applications have been filed in the United States as U.S. provisional applications and in some cases under the PCT. If issued, these patents are predicted to expire between 2033 and 2034.

Our pipeline of Physiocrines is covered by a series of 21 patent families, which covers all 20 human cytosolic tRNA synthetases. These cases are jointly owned by us and Pangu Biopharma, and include pending applications in the United States, Australia, Canada, India, Europe, China and Japan. Patents that issue from these applications, if any, would be expected to expire in 2031. Additional patent applications have also been separately filed on GARS (Glycyl-tRNA synthetase), DARS (Aspartyl-tRNA synthetase), YARS (tyrosyl-tRNA synthetase), and other tRNA synthetases, and any patents issuing from these patent applications would be expected to expire between 2026 and 2030. We have also exclusively in-licensed from TSRI patents and patent applications related to YARS and specific monomeric forms of tRNA synthetases.

The term of individual patents depends upon the legal term of the patents in the countries in which they are obtained. In most countries in which we file, the patent term is generally 20 years from the earliest date of filing the non-provisional patent application from which the patent issued.

In the United States, the patent term of a patent that covers a drug approved by the U.S. Food and Drug Administration, or FDA, may also be eligible for patent term extension, which permits patent term restoration as compensation for the patent term lost during the FDA regulatory review process. The Hatch-Waxman Act permits a patent term extension of up to five years beyond the expiration of the patent. The length of the patent term extension is related to the length of time the drug is under regulatory review. Patent extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval and only one patent applicable to an approved drug may be extended. Similar provisions are available in Europe and other non-United States jurisdictions to extend the term of a patent that covers an approved drug. In the future, if and when our pharmaceutical products receive FDA approval, we expect to apply for patent term extensions on patents covering those products. We intend to seek patent term extensions to any of our issued patents in any jurisdiction where these are available, however there is no guarantee that the applicable authorities, including the FDA in the United States, will agree with our assessment of whether such extensions should be granted, and even if granted, the length of such extensions.

We also rely on trade secret protection for our confidential and proprietary information. Although we take steps to protect our proprietary information and trade secrets, including through contractual means with our employees and consultants, third parties may independently develop substantially equivalent proprietary information and techniques or otherwise gain access to our trade secrets or disclose our technology. Thus, we may not be able to meaningfully protect our trade secrets. It is our policy to require our employees, consultants, outside scientific collaborators, sponsored researchers and other advisors to execute confidentiality agreements upon the commencement of employment or consulting relationships with us. These agreements provide that all confidential information concerning our business or financial affairs developed or made known to the individual during the course of the individual's relationship with us is to be kept confidential and not disclosed to third parties except in specific circumstances. In the case of employees, the agreements provide that all inventions conceived by the individual, and which are related to our current or planned business or research and development or made during normal working hours, on our premises or using our equipment or proprietary information, are our exclusive property.

Manufacturing

We currently contract with third parties for the manufacturing and testing of our product candidates for preclinical studies and clinical trials and intend to do so in the future. We do not own or operate manufacturing facilities for the production of clinical quantities of our product candidates. We currently have no plans to build our own clinical or commercial scale manufacturing capabilities. The use of contracted manufacturing and reliance on collaboration partners is relatively cost-efficient and has eliminated the need for our direct investment in manufacturing facilities and additional staff early in development. Although we rely on contract manufacturers, we have personnel with extensive manufacturing experience to oversee our contract manufacturers.

Resolaris is produced in recombinant bacteria and then purified and packaged for clinical use. The active pharmaceutical ingredient for Resolaris is currently manufactured in India by Syngene International Limited, or Syngene, pursuant to a Master Services Agreement and a Quality Agreement executed in November 2012. We have a non-exclusive license to the cell line used to produce the active pharmaceutical ingredient for Resolaris. All other raw materials for Resolaris are commercially available. We intend to continue to work with Syngene for the production of Resolaris for preclinical studies and clinical testing up to pivotal trials. We contract with other third parties to conduct fill and finish and labeling, as well as for the storage and distribution of Resolaris to clinical sites and plan to do so for other product candidates that we may develop.

To date, our third-party manufacturers have met our manufacturing requirements for clinical development, and we expect that our current third-party manufacturers are capable of providing sufficient quantities of our product candidates to meet anticipated clinical development needs through to the start of the pivotal clinical trials.

To meet our projected needs for the pivotal clinical trials and larger scale commercial manufacturing, we are currently working with Fujifilm Diosynth Biotechnologies UK Limited and FDB USA, Inc., or Fujifilm, to

develop a scaled up manufacturing process for Resolaris. Additionally, we are currently negotiating with alternative fill-finish and labelling contract manufacturing organizations, or CMOs, to enable the commercial production and supply of Resolaris. We believe that Fujifilm and these alternative CMOs can satisfy our clinical, regulatory and commercial requirements for Resolaris. We cannot be certain, however, that the transfer and commercial scale up of the manufacturing process for Resolaris will not result in significant delay or add material additional costs.

Sales and Marketing

We currently intend to build the commercial infrastructure in the United States and Europe necessary to effectively support the commercialization of all of our product candidates, if and when we believe a regulatory approval of the first of such product candidates in a particular geographic market appears imminent. The commercial infrastructure for products directed at rare disease indications typically consists of a targeted, specialty sales force that calls on a limited and focused group of physicians supported by sales management, medical liaisons, internal sales support, an internal marketing group, and distribution support. One challenge unique to commercializing therapies for rare diseases is the difficulty in identifying eligible patients due to the very small and sometimes heterogeneous disease populations. Our management team is experienced in maximizing patient identification for both clinical development and commercialization purposes in rare diseases.

Additional capabilities important to the marketing of therapeutics for rare diseases include the management of key accounts such as managed care organizations, group-purchasing organizations, specialty pharmacies, and government accounts. To develop the appropriate commercial infrastructure, we will have to invest significant amounts of financial and management resources, some of which will be committed prior to any confirmation that any of our product candidates will be approved.

Although we currently intend to commercialize Resolaris and any other product candidates that we may develop on our own, we may elect in the future to utilize strategic partners, distributors, or contract sales forces to assist in the commercialization of our products in selected geographic locations or for particular indications.

Government Regulation

Government authorities in the United States, including federal, state, and local authorities, and in other countries, extensively regulate, among other things, the manufacturing, research and clinical development, marketing, labeling and packaging, storage, distribution, post-approval monitoring and reporting, advertising and promotion, pricing, and export and import of pharmaceutical and biological products, such as those we are developing. The process of obtaining regulatory approvals and the subsequent compliance with appropriate federal, state, local, and foreign statutes and regulations require the expenditure of substantial time and financial resources.

U.S. Government Regulation

In the United States, the FDA regulates drugs under the Federal Food, Drug, and Cosmetic Act, or FDCA, and its implementing regulations, and biologics under the FDCA and the Public Health Service Act, or PHSA, and its implementing regulations. FDA approval is required before any new unapproved drug or biologic or dosage form, including a new use of a previously approved drug, can be marketed in the United States. Drugs and biologics are also subject to other federal, state, and local statutes and regulations. If we fail to comply with applicable FDA or other requirements at any time during the product development process, clinical testing, the approval process or after approval, we may become subject to administrative or judicial sanctions. These sanctions could include the FDA's refusal to approve pending applications, license suspension or revocation, withdrawal of an approval, warning letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, civil penalties or criminal prosecution. Any FDA enforcement action could have a material adverse effect on us.

The process required by the FDA before product candidates may be marketed in the United States generally involves the following:

- completion of extensive preclinical laboratory tests and preclinical animal studies, all performed in accordance with the Good Laboratory Practices, or GLP, regulations;
- submission to the FDA of an investigational new drug application, or IND, which must become effective before human clinical trials may begin and must be updated annually;
- approval by an independent institutional review board, or IRB, or ethics committee representing each clinical site before each clinical trial may be initiated;
- performance of adequate and well-controlled human clinical trials to establish the safety and efficacy of the product candidate for each proposed indication;
- preparation of and submission to the FDA of a biologics license application, or BLA, or a new drug application, or NDA, after completion of all pivotal clinical trials;
- potential review of the product application by an FDA advisory committee, where appropriate and if applicable;
- a determination by the FDA within 60 days of its receipt of a BLA or NDA to file the application for review;
- satisfactory completion of an FDA pre-approval inspection of the manufacturing facilities where the proposed product is produced to assess compliance with current Good Manufacturing Practices, or cGMP; and
- FDA review and approval of a BLA or NDA prior to any commercial marketing or sale of the product in the United States.

The preclinical and clinical testing and approval process requires substantial time, effort, and financial resources, and we cannot be certain that any approvals for our product candidates will be granted on a timely basis, if at all.

An IND is a request for authorization from the FDA to administer an investigational new drug product to humans in clinical trials. The central focus of an IND submission is on the general investigational plan and the protocol(s) for human trials. The IND also includes results of animal and in vitro studies assessing the toxicology, pharmacokinetics, pharmacology, and pharmacodynamic characteristics of the product; chemistry, manufacturing, and controls information; and any available human data or literature to support the use of the investigational new drug. An IND must become effective before human clinical trials may begin. An IND will automatically become effective 30 days after receipt by the FDA, unless before that time the FDA raises concerns or questions related to the proposed clinical trials. In such a case, the IND may be placed on clinical hold and the IND sponsor and the FDA must resolve any outstanding concerns or questions before clinical trials can begin. Accordingly, submission of an IND may or may not result in the FDA allowing clinical trials to commence. The FDA may impose a clinical hold at any time during clinical trials and may impose a partial clinical hold that would limit trials, for example, to certain doses or for a certain length of time.

Clinical Trials

Clinical trials involve the administration of the investigational new drug to human subjects under the supervision of qualified investigators in accordance with Good Clinical Practices, or GCPs, which include the requirement that all research subjects provide their informed consent for their participation in any clinical trial. Clinical trials are conducted under protocols detailing, among other things, the objectives of the study, the parameters to be used in monitoring safety, and the efficacy criteria to be evaluated. A protocol for each clinical trial and any subsequent protocol amendments must be submitted to the FDA as part of the IND. Additionally, approval must also be obtained from each clinical trial site's institutional review board, or IRB, before the trials may be initiated, and the IRB must monitor the trial until completed. There are also requirements governing the reporting of ongoing clinical trials and clinical trial results to public registries.

The clinical investigation of a drug is generally divided into three or four phases. Although the phases are usually conducted sequentially, they may overlap or be combined.

- *Phase 1*. The drug is initially introduced into healthy human subjects or patients with the target disease or condition. These studies are designed to evaluate the safety, dosage tolerance, metabolism and pharmacologic actions of the investigational new drug in humans, the side effects associated with increasing doses, and if possible, to gain early evidence on effectiveness.
- *Phase 2*. The drug is administered to a limited patient population to evaluate dosage tolerance and optimal dosage, identify possible adverse side effects and safety risks, and preliminarily evaluate efficacy.
- *Phase 3*. The drug is administered to an expanded patient population, generally at geographically dispersed clinical trial sites to generate enough data to statistically evaluate dosage, clinical effectiveness and safety, to establish the overall benefit-risk relationship of the investigational new drug product, and to provide an adequate basis for product approval.
- *Phase 4*. In some cases, the FDA may condition approval of a BLA or NDA for a product candidate on the sponsor's agreement to conduct additional clinical trials after approval. In other cases, a sponsor may voluntarily conduct additional clinical trials after approval to gain more information about the drug. Such post-approval studies are typically referred to as Phase 4 clinical trials.

A pivotal trial is a clinical trial that adequately meets regulatory agency requirements for the evaluation of a drug candidate's efficacy and safety such that it can be used to justify the approval of the product. Generally, pivotal trials are Phase 3 trials, but the FDA may accept results from Phase 2 clinical trials if the trial design provides a well-controlled and reliable assessment of clinical benefit, particularly in situations where there is an unmet medical need and the results are sufficiently robust.

Sponsors must also report to the FDA, within certain timeframes, serious and unexpected adverse reactions, any clinically important increase in the rate of a serious suspected adverse reaction over that listed in the protocol or investigator's brochure, or any findings from other studies or animal or in vitro testing that suggest a significant risk in humans exposed to the product candidate. The FDA, the IRB, or the clinical trial sponsor may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Additionally, some clinical trials are overseen by an independent group of qualified experts organized by the clinical trial sponsor, known as a data safety monitoring board or committee. This group provides authorization for whether or not a trial may move forward at designated check points based on access to certain data from the trial. We may also suspend or terminate a clinical trial based on evolving business objectives or competitive climate.

The clinical trial process can take three to ten years or more to complete, and there can be no assurance that the data collected will support FDA approval or licensure of the product. Results from one trial are not necessarily predictive of results from later trials.

Submission of a BLA or NDA to the FDA

Assuming successful completion of all required testing in accordance with all applicable regulatory requirements, detailed investigational new drug product information is submitted to the FDA in the form of a BLA or NDA requesting approval to market the product for one or more indications. Under federal law, the submission of most BLAs and NDAs is subject to an application user fee. For fiscal year 2015, the application user fee exceeds $2.3 million, and the sponsor of an approved BLA or NDA is also subject to annual product and establishment user fees, set at $110,370 per product and $569,200 per establishment. These fees are typically increased annually. Applications for orphan drug products are exempted from the BLA and NDA user fees and may be exempted from product and establishment user fees, unless the application includes an indication for other than a rare disease or condition.

A BLA or NDA must include all relevant data available from pertinent preclinical studies and clinical trials, including negative or ambiguous results as well as positive findings, together with detailed information relating

to the product's chemistry, manufacturing, controls, and proposed labeling, among other things. Data can come from company-sponsored clinical trials intended to test the safety and effectiveness of a use of a product, or from a number of alternative sources, including trials initiated by investigators. To support marketing approval, the data submitted must be sufficient in quality and quantity to establish the safety and effectiveness of the investigational new drug product to the satisfaction of the FDA.

Once a BLA or NDA has been submitted, the FDA's goal is to review the application within ten months after it accepts the application for filing, or, if the application relates to an unmet medical need in a serious or life-threatening indication, six months after the FDA accepts the application for filing. The review process is often significantly extended by the FDA's requests for additional information or clarification.

Before approving a BLA or NDA, the FDA typically will inspect the facility or facilities where the product is manufactured. The FDA will not approve an application unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Additionally, before approving a BLA or NDA, the FDA will typically inspect one or more clinical sites to assure compliance with GCP.

The FDA is required to refer an application for a novel drug to an advisory committee or explain why such referral was not made. Typically, an advisory committee is a panel of independent experts, including clinicians and other scientific experts, that reviews, evaluates and provides a recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions.

The FDA's Decision on a BLA or NDA

After the FDA evaluates the BLA or NDA and conducts inspections of manufacturing facilities where the product will be produced, it may issue an approval letter or a Complete Response Letter. An approval letter authorizes commercial marketing of the drug with specific prescribing information for specific indications. A Complete Response Letter indicates that the review cycle of the application is complete and the application is not ready for approval. A Complete Response Letter may require additional clinical data or an additional pivotal Phase 3 clinical trial(s), or other significant, expensive and time-consuming requirements related to clinical trials, preclinical studies or manufacturing. Even if such additional information is submitted, the FDA may ultimately decide that the BLA or NDA does not satisfy the criteria for approval. The FDA could also approve the BLA or NDA with a Risk Evaluation and Mitigation Strategy, or REMS, plan to mitigate risks, which could include medication guides, physician communication plans, or elements to assure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. The FDA also may condition approval on, among other things, changes to proposed labeling, development of adequate controls and specifications, or a commitment to conduct one or more post-market studies or clinical trials. Such post-market testing may include Phase 4 clinical trials and surveillance to further assess and monitor the product's safety and effectiveness after commercialization. Also, new government requirements, including those resulting from new legislation, may be established, or the FDA's policies may change, which could delay or prevent regulatory approval of our products under development.

Expedited Review and Accelerated Approval Programs

A sponsor may seek approval of its product candidate under programs designed to accelerate FDA's review and approval of BLAs and NDAs. For example, Fast Track Designation may be granted to a drug intended for treatment of a serious or life-threatening disease or condition that has potential to address unmet medical needs for the disease or condition. The key benefits of fast track designation are more frequent interactions with the FDA during development and testing, the eligibility for priority review, and rolling review, which is submission of portions of an application before the complete marketing application is submitted. Based on results of the Phase 3 clinical trial(s) submitted in a BLA or NDA, upon the request of an applicant, the FDA may grant the BLA or NDA a priority review designation, which sets the target date for FDA action on the application at six months after the FDA accepts the application for filing. Priority review is granted where there is evidence that

the proposed product would be a significant improvement in the safety or effectiveness of the treatment, diagnosis, or prevention of a serious condition. If criteria are not met for priority review, the application is subject to the standard FDA review period of ten months after FDA accepts the application for filing. Priority review designation does not change the scientific/medical standard for approval or the quality of evidence necessary to support approval.

Under the accelerated approval program, the FDA may approve a BLA or NDA on the basis of either a surrogate endpoint that is reasonably likely to predict clinical benefit, or on a clinical endpoint that can be measured earlier than irreversible morbidity or mortality, that is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the availability or lack of alternative treatments. Post-marketing trials or completion of ongoing trials after marketing approval are generally required to verify the drug's clinical benefit in relationship to the surrogate endpoint or ultimate outcome in relationship to the clinical benefit. In addition, the Food and Drug Administration Safety and Innovation Act, or FDASIA, which was enacted and signed into law in 2012, established the new Breakthrough Therapy designation. A sponsor may seek FDA designation of its product candidate as a breakthrough therapy if the drug is intended, alone or in combination with one or more other drugs, to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development.

Post-Approval Requirements

Drugs manufactured or distributed pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product sampling and distribution, advertising and promotion and reporting of adverse experiences with the product. After approval, most changes to the approved product, such as adding new indications or other labeling claims, are subject to prior FDA review and approval. There also are continuing, annual user fee requirements for any marketed products and the establishments at which such products are manufactured, as well as new application fees for supplemental applications with clinical data.

Drug manufacturers are subject to periodic unannounced inspections by the FDA and state agencies for compliance with cGMP requirements. Changes to the manufacturing process are strictly regulated, and, depending on the significance of the change, may require prior FDA approval before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP and impose reporting and documentation requirements upon us and any third-party manufacturers that we may decide to use. Accordingly, manufacturers must continue to expend time, money and effort in the area of production and quality control to maintain compliance with cGMP and other aspects of regulatory compliance.

We rely, and expect to continue to rely, on third parties for the production of clinical quantities of our product candidates, and expect to rely in the future on third parties for the production of commercial quantities. Future FDA and state inspections may identify compliance issues at our facilities or at the facilities of our contract manufacturers that may disrupt production or distribution, or require substantial resources to correct. In addition, discovery of previously unknown problems with a product or the failure to comply with applicable requirements may result in restrictions on a product, manufacturer or holder of an approved BLA or NDA, including withdrawal or recall of the product from the market or other voluntary, FDA-initiated or judicial action that could delay or prohibit further marketing. Also, new government requirements, including those resulting from new legislation, may be established, or the FDA's policies may change, which could delay or prevent regulatory approval of our products under development.

The FDA may withdraw approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the approved labeling to

add new safety information; imposition of post-market studies or clinical trials to assess new safety risks; or imposition of distribution restrictions or other restrictions under a REMS program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- fines, warning letters or holds on post-approval clinical trials;
- refusal of the FDA to approve pending BLAs or NDAs or supplements to approved BLAs or NDAs, or suspension or revocation of product license approvals;
- product seizure or detention, or refusal to permit the import or export of products; or
- injunctions or the imposition of civil or criminal penalties.

The FDA strictly regulates marketing, labeling, advertising, and promotion of products that are placed on the market. Drugs may be promoted only for the approved indications and in accordance with the provisions of the approved label. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant liability.

Orphan Designation and Exclusivity

The FDA may grant orphan drug designation to drugs intended to treat a rare disease or condition that affects fewer than 200,000 individuals in the United States, or if it affects more than 200,000 individuals in the United States, there is no reasonable expectation that the cost of developing and making the drug for this type of disease or condition will be recovered from sales in the United States.

Orphan drug designation entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages, and user-fee waivers. In addition, if a product receives FDA approval for the indication for which it has orphan designation, the product is entitled to orphan drug exclusivity, which means the FDA may not approve any other application to market the same drug for the same indication for a period of seven years, except in limited circumstances, such as a showing of clinical superiority over the product with orphan exclusivity.

Pediatric Trials and Exclusivity

BLAs and NDAs must contain data, or a proposal for post-marketing activity, to assess the safety and effectiveness of an investigational new drug product for the claimed indications in all relevant pediatric populations in order to support dosing and administration for each pediatric subpopulation for which the drug is safe and effective. The FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults or full or partial waivers if certain criteria are met. Discussions about pediatric development plans can be discussed with the FDA at any time, but usually occur any time between the end-of-Phase 2 meeting and submission of the BLA or NDA. The requirements for pediatric data do not apply to any drug for an indication for which orphan designation has been granted.

Pediatric exclusivity is another type of non-patent exclusivity in the United States and, if granted, provides for the attachment of an additional six months of marketing protection to the term of any existing regulatory exclusivity, including the five-year and three-year non-patent and orphan exclusivity. This six-month exclusivity may be granted if a BLA or NDA sponsor submits pediatric data that fairly respond to a written request from the FDA for such data. The data do not need to show the product to be effective in the pediatric population studied; rather, if the clinical trial is deemed to fairly respond to the FDA's request, the additional protection is granted. If reports of FDA-requested pediatric trials are submitted to and accepted by the FDA within the statutory time limits, whatever statutory or regulatory periods of exclusivity or patent protection covering the product are

extended by six months. This is not a patent term extension, but it effectively extends the regulatory period during which the FDA cannot accept or approve another application relying on the BLA or NDA sponsor's data.

Patent Term Restoration

Depending upon the timing, duration, and specifics of the FDA approval of the use of our product candidates, some of our U.S. patents may be eligible for limited patent term extension under the Drug Price Competition and Patent Term Restoration Act of 1984, commonly referred to as the Hatch-Waxman Amendments. The Hatch-Waxman Amendments permit a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. However, patent term restoration cannot extend the remaining term of a patent beyond a total of 14 years from the product's approval date. The patent term restoration period is generally one-half the time between the effective date of an IND and the submission date of a BLA or NDA, plus the time between the submission date and the approval of that application. Only one patent applicable to an approved product is eligible for the extension and the application for the extension must be submitted prior to the expiration of the patent and within 60 days of the product's approval. The U.S. Patent and Trademark Office, in consultation with the FDA, reviews and approves the application for any patent term extension or restoration. In the future, we may apply for restoration of patent term for one of our currently owned or licensed patents to add patent life beyond its current expiration date, depending on the expected length of the clinical trials and other factors involved in the filing of the relevant BLA or NDA.

Biosimilars and Exclusivity

The Patient Protection and Affordable Care Act, or Affordable Care Act, signed into law on March 23, 2010, includes a subtitle called the Biologics Price Competition and Innovation Act of 2009, or BPCI Act, which created an abbreviated approval pathway for biological products shown to be similar to, or interchangeable with, an FDA-licensed reference biological product. This amendment to the PHSA attempts to minimize duplicative testing. Biosimilarity, which requires that there be no clinically meaningful differences between the biological product and the reference product in terms of safety, purity, and potency, can be shown through analytical studies, animal studies, and a clinical trial or trials. Interchangeability requires that a product is biosimilar to the reference product and the product must demonstrate that it can be expected to produce the same clinical results as the reference product and, for products administered multiple times, the biologic and the reference biologic may be switched after one has been previously administered without increasing safety risks or risks of diminished efficacy relative to exclusive use of the reference biologic. However, complexities associated with the larger, and often more complex, structure of biological products, as well as the process by which such products are manufactured, pose significant hurdles to implementation that are still being worked out by the FDA.

A reference biologic is granted twelve years of exclusivity from the time of first licensure of the reference product. The first biologic product submitted under the abbreviated approval pathway that is determined to be interchangeable with the reference product has exclusivity against other biologics submitting under the abbreviated approval pathway for the lesser of (i) one year after the first commercial marketing, (ii) eighteen months after approval if there is no legal challenge, (iii) eighteen months after the resolution in the applicant's favor of a lawsuit challenging the biologics' patents if an application has been submitted, or (iv) 42 months after the application has been approved if a lawsuit is ongoing within the 42-month period.

Abbreviated New Drug Applications for Generic Drugs

In 1984, with passage of the Hatch-Waxman Amendments, Congress authorized the FDA to approve generic drugs that are the same as drugs previously approved by the FDA under the NDA provisions of the statute. To obtain approval of a generic drug, an applicant must submit an abbreviated new drug application, or ANDA, to the agency. In support of such applications, a generic manufacturer may rely on the preclinical and clinical testing previously conducted for a drug product previously approved under an NDA, known as the reference listed drug, or RLD.

Specifically, in order for an ANDA to be approved, the FDA must find that the generic version is identical to the RLD with respect to the active ingredients, the route of administration, the dosage form, and the strength of the drug. At the same time, the FDA must also determine that the generic drug is "bioequivalent" to the innovator drug. Under the statute, a generic drug is bioequivalent to an RLD if "the rate and extent of absorption of the [generic] drug do not show a significant difference from the rate and extent of absorption of the listed drug. . . ."

Upon approval of an ANDA, the FDA indicates that the generic product is "therapeutically equivalent" to the RLD and it assigns a therapeutic equivalence rating to the approved generic drug in its publication "Approved Drug Products with Therapeutic Equivalence Evaluations," also referred to as the "Orange Book." Physicians and pharmacists consider an "AB" therapeutic equivalence rating to mean that a generic drug is fully substitutable for the RLD. In addition, by operation of certain state laws and numerous health insurance programs, the FDA's designation of an "AB" rating often results in substitution of the generic drug without the knowledge or consent of either the prescribing physician or patient.

The FDCA provides a period of five years of non-patent exclusivity for a new drug containing a new chemical entity. In cases where such exclusivity has been granted, an ANDA may not be filed with the FDA until the expiration of five years unless the submission is accompanied by a Paragraph IV certification, in which case the applicant may submit its application four years following the original product approval. The FDCA also provides for a period of three years of exclusivity if the NDA includes reports of one or more new clinical investigations, other than bioavailability or bioequivalence studies, that were conducted by or for the applicant and are essential to the approval of the application. This three-year exclusivity period often protects changes to a previously approved drug product, such as a new dosage form, route of administration, combination or indication.

Hatch-Waxman Patent Certification and the 30-Month Stay

Upon approval of an NDA or a supplement thereto, NDA sponsors are required to list with the FDA each patent with claims that cover the applicant's product or a method of using the product. Each of the patents listed by the NDA sponsor is published in the Orange Book. When an ANDA applicant files its application with the FDA, the applicant is required to certify to the FDA concerning any patents listed for the reference product in the Orange Book, except for patents covering methods of use for which the ANDA applicant is not seeking approval.

Specifically, the applicant must certify with respect to each patent that:

- the required patent information has not been filed;
- the listed patent has expired;
- the listed patent has not expired, but will expire on a particular date and approval is sought after patent expiration; or
- the listed patent is invalid, unenforceable or will not be infringed by the new product.

A certification that the new product will not infringe the already approved product's listed patents or that such patents are invalid or unenforceable is called a Paragraph IV certification. If the applicant does not challenge the listed patents or indicates that it is not seeking approval of a patented method of use, the ANDA application will not be approved until all the listed patents claiming the referenced product have expired.

If the ANDA applicant has provided a Paragraph IV certification to the FDA, the applicant must also send notice of the Paragraph IV certification to the NDA and patent holders once the ANDA has been accepted for filing by the FDA. The NDA and patent holders may then initiate a patent infringement lawsuit in response to the notice of the Paragraph IV certification. The filing of a patent infringement lawsuit within 45 days after the receipt of a Paragraph IV certification automatically prevents the FDA from approving the ANDA until the earlier of 30 months after the receipt of the Paragraph IV notice, expiration of the patent, or a decision in the infringement case that is favorable to the ANDA applicant.

European Union/Rest of World Government Regulation

In addition to regulations in the United States, we will be subject to a variety of regulations in other jurisdictions governing, among other things, clinical trials and any commercial sales and distribution of our products. The cost of establishing a regulatory compliance system for numerous varying jurisdictions can be very significant. Although many of the issues discussed above with respect to the United States apply similarly in the context of the European Union and in other jurisdictions, the approval process varies between countries and jurisdictions and can involve additional product testing and additional administrative review periods. The time required to obtain approval in other countries and jurisdictions might differ from and be longer than that required to obtain FDA approval. Regulatory approval in one country or jurisdiction does not ensure regulatory approval in another, but a failure or delay in obtaining regulatory approval in one country or jurisdiction may negatively impact the regulatory process in others.

Whether or not we obtain FDA approval for a product, we must obtain the requisite approvals from regulatory authorities in foreign countries prior to the commencement of clinical trials or marketing of the product in those countries. Certain countries outside of the United States have a similar process that requires the submission of a clinical trial application much like the IND prior to the commencement of human clinical trials. In the European Union, for example, a clinical trial application, or CTA, must be submitted for each clinical protocol to each country's national health authority and an independent ethics committee, much like the FDA and IRB, respectively. Once the CTA is accepted in accordance with a country's requirements, the clinical trial may proceed.

The requirements and process governing the conduct of clinical trials vary from country to country. In all cases, the clinical trials are conducted in accordance with cGCP, the applicable regulatory requirements, and the ethical principles that have their origin in the Declaration of Helsinki.

To obtain regulatory approval of an investigational medicinal product under European Union regulatory systems, we must submit a marketing authorization application. The content of the BLA or NDA filed in the United States is similar to that required in the European Union, with the exception of, among other things, country-specific document requirements.

For other countries outside of the European Union, such as countries in Eastern Europe, Latin America or Asia, the requirements governing product licensing, pricing, and reimbursement vary from country to country.

Countries that are part of the European Union, as well as countries outside of the European Union, have their own governing bodies, requirements, and processes with respect to the approval of pharmaceutical and biologic products. If we fail to comply with applicable foreign regulatory requirements, we may be subject to, among other things, fines, suspension or withdrawal of regulatory approvals, product recalls, seizure of products, operating restrictions and criminal prosecution.

Authorization Procedures in the European Union

Medicines can be authorized in the European Union by using either the centralized authorization procedure or national authorization procedures.

- *Centralized procedure*. The EMA implemented the centralized procedure for the approval of human medicines to facilitate marketing authorizations that are valid throughout the European Economic Area, or EEA, which is comprised of the 28 member states of the European Union plus Norway, Iceland, and Lichtenstein. This procedure results in a single marketing authorization issued by the EMA that is valid across the EEA. The centralized procedure is compulsory for human medicines that are: derived from biotechnology processes, such as genetic engineering, contain a new active substance indicated for the treatment of certain diseases, such as HIV/AIDS, cancer, diabetes, neurodegenerative disorders or autoimmune diseases and other immune dysfunctions, and officially designated orphan medicines.
- For medicines that do not fall within these categories, an applicant has the option of submitting an application for a centralized marketing authorization to the European Commission following a

favorable opinion by the EMA, as long as the medicine concerned is a significant therapeutic, scientific or technical innovation, or if its authorization would be in the interest of public health.

- *National authorization procedures*. There are also two other possible routes to authorize medicinal products in several European Union countries, which are available for investigational medicinal products that fall outside the scope of the centralized procedure:
    - *Decentralized procedure*. Using the decentralized procedure, an applicant may apply for simultaneous authorization in more than one European Union country of medicinal products that have not yet been authorized in any European Union country and that do not fall within the mandatory scope of the centralized procedure.
    - *Mutual recognition procedure*. In the mutual recognition procedure, a medicine is first authorized in one European Union Member State, in accordance with the national procedures of that country. Following this, further marketing authorizations can be sought from other European Union countries in a procedure whereby the countries concerned agree to recognize the validity of the original, national marketing authorization.

In some cases, a Pediatric Investigation Plan, or PIP, or a request for waiver or deferral, is required for submission prior to submitting a marketing authorization application. A PIP describes, among other things, proposed pediatric trials and their timing relative to clinical trials in adults.

New Chemical Entity Exclusivity

In the European Union, new chemical entities, sometimes referred to as new active substances, qualify for eight years of data exclusivity upon marketing authorization and an additional two years of market exclusivity. This data exclusivity, if granted, prevents regulatory authorities in the European Union from referencing the innovator's data to assess a generic (abbreviated) application for eight years, after which generic marketing authorization can be submitted, and the innovator's data may be referenced, but not approved for two years. The overall ten-year period will be extended to a maximum of eleven years if, during the first eight years of those ten years, the marketing authorization holder obtains an authorization for one or more new therapeutic indications which, during the scientific evaluation prior to their authorization, are held to bring a significant clinical benefit in comparison with existing therapies.

Orphan Designation and Exclusivity

In the European Union, the EMA's Committee for Orphan Medicinal Products, or COMP, grants orphan drug designation to promote the development of products that are intended for the diagnosis, prevention or treatment of life-threatening or chronically debilitating conditions that affect not more than 5 in 10,000 persons in the European Union Community, or when, without incentives, it is unlikely that sales of such products in the European Union would be sufficient to justify the necessary investment in developing the products. Additionally, orphan drug designation is only available where no satisfactory method of diagnosis, prevention, or treatment of the condition has been authorized (or the product would be a significant benefit to those affected).

In the European Union, orphan drug designation entitles a party to financial incentives such as reduction of fees or fee waivers and ten years of market exclusivity is granted following medicinal product approval. This period may be reduced to six years if the orphan drug designation criteria are no longer met, including where it is shown that the product is sufficiently profitable not to justify maintenance of market exclusivity. Market exclusivity would not prevent the approval of a similar drug that is shown to be safer, more effective or otherwise clinically superior.

Orphan drug designation must be requested before submitting an application for marketing approval. Orphan drug designation does not convey any advantage in, or shorten the duration of, the regulatory review and approval process.

Exceptional Circumstances/Conditional Approval

Orphan drugs or drugs with unmet medical needs may be eligible for European Union approval under exceptional circumstances or with conditional approval. Approval under exceptional circumstances may be applicable to orphan products and is used when an applicant is unable to provide comprehensive data on the efficacy and safety under normal conditions of use because the indication for which the product is intended is encountered so rarely that the applicant cannot reasonably be expected to provide comprehensive evidence, when the present state of scientific knowledge does not allow comprehensive information to be provided, or when it is medically unethical to collect such information. Conditional marketing authorization may be applicable to orphan medicinal products, medicinal products for seriously debilitating or life-threatening diseases, or medicinal products to be used in emergency situations in response to recognized public threats. Conditional marketing authorization can be granted on the basis of less complete data than is normally required in order to meet unmet medical needs and in the interest of public health, provided the risk-benefit balance is positive, it is likely that the applicant will be able to provide the comprehensive clinical data, and unmet medical needs will be fulfilled. Conditional marketing authorization is subject to certain specific obligations to be reviewed annually.

Accelerated Review

Under the centralized procedure in the European Union, the maximum timeframe for the evaluation of a marketing authorization application is 210 days (excluding clock stops, when additional written or oral information is to be provided by the applicant in response to questions asked by the EMA's Committee for Medicinal Products for Human Use, or CHMP). Accelerated evaluation might be granted by the CHMP in exceptional cases, when a medicinal product is expected to be of a major public health interest, particularly from the point of view of therapeutic innovation. In this circumstance, EMA ensures that the opinion of the CHMP is given within 150 days, excluding clock stops.

Pharmaceutical Coverage, Pricing and Reimbursement

Significant uncertainty exists as to the coverage and reimbursement status of any products for which we obtain regulatory approval. In the United States and markets in other countries, sales of any products for which we receive regulatory approval for commercial sale will depend in part on the availability of coverage and reimbursement from third-party payors. Third-party payors include government authorities, managed care providers, private health insurers and other organizations. The process for determining whether a payor will provide coverage for a product may be separate from the process for setting the reimbursement rate that the payor will pay for the product. Third-party payors may limit coverage to specific products on an approved list, or formulary, which might not include all of the FDA-approved products for a particular indication. Moreover, a payor's decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved. Adequate third- party reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in product development.

Third-party payors are increasingly challenging the price and examining the medical necessity and cost-effectiveness of medical products and services, in addition to their safety and efficacy. In order to obtain coverage and reimbursement for any product that might be approved for sale, we may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of our products, in addition to the costs required to obtain regulatory approvals. Our product candidates may not be considered medically necessary or cost-effective. If third-party payors do not consider a product to be cost-effective compared to other available therapies, they may not cover the product after approval as a benefit under their plans or, if they do, the level of payment may not be sufficient to allow a company to sell its products at a profit.

The U.S. government, state legislatures and foreign governments have shown significant interest in implementing cost containment programs to limit the growth of government-paid health care costs, including price controls, restrictions on reimbursement and requirements for substitution of generic products for branded prescription drugs. By way of example, the Patient Protection and Affordable Care Act, as amended by the

Health Care and Education Reconciliation Act, collectively, the Healthcare Reform Law, contains provisions that may reduce the profitability of drug products, including, for example, increased rebates for drugs sold to Medicaid programs, extension of Medicaid rebates to Medicaid managed care plans, mandatory discounts for certain Medicare Part D beneficiaries and annual fees based on pharmaceutical companies' share of sales to federal health care programs. Adoption of government controls and measures, and tightening of restrictive policies in jurisdictions with existing controls and measures, could limit payments for pharmaceuticals.

In the European Community, governments influence the price of pharmaceutical products through their pricing and reimbursement rules and control of national health care systems that fund a large part of the cost of those products to consumers. Some jurisdictions operate positive and negative list systems under which products may only be marketed once a reimbursement price has been agreed to by the government. To obtain reimbursement or pricing approval, some of these countries may require the completion of clinical trials that compare the cost-effectiveness of a particular product candidate to currently available therapies. Other member states allow companies to fix their own prices for medicines, but monitor and control company profits. The downward pressure on health care costs in general, particularly prescription drugs, has become very intense. As a result, increasingly high barriers are being erected to the entry of new products. In addition, in some countries, cross-border imports from low-priced markets exert a commercial pressure on pricing within a country.

The marketability of any products for which we receive regulatory approval for commercial sale may suffer if the government and third-party payors fail to provide adequate coverage and reimbursement. In addition, an increasing emphasis on cost containment measures in the United States and other countries has increased and we expect will continue to increase the pressure on pharmaceutical pricing. Coverage policies and third-party reimbursement rates may change at any time. Even if favorable coverage and reimbursement status is attained for one or more products for which we receive regulatory approval, less favorable coverage policies and reimbursement rates may be implemented in the future.

Other Healthcare Laws and Compliance Requirements

If we obtain regulatory approval for any of our product candidates, we may be subject to various federal and state laws targeting fraud and abuse in the healthcare industry. These laws may impact, among other things, our proposed sales, marketing and education programs. In addition, we may be subject to patient privacy regulation by both the federal government and the states in which we conduct our business. The laws that may affect our ability to operate include:

- the federal Anti-Kickback Statute, which prohibits, among other things, persons from knowingly and willfully soliciting, receiving, offering or paying remuneration, directly or indirectly, to induce, or in return for, the purchase or recommendation of an item or service reimbursable under a federal healthcare program, such as the Medicare and Medicaid programs;
- federal civil and criminal false claims laws and civil monetary penalty laws, which prohibit, among other things, individuals or entities from knowingly presenting, or causing to be presented, claims for payment from Medicare, Medicaid, or other third-party payors that are false or fraudulent;
- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which created new federal criminal statutes that prohibit executing a scheme to defraud any healthcare benefit program and making false statements relating to healthcare matters;
- the federal transparency laws, including the federal Physician Payment Sunshine Act, that requires drug and biologics manufacturers to disclose payments and other transfers of value provided to physicians and teaching hospitals;
- HIPAA, as amended by the Health Information Technology and Clinical Health Act, or HITECH, and its implementing regulations, which imposes certain requirements relating to the privacy, security and transmission of individually identifiable health information; and

- state law equivalents of each of the above federal laws, such as anti-kickback and false claims laws that may apply to items or services reimbursed by any third-party payor, including commercial insurers, and state laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and may not have the same effect, thus complicating compliance efforts.

The Healthcare Reform Law broadened the reach of the fraud and abuse laws by, among other things, amending the intent requirement of the federal Anti-Kickback Statute and the applicable criminal healthcare fraud statutes contained within 42 U.S.C. § 1320a-7b, effective March 23, 2010. Pursuant to the statutory amendment, a person or entity no longer needs to have actual knowledge of this statute or specific intent to violate it in order to have committed a violation. In addition, the Healthcare Reform Law provides that the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the civil False Claims Act or the civil monetary penalties statute. Many states have adopted laws similar to the federal Anti-Kickback Statute, some of which apply to the referral of patients for healthcare items or services reimbursed by any source, not only the Medicare and Medicaid programs.

We are also subject to the U.S. Foreign Corrupt Practices Act, or FCPA, which prohibits improper payments or offers of payments to foreign governments and their officials for the purpose of obtaining or retaining business. Safeguards we implement to discourage improper payments or offers of payments by our employees, consultants, and others may be ineffective, and violations of the FCPA and similar laws may result in severe criminal or civil sanctions, or other liabilities or proceedings against us, any of which would likely harm our reputation, business, financial condition and result of operations.

If our operations are found to be in violation of any of the laws described above or any other governmental regulations that apply to us, we may be subject to penalties, including civil and criminal penalties, exclusion from participation in government healthcare programs, such as Medicare and Medicaid and imprisonment, damages, fines and the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our results of operations.

Our Advisors

Scientific Advisory Board

We have assembled a world-class scientific advisory board with expertise in biology for medical applications. The members of our scientific advisory board have made significant scientific contributions in their individual fields, have published in top-tier journals and have been recognized with numerous awards and distinctions, including the Nobel Prize in Physiology or Medicine. Members of our scientific advisory board provide strategic advice to us in such fields as proteomics, translational research and molecular biology, and perform such other services as may be mutually determined by us and the scientific advisory board member. Our scientific advisory board meets on an as-needed basis, based on our need for advice in their respective fields of expertise from time to time.

Name	Affiliation
Susan L. Ackerman, Ph.D.	Professor, The Jackson Laboratory and Howard Hughes Medical Institute Investigator
Bruce Beutler, M.D.	Founding Director, Center for the Genetics of Host Defense, UT Southwestern Medical Center
Floyd Bloom, M.D.	Professor Emeritus, Molecular and Cellular Neuroscience Department, The Scripps Research Institute
Benjamin F. Cravatt, Ph.D.	Professor and Chairman of the Department of Chemical Physiology, The Scripps Research Institute
Nancy Ip, Ph.D.	Dean of Science and Director of the State Key Laboratory of Molecular Neuroscience at Hong Kong University of Science and Technology
Osamu Nureki, Ph.D.	Professor, Department of Biological Sciences, Graduate School of Science, The University of Tokyo
Wing Hung Wong, Ph.D.	Stephen R. Pierce Family Goldman Sachs Professor in Science and Human Health; Professor of Statistics, Stanford University

Therapeutic Advisory Board

We have convened a select group of experienced drug discovery leaders to guide our discovery and development of innovative Physiocrine-based medicines. Our therapeutic advisory board members have extensive drug development expertise in both biotechnology company and pharmaceutical company settings. They have repeatedly demonstrated their ability to build high quality research and development organizations and to transform promising research into products. Members of our therapeutic advisory board provide strategic advice to us in the areas of translational and clinical research and perform such other services as may be mutually determined by us and the therapeutic advisory board member. Our therapeutic advisory board generally meets once per year.

Name	Affiliation
Thomas O. Daniel, M.D.	President, Research and Early Development, Celgene Corporation
R. Alan Ezekowitz, M.D., Ph.D.	Advisor, Cardinal Partners; President, Chief Executive Officer and Co-Founder, Abide Therapeutics, Inc.
L. Patrick Gage, Ph.D.	Chairman, Cytokinetics Inc.; Executive Chairman, Virdante Pharmaceuticals, Inc.
Richard Heyman, Ph.D.	Former Chief Executive Officer, Seragon Pharmaceuticals, Inc. (acquired by Genentech/Roche)
Keith James, Ph.D.	President, Ferring Research Institute Inc.; Senior Vice President, Research and Development, Ferring Pharmaceuticals Inc.
Paul Negulescu, Ph.D.	Vice President, Research, Vertex Pharmaceuticals Incorporated
Timothy Rink, MA., M.D., Sc.D.	Director, Kymab Ltd.; Director, Santhera Pharmaceuticals Holding AG; Director, Stevanage Bioscience Catalyst
Wendell Wierenga, Ph.D.	Director, Apricus Biosciences, Inc., Concert Pharmaceuticals, Inc. and Ocera Therapeutics, Inc.
Doug Williams, Ph.D.	Executive Vice President, Research and Development, Biogen Idec Inc.

Employees

As of April 1, 2015, we had 49 full-time employees. None of our employees are represented by labor unions or covered by collective bargaining agreements. We consider our relationship with our employees to be good.

Facilities

Our administrative offices and research laboratory are located in San Diego, California. We lease approximately 17,083 square feet of office and laboratory space under a lease that currently expires in May 2017. We believe that our facility is sufficient to meet our needs and that suitable additional space will be available as and when needed.

Legal Proceedings

We are not a party to any material legal proceedings at this time. From time to time, we may be subject to various legal proceedings and claims that arise in the ordinary course of our business activities. Although the results of litigation and claims cannot be predicted with certainty, as of the date of this prospectus, we do not believe we are party to any claim or litigation the outcome of which, if determined adversely to us, would individually or in the aggregate be reasonably expected to have a material adverse effect on our business. Regardless of the outcome, litigation can have an adverse impact on us because of defense and settlement costs, diversion of management resources and other factors.

MANAGEMENT

Executive Officers and Directors

The following table sets forth information regarding our executive officers and directors, including their ages as of April 3, 2015:

Name	Age	Position
Executive Officers:		
John D. Mendlein, Ph.D.	55	Chief Executive Officer and Executive Chairman, Board of Directors
Frederic Chereau	48	President and Chief Operating Officer
David M. Weiner, M.D.	50	Chief Medical Officer
Melissa A. Ashlock, M.D.	57	Vice President, External Scientific Alliances and Human Genetics
John C. McKew, Ph.D.	51	Vice President, Research
Fred Ramsdell, Ph.D.	54	Vice President, Immunology
Kelly Blackburn	51	Vice President, Clinical Affairs
Andrew Cubitt, Ph.D.	52	Vice President, Product Protection
Holly D. Chrzanowski	49	Vice President, Enterprise Talent and Organization
Marcy Graham	48	Vice President, Investor Relations and Corporate Communications
Non-Management Directors:		
John K. Clarke	61	Chairman of the Board
Srinivas Akkaraju, M.D., Ph.D.	47	Director
James C. Blair, Ph.D.	75	Director
Kathryn E. Falberg	54	Director
Amir H. Nashat, Sc.D.	42	Director
Paul Schimmel, Ph.D.	74	Director

(1) Member of the audit committee.
(2) Member of the compensation committee.
(3) Member of the nominating and corporate governance committee.

John D. Mendlein, Ph.D. has served as our Executive Chairman since July 2010 and as our Chief Executive Officer since September 2011. Dr. Mendlein is Vice Chairman of the Board of Fate Therapeutics, Inc., a biopharmaceutical company, and also holds board positions with Moderna Therapeutics, Inc., Pronutria Biosciences, Inc. and BIO (Biotechnology Industry Organization) emerging companies board. Dr. Mendlein previously served as the Chief Executive Officer of Adnexus Therapeutics, Inc., a biopharmaceutical company, from 2005 to 2008, which was purchased by Bristol-Myers Squibb Company in 2008. Dr. Mendlein also served on the board of directors of Monogram Biosciences, Inc., an HIV and oncology diagnostic company that was acquired by Laboratory Corporation of America Holdings in 2009. Before that, he served as Chairman and Chief Executive Officer of Affinium Pharmaceuticals, Ltd. (acquired by Debiopharm Group) from 2000 to 2005, and as a board member, General Counsel and Chief Knowledge Officer at Aurora Bioscience Corporation (acquired by Vertex Pharmaceuticals) from August 1996 to September 2001. Dr. Mendlein holds a Ph.D. in physiology and biophysics from the University of California, Los Angeles, a J.D. from the University of California, Hastings College of the Law, and a B.S. in biology from the University of Miami. Dr. Mendlein is the co-author or co-inventor of over 210 publications and published patent properties, including a number of patents associated with our company.

Frederic Chereau has served as our President and Chief Operating Officer since January 2014. From September 2012 to December 2013, Mr. Chereau was Senior Vice President, Global Angioedema Franchise Lead at Shire plc, a global biopharmaceuticals company. Prior to that, from October 2008 to September 2012, he served as President and Chief Executive Officer of Pervasis Therapeutics, Inc., a clinical-stage therapeutics company where substantially all assets were acquired by Shire plc. Before Pervasis, Mr. Chereau worked at Genzyme from 1999 to 2008, where he held various roles, including Vice President and General Manager of the

Cardiovascular Business Unit. Prior to that, he started his career at Hemotech S.A., where he held sales and marketing roles. Mr. Chereau sits on the Advisory Board of Cell2B, a biotechnology company dedicated to the development of advanced cellular therapies in Portugal, and on the Strategic Advisory Board of La Rochelle Business School in France. Mr. Chereau holds a B.S. in physics from the University of Paris, a Master in Management from La Rochelle Business School in France and an M.B.A. from INSEAD, Fontainebleau, France and Singapore.

David M. Weiner, M.D. has served as our Chief Medical Officer since March 2014. Prior to that, he served as the Chief Medical Officer of Proteostasis Therapeutics, Inc., a venture backed biopharmaceutical company, from September 2012 to March 2014, and as its interim Chief Executive Officer from July 2013 to March 2014. From 2007 to 2011, Dr. Weiner held a number of roles, including Vice President and head of early clinical development, Neurodegenerative Disease, at Merck Serono S.A., a global pharmaceutical company. From 1997 to 2007, he served in both pre-clinical and clinical development roles at ACADIA Pharmaceuticals. Dr. Weiner's clinical experience includes a faculty appointment in Neuroscience and Psychiatry at the University of California, San Diego. He trained in neurology at New York Hospital, Memorial Sloan Kettering Cancer Center, Weill Cornell Medical Center, after completing a medical internship at St. Vincent's Medical Center in New York. Dr. Weiner holds a B.A. in biopsychology from Brandeis University and an M.D. from the State University of New York at Buffalo. Dr. Weiner is the co-author or co-inventor of over 30 publications and patent properties, and serves on the advisory board of the Michael J. Fox Foundation. He also holds licenses to practice medicine (States of California, New York and Vermont).

Melissa A. Ashlock, M.D. has served as our Vice President, External Scientific Alliances and Human Genetics since May 2011. Between 1999, and 2011, Dr. Ashlock was employed by the Cystic Fibrosis Foundation (CFF), holding positions including Vice President of Drug Discovery for its therapeutics affiliate where she was the program leader for multiple CFF funded collaborative drug discovery programs with industry. Among these was a multi-year collaboration with Vertex that led to the worldwide marketed CFTR modulator, Kalydeco. Dr. Ashlock has also held consultancy roles with following companies: Vertex Pharmaceuticals Incorporated, a global biotechnology company, from March 2011 to June 2011; John J. Flatley Company (for their cystic fibrosis research lab), from January 2011 to June 2011; Galapagos NV, a clinical-stage biotechnology company, from April 2010 to April 2011; and Therapeutics for Rare and Neglected Diseases Program, National Institutes of Health, from March 2009 to February 2010. She completed her internship and medical residency in adult internal medicine at New York Hospital (Cornell University Medical College) and Mary Hitchcock Memorial Hospital (Dartmouth Medical School), respectively. Dr. Ashlock, who has also published under the name Melissa Rosenfeld, M.D., has been co-inventor or author of more than 50 issued patents and publications. Dr. Ashlock holds a B.S. in biochemistry from Purdue University and an M.D. from Weill Cornell Medical College. She also holds a license to practice medicine (State of Maryland).

John C. McKew, Ph.D. has served as our Vice President, Research since October 2014. Prior to that, from October 2010 to October 2014, Dr. McKew served as the Acting Scientific Director of the Division of Preclinical Innovation at the National Center for Advancing Translational Sciences (NCATS) within the National Institutes of Health (NIH). A portion of his responsibilities were focused on building the Therapeutics for Rare and Neglected Diseases and the Bridging Interventional Developments Gaps programs into novel collaborative preclinical and early clinical development programs. Before joining the NIH, from October 1993 to January 2011, Dr. McKew held a director level position at Wyeth Research in Cambridge, Massachusetts. Dr. McKew held post-doctoral research positions at the University of Geneva and Firmenich, SA and is currently an Adjunct Associate Professor at the Boston University School of Medicine. He has given more than 60 invited lectures, and is an author on over 45 peer-reviewed articles and an inventor on more than 35 patents and patent applications. He holds B.S. degrees in chemistry and biochemistry from the State University of New York at Stony Brook and a Ph.D. in chemistry from the University of California, Davis.

Fred Ramsdell, Ph.D. has served as our Vice President, Immunology since June 2014. He also provides consulting services to a number of biotechnology and pharmaceutical companies, as well as to various non-profit

organizations in the area of immunobiology. Prior to joining aTyr, from October 2008 to May 2014, Dr. Ramsdell served as Scientific Director, Discovery Immunology at Novo Nordisk, A/S, a global healthcare company. Dr. Ramsdell was Director of the Immunology Program at Darwin Molecular Corporation (acquired by Celltech Limited) from 1994 to 2004. Prior to that, he worked as a Senior Scientist at Immunex Corporation. He conducted post-doctoral studies at the National Institutes of Health, researching a variety of questions regarding immune cell function and tolerance. He has over 50 publications. He holds a B.S. in biochemistry and cell biology from the University of California, San Diego and a Ph.D. in microbiology and immunology from the University of California, Los Angeles.

Kelly Blackburn has served as our Vice President, Clinical Affairs since July 2013. Ms. Blackburn served as a consultant from September 2012 to July 2013 to a number of companies, including Agios Pharmaceuticals, Promedior Inc. and aTyr. Prior to this, Ms. Blackburn was the Vice President, Clinical Development Operations at Vertex Pharmaceuticals Incorporated from September 2006 to September 2012. In this role she oversaw the global operations through to NDA for Kalydeco and Incivek. From September 2002 to August 2006, Ms. Blackburn was Director of Clinical and Safety Operations for Millennium Pharmaceuticals where she was responsible for the VELCADE program which was successfully approved during her tenure. Ms. Blackburn has also served as an advisor to Transforme1, a new technology company for data capture, from July 2013 to December 2014. Ms. Blackburn holds a B.S. in biochemistry from University of New Hampshire, an M.H.A. from Quinnipiac College and an M.Ed. from Cambridge College.

Andrew Cubitt, Ph.D. has served as our Vice President, Product Protection since September 2011 and provided consulting services to us from January 2011 to September 2011. Prior to that, from 2009 to 2011, he worked as a senior patent agent for the Global Patent Group LLC, a patent consulting firm. He co-founded Anaptys Biosciences, a therapeutic antibody company, in 2005 and served as Executive Director of Corporate Development until 2009. He also served as Senior Manager, Technology and Intellectual Property at Aurora Bioscience Corporation. Dr. Cubitt did his postdoctoral training at Weill Cornell Medical College in New York, and at the University of California San Diego, where he was part of team that initiated development of the green fluorescent protein (GFP) with Roger Tsien, Ph.D. Dr. Cubitt holds a Ph.D. in biochemistry from the University of Sheffield and a first class honors degree (B.Sc) in medical biochemistry from the University of Birmingham in the UK. Dr Cubitt is a co-inventor or co-author of 18 issued US patents and 20 publications.

Holly D. Chrzanowski has served as our Vice President, Enterprise Talent and Organization since April 2013 and provided consulting services to us from 2010 to 2013. Prior to joining aTyr, she operated her own human resources consulting practice, HC Consulting, for 12 years, providing human resources consulting services to a wide variety of biotechnology companies located nationwide. She also served as a Director, Human Resources at Vertex Pharmaceuticals Incorporated as a consultant and Senior Manager, Human Resources at Aurora Biosciences Corporation. Prior to this, Ms. Chrzanowski held a variety of management level positions in human resources at Geometric Results Incorporated, a multinational subsidiary of Ford Motor Company (acquired by MSX International). Ms. Chrzanowski attended the University of Salzburg, Austria where she studied German language. She holds a B.A. in political science from California State University at Long Beach.

Marcy Graham has served as our Vice President, Investor Relations and Corporate Communications since January 2015. Prior to that, from 2013 to 2015, Ms. Graham served as head of Investor Relations and Corporate Communications at Ambit Biosciences (acquired by Daichi Sankyo), a biopharmaceutical company. Before joining Ambit, from 2011 to 2013, Ms. Graham served as Senior Director, Investor Relations and Corporate Communications at Sequenom, Inc., a life sciences diagnostics company. Prior to Sequenom, from 2007 to 2011, she was the Executive Director, Investor Relations at Genoptix, Inc. and was previously the Director of Investor Relations at Novatel Wireless following a position heading the Investor Relations effort at Leap Wireless, home of wireless telecommunications provider Cricket Communications. Ms. Graham holds a Certification in Investor Relations from the University of California, Irvine, an M.B.A. from the Robert O. Anderson School of Management at the University of New Mexico and a B.A. degree in Journalism and Mass Communications from the University of New Mexico.

John K. Clarke has served as Chairman of our Board of Directors since September 2005. Mr. Clarke is Managing General Partner of Cardinal Partners, a venture capital partnership focused on healthcare investing. He co-founded Cardinal Partners in 1997 and has served as President of CHP Management, Inc. since that time. He currently serves as Chairman of the Board of Directors of Alnylam Pharmaceuticals, Inc. and as a director of Momenta Pharmaceuticals, Inc. and Rib-X Pharmaceuticals Inc. He has also served as a director for Verastem, Inc., Sirtris Pharmaceuticals, Inc. (acquired by GlaxoSmithKline), TechRx Technology Services Corporation (acquired by NDCHealth) and Visicu, Inc. (acquired by Phillips Electronics). Mr. Clarke holds an A.B. in economics and biology from Harvard University and an M.B.A. from the Wharton School at the University of Pennsylvania. We believe Mr. Clarke is qualified to serve on our board of directors due to his extensive experience within the field of drug discovery and development and his broad leadership experience on various public and private company boards.

Srinivas Akkaraju, M.D., Ph. D. Dr. Akkaraju has served as a director since March 2015. Since April 2013, Dr. Akkaraju has been General Partner of Sofinnova Ventures. From January 2009 to April 2013, Dr. Akkaraju served as Managing Director of New Leaf Venture Partners. From August 2006 to December 2008, Dr. Akkaraju served as a Managing Director at Panorama Capital, LLC, a private equity firm founded by the former venture capital investment team of J.P. Morgan Partners, LLC, a private equity division of JPMorgan Chase & Co. Prior to co-founding Panorama Capital, he was with J.P. Morgan Partners, which he joined in April 2001 and of which he became a Partner in January 2005. From October 1998 to April 2001, he was in Business and Corporate Development at Genentech, Inc. (now a member of the Roche Group), a biotechnology company, most recently as Senior Manager. In addition to aTyr, Dr. Akkaraju serves as a director of Seattle Genetics, Intercept Pharmaceuticals, Inc., ZS Pharma, and Versartis, Inc, which are all publicly traded biotechnology companies. Previously, Dr. Akkaraju served as a director on the boards of Barrier Therapeutics, Inc., Eyetech Pharmaceuticals, Inc. and Synageva Biopharma Corp., all publicly traded biotechnology companies, and Amarin Corporation plc, a foreign publicly traded biotechnology company. Prior to joining Genentech, Dr. Akkaraju was a graduate student at Stanford University, where he received an M.D. and a Ph.D. in Immunology. He holds B.A.s in biochemistry and computer science from Rice University. We believe that Dr. Akkaraju is qualified to serve on our board of directors due to his strong scientific background coupled with extensive experience in private equity and venture capital investing allowing him to thoroughly understand our technology and provide strong business and strategic expertise.

James C. Blair, Ph.D. has served as a director since December 2010. Dr. Blair has been a Partner of Domain Associates, a venture capital firm with a focus on life sciences, since the company's founding in 1985. Present board memberships include Clovis Oncology, Inc., as well as numerous private company boards. He previously served on the boards of Zogenix, Inc., Cadence Pharmaceuticals, Inc. and Five Prime Therapeutics, Inc. Dr. Blair currently serves on the board of directors of the Prostate Cancer Foundation and the Sanford-Burnham Medical Research Institute. He is also on the advisory boards of the Department of Molecular Biology at Princeton University, the USC Stevens Institute for Innovation, and the Division of Chemistry and Chemical Engineering at the California Institute of Technology. Dr. Blair holds a B.S.E. in electrical engineering from Princeton University and an M.S.E. and Ph.D. in electrical engineering from the University of Pennsylvania. We believe Dr. Blair is qualified to serve on our board of directors due to his experience in the life science industry and his years of business and leadership experience.

Kathryn E. Falberg has served as a director since July 2014. Ms. Falberg most recently served as Executive Vice President and Chief Financial Officer of Jazz Pharmaceuticals PLC, a biopharmaceutical company, from 2009 to 2014. From 1995 to 2001, Ms. Falberg was with Amgen Inc., where she served as Senior Vice President, Finance and Strategy, Chief Financial Officer, and before that as Vice President, Controller and Chief Accounting Officer, and Vice President, Treasurer. Ms. Falberg currently serves as Chairman of the board of directors and is the Audit Committee Chair of Halozyme Therapeutics, Inc., a biopharmaceutical company, and Medivation, Inc., a biopharmaceutical company. Ms. Falberg holds a B.A. in economics and an M.B.A. in finance from the University of

California, Los Angeles. We believe Ms. Falberg is qualified to serve on our board of directors due to her extensive background in financial and accounting matters for public companies and her leadership experience in the biotechnology industry.

Amir H. Nashat, Sc.D. has served as a director since November 2006. He is also a Managing General Partner at Polaris Venture Partners, a venture capital firm. He joined Polaris in April 2002 and focuses on investments in healthcare, consumer products and energy. Dr. Nashat is currently a director of Fate Therapeutics, Inc. and BIND Therapeutics, Inc., as well as a director of several private companies. Additionally, Dr. Nashat has served as a director of Adnexus Therapeutics, Inc. (acquired by Bristol-Myers Squibb Company) and other private companies. Dr. Nashat holds a Sc.D. in chemical engineering from the Massachusetts Institute of Technology with a minor in biology and an M.S. and B.S. in materials science and mechanical engineering from the University of California, Berkeley. We believe Dr. Nashat is qualified to serve on our board of directors due to his extensive experience within the field of drug discovery and development, his broad leadership experience on various boards, and his financial expertise with life sciences companies.

Paul Schimmel, Ph.D. has served as a director since September 2005. Dr. Schimmel is an Ernest and Jean Hahn Professor at The Skaggs Institute for Chemical Biology at The Scripps Research Institute. He was formerly the John D. and Catherine T. MacArthur Professor of Biochemistry and Biophysics in the Department of Biology at the Massachusetts Institute of Technology. Dr. Schimmel holds a B.A. in biochemistry and biophysics from Ohio Wesleyan University and a Ph.D. from the Massachusetts Institute of Technology. We believe Dr. Schimmel is qualified to serve on our board of directors due to his role as one of our scientific founders and his discoveries and scientific leadership in the field of Physiocrine biology and other areas important to the development of therapeutics.

Principal Financial and Accounting Officer

Below is the biography of Stan Blackburn, our principal financial and accounting officer, who serves as a consultant:

Stan Blackburn has served as our Acting Chief Financial Officer as a consultant since October 2008. Mr. Blackburn has provided senior financial consulting services to early stage life science and technology companies through his firm BlackFord Partners, Inc. for over 13 years and as an independent consultant for over 25 years. He worked as a certified public accountant with Arthur Andersen & Company for over nine years. He holds a B.S. in accountancy from the University of Illinois.

Composition of Our Board of Directors

Our board of directors currently consists of seven members, all of whom were elected pursuant to the provisions of a stockholders' agreement, which will terminate immediately prior to the completion of this offering. Pursuant to the provisions of a registration and voting rights agreement, upon the completion of this offering, certain of our stockholders who previously held shares of our Series E redeemable convertible preferred stock may designate one individual as a nominee to serve on our board of directors, subject to certain conditions. Our nominating and corporate governance committee and board of directors may consider a broad range of factors relating to the qualifications and background of director nominees, which may include diversity and is not limited to race, gender or national origin. We have no formal policy regarding board diversity. Our nominating and corporate governance committee's and board of directors' priority in selecting board members is identification of persons who will further the interests of our stockholders through his or her established record of professional accomplishment, the ability to contribute positively to the collaborative culture among board members, knowledge of our business, understanding of the competitive landscape and professional and personal experiences and expertise relevant to our business strategy. Our directors hold office until their successors have been elected and qualified or until the earlier of their resignation or removal.

Our amended and restated certificate of incorporation and amended and restated bylaws that will become effective upon the completion of this offering also provide that our directors may be removed only for cause by the affirmative vote of the holders of at least % of the votes that all our stockholders would be entitled to cast in an annual election of directors, and that any vacancy on our board of directors, including a vacancy resulting from an enlargement of our board of directors, may be filled only by vote of a majority of our directors then in office.

Director Independence. Our board of directors has determined that all members of our board of directors, except Dr. Mendlein, are independent, as determined in accordance with the rules of The NASDAQ Stock Market and the Securities and Exchange Commission, or SEC. In making such independence determination, our board of directors considered the relationships that each non-employee director has with us and all other facts and circumstances that our board of directors deemed relevant in determining their independence, including the beneficial ownership of our capital stock by each non-employee director. In considering the independence of the directors listed above, our board of directors considered the association of our directors with the holders of more than five percent of our common stock. Upon the completion of this offering, we expect that the composition and functioning of our board of directors and each of our committees will comply with all applicable requirements of The NASDAQ Stock Market and the rules and regulations of the SEC. There are no family relationships among any of our directors or executive officers.

Staggered Board. In accordance with the terms of our amended and restated certificate of incorporation and amended and restated bylaws that will become effective upon the completion of this offering, our board of directors will be divided into three classes, Class I, Class II and Class III, with each class serving staggered three-year terms. Upon the expiration of the term of a class of directors, directors in that class will be eligible to be elected for a new three-year term at the annual meeting of stockholders in the year in which their term expires.

- Our Class I directors will be , and ;
- Our Class II directors will be and ; and
- Our Class III directors will be and .

Our amended and restated certificate of incorporation and amended and restated bylaws that will become effective upon the completion of this offering provide that the authorized number of directors may be changed only by resolution of our board of directors.

The division of our board of directors into three classes with staggered three-year terms may delay or prevent stockholder efforts to effect a change of our management or a change in control.

Leadership Structure of the Board

Our board of directors believes that the decision as to who should serve as Chairman, Executive Chairman and Chief Executive Officer is the proper responsibility of the board of directors. Our amended and restated bylaws that will be in effect upon the completion of this offering will not require our Executive Chairman, Chairman and Chief Executive Officer positions to be separate and our board of directors will carefully consider the advantages and disadvantages of such separation or combination. At the present time, our board of directors believes the interests of all stockholders are best served through a leadership model with a combined Executive Chairman and Chief Executive Officer position and an independent Chairman. Our Executive Chairman and Chief Executive Officer focuses on our day-to-day operations, while our independent Chairman serves as our lead independent director. Our independent Chairman leads our board of directors in its fundamental role of providing advice to and independent oversight of management.

Board's Role in Risk Oversight

We face a number of risks, including risks relating to our financial condition, development and commercialization activities, operations and intellectual property as more fully discussed under "Risk Factors" in

this prospectus. Management is responsible for the day-to-day management of risks we face, while our board of directors, as a whole and through its committees, has responsibility for the oversight of risk management. In its risk oversight role, our board of directors has the responsibility to satisfy itself that the risk management processes designed and implemented by management are adequate and functioning as designed.

The role of our board of directors in overseeing the management of our risks is conducted primarily through committees of our board of directors, as disclosed in the descriptions of each of the committees below and in the charters of each of the committees. The full board of directors (or the appropriate board committee in the case of risks that are under the purview of a particular committee) discusses with management our major risk exposures, their potential impact on our company, and the steps we take to manage them. When a board committee is responsible for evaluating and overseeing the management of a particular risk or risks, the chairman of the relevant committee reports on the discussion to the full board of directors during the committee reports portion of the next board meeting. This enables our board of directors and its committees to coordinate the risk oversight role, particularly with respect to risk interrelationships.

Board Committees

Our board of directors has established an audit committee, a compensation committee and a nominating and governance committee. The composition of each committee set forth below will be effective upon the closing of this offering. Each committee will operate under a charter approved by our board. Following this offering, copies of each committee's charter will be posted on the Corporate Governance section of our website, at www.atyrpharma.com.

Audit Committee

, and currently serve on the audit committee, which is chaired by . Under the applicable NASDAQ rules, we are permitted to phase in our compliance with the independent audit committee requirements set forth in NASDAQ Marketplace Rule 5605(c)(2)(A)(ii) on the same schedule as we are permitted to phase in our compliance with the independent audit committee requirement pursuant to Rule 10A-3(b)(1)(iv)(A) under the Securities Exchange Act of 1934, as amended, or the Exchange Act, which require (1) one independent member at the time of listing; (2) a majority of independent members within 90 days of listing; and (3) all independent members within one year of listing. Our board of directors has determined that each of , and is an independent director under the NASDAQ Marketplace Rules and Rule 10A-3 of the Exchange Act. We believe that the composition of our audit committee will comply with applicable rules of The NASDAQ Stock Market under the phase-in schedule described above. Our board of directors has designated as an "audit committee financial expert," as defined under the applicable rules of the Securities and Exchange Commission. The audit committee's responsibilities include:

- appointing, approving the compensation of, and assessing the independence of our independent registered public accounting firm;
- approving auditing and permissible non-audit services, and the terms of such services, to be provided by our independent registered public accounting firm;
- reviewing the internal audit plan with the independent registered public accounting firm and members of management responsible for preparing our financial statements;
- reviewing and discussing with management and the independent registered public accounting firm our annual and quarterly financial statements and related disclosures as well as critical accounting policies and practices used by us;
- reviewing the adequacy of our internal control over financial reporting;
- establishing policies and procedures for the receipt and retention of accounting-related complaints and concerns;

- recommending, based upon the audit committee's review and discussions with management and the independent registered public accounting firm, whether our audited financial statements shall be included in our Annual Report on Form 10-K;
- monitoring the integrity of our financial statements and our compliance with legal and regulatory requirements as they relate to our financial statements and accounting matters;
- preparing the audit committee report required by SEC rules to be included in our annual proxy statement;
- reviewing all related party transactions for potential conflict of interest situations and approving all such transactions; and
- reviewing quarterly earnings releases.

Compensation Committee

, and currently serve on the compensation committee, which is chaired by . Our board of directors has determined that each member of the compensation committee is "independent" as that term is defined in the applicable NASDAQ Stock Market rules. The compensation committee's responsibilities include:

- annually reviewing and approving corporate goals and objectives relevant to the compensation of our Chief Executive Officer;
- evaluating the performance of our Chief Executive Officer in light of such corporate goals and objectives and determining the compensation of our Chief Executive Officer;
- reviewing and approving the compensation of our other executive officers;
- reviewing and establishing our overall management compensation, philosophy and policy;
- overseeing and administering our compensation and similar plans;
- evaluating and assessing potential and current compensation advisors in accordance with the independence standards identified in the applicable NASDAQ Stock Market rules;
- retaining and approving the compensation of any compensation advisors;
- reviewing and approving our policies and procedures for the grant of equity-based awards;
- reviewing and making recommendations to our board of directors with respect to director compensation;
- preparing the compensation committee report required by SEC rules to be included in our annual proxy statement;
- reviewing and discussing with management the compensation discussion and analysis to be included in our annual proxy statement or Annual Report on Form 10-K; and
- reviewing and discussing with our board of directors corporate succession plans for the Chief Executive Officer and other key officers.

Nominating and Corporate Governance Committee

, and currently serve on the nominating and corporate governance committee, which is chaired by . Our board of directors has determined that each member of the nominating and corporate governance committee is "independent" as that term is defined in the applicable NASDAQ Stock Market rules. The nominating and corporate governance committee's responsibilities include:

- developing and recommending to our board of directors criteria for board and committee membership;

- establishing procedures for identifying and evaluating board of director candidates, including nominees recommended by stockholders;
- identifying individuals qualified to become members of our board of directors;
- recommending to our board of directors the persons to be nominated for election as directors and to each of our board's committees;
- developing and recommending to our board of directors a set of corporate governance guidelines; and
- overseeing the evaluation of our board of directors and management.

Our board of directors may establish other committees from time to time.

Compensation Committee Interlocks and Insider Participation

None of the members of our compensation committee has at any time during the prior three years been one of our officers or employees. None of our executive officers currently serves, or in the past fiscal year has served, as a member of our board of directors or compensation committee of any entity that has one or more executive officers serving on our board of directors or compensation committee.

Corporate Governance

Prior to the completion of this offering, we will adopt a written code of business conduct and ethics that applies to our directors, officers and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. Following the completion of this offering, a current copy of the code will be posted on the Corporate Governance section of our website, which is located at www.atyrpharma.com. If we make any substantive amendments to, or grant any waivers from, the code of business conduct and ethics for any officer or director, we will disclose the nature of such amendment or waiver on our website or in a current report on Form 8-K.

EXECUTIVE AND DIRECTOR COMPENSATION

Summary Compensation Table

The following table presents information regarding the total compensation earned by each individual who served as our chief executive officer at any time during the fiscal year ended December 31, 2014 and our two other most highly compensated executive officers who were serving as executive officers as of December 31, 2014. We refer to these officers as our named executive officers.

Name and Principal Position	Year	Salary ($)	Stock Awards ($)	Option Awards ($)(1)	Non-Equity Incentive Plan Compensation ($)(2)	All Other Compensation ($)(3)	Total ($)
John D. Mendlein, Ph.D *Chief Executive Officer and Executive Chairman*	2014	410,000	268,089(4)	604,606(5)	76,875	38,407	1,397,977
	2013	400,000	—	408,959	160,000	—	968,959
Frederic Chereau *President and Chief Operating Officer*	2014	319,731(6)	—	1,503,835	49,140	149,511	2,022,217
David M. Weiner, M.D. *Chief Medical Officer*	2014	265,208(7)	—	1,470,231	31,280	75,207	1,841,926

(1) In accordance with SEC rules, this column reflects the aggregate grant date fair value of the option awards granted during the years indicated, computed in accordance with Financial Accounting Standard Board ASC Topic 718 for stock-based compensation transactions, or ASC 718. Assumptions used in the calculation of these amounts are included in Note 7 to our consolidated financial statements included elsewhere in this prospectus. These amounts do not reflect the actual economic value that will be realized by the named executive officer upon the vesting of the stock options, the exercise of the stock options or the sale of the common stock underlying such stock options.

(2) The amounts reported reflect the discretionary cash bonus determined by our board of directors upon recommendation of our compensation committee based on achievement of certain performance goals and metrics as specified by our board of directors upon recommendation of our compensation committee.

(3) The amounts reported in this column include (i) supplemental compensation paid to Dr. Mendlein and Mr. Chereau in the amounts of $28,407 and $21,067, respectively, (ii) reimbursements to Dr. Mendlein pursuant to his employment agreement for medical expenses in the amount of $10,000, (iii) contributions made by the Company to a health savings account for Mr. Chereau in the amount of $2,275, (iv) relocation expenses for Mr. Chereau and Dr. Weiner, in the amounts of $81,000 and $50,000, respectively and (v) related tax gross-ups for the relocation expenses of Mr. Chereau and Dr. Weiner, of $45,169 and $25,207, respectively.

(4) In accordance with SEC rules, this amount reflects the incremental grant date fair value, computed as of the modification date in accordance with ASC 718 associated with the amendment in December 2014 of a restricted stock grant to provide for the lapsing of the Company's right of repurchase with respect to 192,870 shares of common stock underlying the grant. This amount was not paid to or realized by the officer in the year indicated.

(5) The amount reported also reflects the incremental grant date fair value of $453,452, computed as of the modification date in accordance with ASC 718, associated with the amendment in December 2014 of the vesting schedule for a previously granted stock option. Assumptions used in the calculation of this amount are included in Note 7 to our consolidated financial statements included elsewhere in this prospectus. This amount was not paid to or realized by the officer in the year indicated.

(6) Mr. Chereau began his employment with us on January 9, 2014.

(7) Dr. Weiner began his employment with us on March 17, 2014.

Employment Arrangements with Our Named Executive Officers

John D. Mendlein, Ph.D.

Dr. Mendlein entered into an at-will employment agreement with us as of January 1, 2010, which provided for an initial annual base salary of $150,000, subject to periodic review and increases as determined by our board of directors. Pursuant to the terms of his employment agreement, Dr. Mendlein is considered annually for a bonus target, currently in an amount of up to 50% of his then-current base salary, as determined by our board of directors and compensation committee. Dr. Mendlein may elect to receive a grant of fully-vested shares of our common stock in lieu of a cash bonus. In connection with commencement of his employment, we granted Dr. Mendlein a signing bonus of $31,250. In addition, Dr. Mendlein is entitled to reimbursement in an amount up to $10,000 per calendar year of certain healthcare fees and expenses.

Payments in Connection with a Change of Control

Upon the completion of this offering, Dr. Mendlein will be entitled to request an agreement with us regarding a change in control that would provide for a "gross-up" payment in the event certain excise taxes and penalties are imposed as a result of Sections 280G and/or 4999 of the Code. In the event that Dr. Mendlein's employment ends within 12 months of any change of control as defined in the agreement, other than as a result of termination for cause, we have agreed to enter into a consulting or advisory relationship with Dr. Mendlein following such change of control such that any options or restricted shares that were unvested as of the consummation of such change of control become fully vested, subject to Dr. Mendlein continuing to provide bona fide services to the Company.

Payments Provided upon Termination for Good Reason or Without Cause

Dr. Mendlein's employment is at-will. In the event of termination by Dr. Mendlein for good reason or by us without cause, Dr. Mendlein will be entitled to receive (i) the amount of his accrued but unpaid salary, earned but unpaid bonus, and any accrued but unused vacation as of the date of termination, (ii) reimbursement of any expenses properly incurred on behalf of the Company prior to any such termination and not yet reimbursed, (iii) continuation of his base salary for a period of six months after the effective date of termination and one half of the full bonus that Dr. Mendlein would have received had the Company met all of the targets in the annual bonus plan that was approved by our board for the calendar year in which the termination occurred, and (iv) continuation of group health plan benefits for a period of six months, in the case of each of (iii) and (iv), subject to the execution and non-revocation of a release agreement and written acknowledgement of Dr. Mendlein's continuing confidentiality obligations.

Under Dr. Mendlein's employment agreement, the terms below are generally defined as follows:

"cause" means (i) conduct constituting an uncured material act of willful misconduct in connection with the performance of his duties; (ii) conviction of, or entry of a pleading of guilty or nolo contendere to, any crime involving fraud or embezzlement that results in material damage to the Company or any felony; (iii) willful and repeated failure to substantially perform the duties, functions and responsibilities of the position that results in material damage to the Company that continues uncured for 30 days after prior written notice; (iv) a material breach of any of the material provisions of his employment agreement that is uncured for 30 days after prior written notice; or termination in connection with the bankruptcy, dissolution, liquidation, winding up, assignment for the benefit of creditors, or other cessation of the business of the Company as a going concern, other than to effectuate a change of control; and

"good reason" means (i) a substantial diminution or other substantive adverse change, not consented to by Dr. Mendlein, in the nature of scope of his responsibilities, authorities, powers, function or duties; (ii) an involuntary reduction in his base salary except for a decrease as part of reductions by the Company of the annual base salary of its executive employees generally; (iii) a breach by the Company of any of its material obligations under any agreement

between the Company and Dr. Mendlein that remains uncured for 30 days after prior written notice; or (iv) the relocation of the Company's headquarters more than 25 miles away from San Diego, California.

Frederic Chereau

Mr. Chereau entered into an at-will employment agreement with us on December 20, 2013, which provided for an initial base salary of $360,000, subject to periodic review and adjustments as determined by the Company in its sole discretion. Pursuant to the terms of his employment agreement, Mr. Chereau is considered annually for a bonus target of up to 50% of his then-current base salary, as determined by our board of directors based on corporate achievements of goals and achievement of Mr. Chereau's individual goals. Pursuant to the terms of his employment agreement, Mr. Chereau was issued an option to purchase 1,987,795 shares of the Company's common stock on March 5, 2014. In connection with commencement of his employment, we granted Mr. Chereau a relocation assistance payment of $45,000 and reimbursed Mr. Chereau $36,000 for temporary housing.

David M. Weiner, M.D.

Dr. Weiner entered into an at-will employment agreement with us on February 20, 2014, which provided for an initial base salary of $335,000, subject to periodic review and adjustments as determined by the Company in its sole discretion. Pursuant to the terms of his employment agreement, Dr. Weiner is considered annually for a bonus target of up to 40% of his then-current base salary, as determined by our board of directors based on corporate achievements of goals and achievement of Dr. Weiner's individual goals. Pursuant to the terms of his employment agreement, Dr. Weiner was issued an option to purchase 961,836 shares of the Company's common stock on July 10, 2014. In connection with commencement of his employment, we granted Dr. Weiner a relocation assistance payment of $50,000.

Outstanding Equity Awards at Fiscal Year-End

The following table summarizes, for each of the named executive officers, the number of outstanding equity awards held by each of our named executive officers as of December 31, 2014.

	Option Awards				Stock Awards	
	Number of Securities underlying Unexercised Options (#) Exercisable	Number of Securities underlying Unexercised Options (#) Unexercisable	Option Exercise Price ($)	Option Expiration Date	Number of Shares that Have Not Vested (#)	Market Value of Shares that Have Not Vested ($)(1)
John D. Mendlein, Ph.D	397,052	8,448(2)	0.09	3/16/2021	—	—
	209,931	125,959(3)	0.09	3/16/2021	—	—
	456,935	639,709(4)	0.11	9/13/2022	—	—
	263,402	684,848(5)	0.51	6/28/2023	—	—
	30,555	169,445(6)	0.51	3/5/2024	—	—
	—	—	—	—	192,870(7)	285,448
Frederic Chereau.	—	1,987,795(8)	0.51	3/5/2024	—	—
David M. Weiner, M.D	—	961,836(9)	0.51	7/10/2024	—	—

(1) There was no public market for our common stock as of December 31, 2014. The fair value of our common stock as of December 31, 2014 was $1.48 per share.
(2) Option vests with respect to 2.08% of the shares on each monthly anniversary of January 1, 2011.
(3) Option vests with respect to 1.39% of the shares on each monthly anniversary of March 16, 2011.
(4) Option vests with respect to 1.39% of the shares on each monthly anniversary of June 1, 2012.

(5) Option vests with respect to 1.39% of the shares on each monthly anniversary of April 19, 2013.
(6) Option vests with respect to 1.39% of the shares on each monthly anniversary of January 1, 2014.
(7) Represents shares subject to our repurchase right, which will lapse upon the completion of a firm commitment underwritten initial public offering of our securities in which our pre-money valuation exceeds $200 million.
(8) Option vests with respect to 1.39% of the shares on each monthly anniversary of January 9, 2014.
(9) Option vests with respect to 1.39% of the shares on each monthly anniversary of March 17, 2014

Director Compensation

The following table provides certain information concerning compensation earned by the directors who were not named executive officers during the year ended December 31, 2014.

Name	Fees Earned or Paid in Cash ($)	Option Awards ($)(1)(2)	Total ($)
James C. Blair, Ph.D.	13,750	150,397	164,147
John K. Clarke	11,250	150,397	161,647
Kathryn E. Falberg	22,500	150,397	172,897
Amir H. Nashat, Sc.D.	11,250	150,397	161,647
Edward Penhoet, Ph.D.(3)	10,000	150,397	160,397
Paul Schimmel, Ph.D.	11,250	150,397	161,647

(1) The amounts reported reflect the aggregate grant date fair value computed in accordance with ASC 718.
(2) Represents an option to purchase 100,000 shares of common stock at an exercise price of $0.51 per share granted to each of our non-employee directors in July 2014. The shares of common stock underlying each such option vest in 36 equal monthly installments over three years from June 1, 2014 through June 1, 2017. In November 2014, each of the options was amended to allow for the early exercise of the options, subject to our right of repurchase with respect to any unvested shares.
(3) Dr. Penhoet resigned from the board of directors as of April 2, 2015.

Our Chief Executive Officer received no compensation for his services as a director. Pursuant to our board of directors compensation plan, effective as of June 1, 2014, each non-employee director is paid a retainer fee of $20,000 per year, and each committee member is paid $2,500 per year. Committee chairs are paid $7,500 per year, with the exception of the audit committee chair, who is paid $25,000 per year. In addition, each director is eligible to receive an initial option grant of 100,000 shares and an annual option grant of 35,000 shares.

Compensation Risk Assessment

We believe that although a portion of the compensation provided to our executive officers and other employees is performance-based, our executive compensation program does not encourage excessive or unnecessary risk taking. This is primarily due to the fact that our compensation programs are designed to encourage our executive officers and other employees to remain focused on both short-term and long-term strategic goals, in particular in connection with our pay-for-performance compensation philosophy. As a result, we do not believe that our compensation programs are reasonably likely to have a material adverse effect on our company.

Equity Compensation Plans

2014 Stock Plan

Our 2014 Stock Plan, or the 2014 Plan, was originally adopted by our board of directors and our stockholders in 2007, and was subsequently amended and restated in 2014. As of April 1, 2015, we have reserved an aggregate of 27,681,002 shares of our common stock for the issuance of options and other equity awards under the 2014 Plan. This number is subject to adjustment in the event of a consolidation, stock split, stock

dividend or other change in our capitalization. Effective upon the closing of this offering, our board of directors has determined not to grant any further awards under our 2014 Plan. The shares we issue under the 2014 Plan are authorized but unissued shares or shares we reacquire. The shares of common stock underlying any awards that are forfeited, canceled, reacquired by us prior to vesting, satisfied without the issuance of stock or otherwise terminated (other than by exercise) under the 2014 Plan are currently added back to the shares of common stock available for issuance under the 2014 Plan. Upon the closing of this offering, such shares will be added to the shares of common stock available for issuance under the 2015 Plan.

The 2014 Plan is administered by our compensation committee. Our board of directors and our compensation committee have the authority to select the individuals to whom awards will be granted, to make any combination of awards to participants, to accelerate the exercisability or vesting of any award, to provide substitute awards and to determine the specific terms and conditions of each award.

The 2014 Plan permits us to make grants of incentive stock options and non-qualified stock options, restricted stock awards and restricted stock unit awards to our employees, directors and consultants.

The 2014 Plan permits the granting of (1) options to purchase common stock intended to qualify as incentive stock options under Section 422 of the Internal Revenue Code, or the Code, and (2) options that do not so qualify. The option exercise price of each option is determined by our board or directors or our compensation committee but may not be less than 100% of the fair market value of our common stock on the date of grant. In the case of an incentive stock option granted to a participant who, at the time of grant of such option, owns stock representing more than 10% of the voting power of all classes of stock of the Company, then the exercise price may not be less than 110% of the fair market value of our common stock on the date of grant. The term of each option will be fixed by our board of directors or our compensation committee and may not exceed ten years from the date of grant.

The 2014 Plan provides that upon the occurrence of a change in control event, awards may be assumed, substituted for new awards of a successor entity, or otherwise continued or terminated at the effective time of such sale event. In the event any award is not assumed, substituted or otherwise continued in connection with a change in control event, such award will be subject to accelerated vesting. We may make or provide for cash payment to holders of options equal to the difference between the per share cash consideration in the sale event and the exercise price to the holders of vested and exercisable options. We may make or provide for cash payment to holders of restricted stock and restricted stock unit awards in an amount equal to the product of the per share cash consideration and the number of shares subject to each such award. In 2014, we amended certain outstanding option agreements under the 2014 Plan to provide for “double trigger” acceleration upon certain termination events which occur after a change in control event. Additionally, future stock options granted to our Chief Executive Officer and other executive officers as designated by our Chief Executive Officer will also be subject to “double trigger” acceleration unless otherwise determined by our board of directors.

Our board of directors may amend, suspend or terminate the 2014 Plan at any time, subject to stockholder approval where such approval is required by applicable law. Our board of directors may also amend, modify or terminate any outstanding award, provided that no amendment to an award may materially impair any of the rights of a participant under any awards previously granted without his or her written consent.

2015 Stock Option and Incentive Plan

Prior to the effectiveness of this offering, our board of directors intends to adopt, and we expect our stockholders will approve, our 2015 Stock Option and Incentive Plan, or the 2015 Plan. Our 2015 Plan will be effective on the business day immediately prior to the effective date of the registration statement of which this prospectus forms a part and is not expected to be utilized until after the completion of this offering. Our 2015 Plan will provide for the grant of incentive stock options, within the meaning of Section 422 of the Code, to our employees and any of our parent and subsidiary corporations’ employees, and for the grant of nonstatutory stock

options, restricted stock, restricted stock units, stock appreciation rights, performance units and performance shares to our employees, directors and consultants, and our parent and subsidiary corporations' employees and consultants.

We have initially reserved shares of our common stock, or the Initial Limit, for the issuance of awards under the 2015 Plan. The 2015 Plan provides that the number of shares reserved and available for issuance under the plan will automatically increase each January 1, beginning on January 1, 2016, by % of the outstanding number of shares of our common stock on the immediately preceding December 31 or such lesser number of shares as determined by our compensation committee, or the Annual Increase. This number is subject to adjustment in the event of a stock split, stock dividend or other change in our capitalization.

The shares we issue under the 2015 Plan will be authorized but unissued shares or shares that we reacquire. The shares of common stock underlying any awards that are forfeited, cancelled, held back upon exercise or settlement of an award to satisfy the exercise price or tax withholding, reacquired by us prior to vesting, satisfied without any issuance of stock, expire or are otherwise terminated (other than by exercise) under the 2015 Plan and 2014 Plan will be added back to the shares of common stock available for issuance under the 2015 Plan.

Stock options and stock appreciation rights with respect to no more than shares of stock may be granted to any one individual in any one calendar year and the maximum "performance-based award" payable to any one individual under the 2015 Plan is shares of stock or $ in the case of cash-based awards. The maximum aggregate number of shares that may be issued in the form of incentive stock options shall not exceed the Initial Limit cumulatively increased on January 1, 2016 and on each January 1 thereafter by the lesser of the Annual Increase for such year or shares of common stock.

The 2015 Plan will be administered by our compensation committee. Our compensation committee has full power to select, from among the individuals eligible for awards, the individuals to whom awards will be granted, to make any combination of awards to participants, and to determine the specific terms and conditions of each award, subject to the provisions of the 2015 Plan. Persons eligible to participate in the 2015 Plan will be those full or part-time officers, employees, non-employee directors and other key persons (including consultants) as selected from time to time by our compensation committee in its discretion.

The 2015 Plan permits the granting of both options to purchase common stock intended to qualify as incentive stock options under Section 422 of the Code and options that do not so qualify. The option exercise price of each option will be determined by our compensation committee but may not be less than 100% of the fair market value of our common stock on the date of grant. The term of each option will be fixed by our compensation committee and may not exceed ten years from the date of grant. Our compensation committee will determine at what time or times each option may be exercised.

Our compensation committee may award stock appreciation rights subject to such conditions and restrictions as we may determine. Stock appreciation rights entitle the recipient to shares of common stock, or cash, equal to the value of the appreciation in our stock price over the exercise price. The exercise price of each stock appreciation right may not be less than 100% of the fair market value of our common stock on the date of grant.

Our compensation committee may award shares of restricted common stock and restricted stock units to participants subject to such conditions and restrictions as it may determine. These conditions and restrictions may include the achievement of certain performance goals and continued employment with us through a specified vesting period. Our compensation committee may also grant shares of common stock that are free from any restrictions under the 2015 Plan. Unrestricted stock may be granted to participants in recognition of past services or other valid consideration and may be issued in lieu of cash compensation due to such participant.

Our compensation committee may grant performance share awards to participants that entitle the recipient to receive shares of common stock upon the achievement of certain performance goals and such other conditions as our compensation committee shall determine.

Our compensation committee may grant cash bonuses under the 2015 Plan to participants, subject to the achievement of certain performance goals.

Our compensation committee may grant awards of restricted stock, restricted stock units, performance shares or cash-based awards under the 2015 Plan that are intended to qualify as "performance-based compensation" under Section 162(m) of the Code. Those awards would only vest or become payable upon the attainment of performance goals that are established by our compensation committee and related to one or more performance criteria. The performance criteria that would be used with respect to any such awards include: earnings before interest, taxes, depreciation and amortization, net income (loss) (either before or after interest, taxes, depreciation and amortization), changes in the market price of our common stock, economic value-added, funds from operations or similar measure, sales or revenue, acquisitions or strategic transactions, operating income (loss), cash flow (including, but not limited to, operating cash flow and free cash flow), return on capital, assets, equity, or investment, stockholder returns, return on sales, gross or net profit levels, productivity, expense, margins, operating efficiency, customer satisfaction, working capital, earnings (loss) per share of stock, sales or market shares and number of customers, any of which may be measured either in absolute terms or as compared to any incremental increase or as compared to results of a peer group. From and after the time that we become subject to Section 162(m) of the Code, the maximum award that is intended to qualify as "performance-based compensation" under Section 162(m) of the Code that may be made to any one employee during any one calendar year period is shares of common stock with respect to a stock-based award and $ with respect to a cash-based award.

The 2015 Plan provides that in the case of, and subject to, the consummation of a "sale event" as defined in the 2015 Plan, all outstanding awards may be assumed, substituted or otherwise continued by the successor entity. To the extent that the successor entity does not assume, substitute or otherwise continue such awards, then upon the effectiveness of the sale event, all stock options and stock appreciation rights will automatically terminate. In the event of such termination, individuals holding options and stock appreciation rights will be permitted to exercise such options and stock appreciation rights prior to the sale event. In addition, in connection with a sale event, we may make or provide for a cash payment to participants holding options and stock appreciation rights equal to the difference between the per share cash consideration payable to stockholders in the sale event and the exercise price of the options or stock appreciation rights.

Our board of directors may amend or discontinue the 2015 Plan and our compensation committee may amend or cancel outstanding awards for purposes of satisfying changes in law or any other lawful purpose, but no such action may adversely affect rights under an award without the holder's consent. Certain amendments to the 2015 Plan require the approval of our stockholders.

No awards may be granted under the 2015 Plan after the date that is ten years from the date of stockholder approval. No awards under the 2015 Plan have been made prior to the date hereof.

401(k) Plan and Other Benefits

We maintain a tax-qualified retirement plan, or the 401(k) Plan, that provides eligible U.S. employees with an opportunity to save for retirement on a tax advantaged basis. Eligible employees are able to defer eligible compensation subject to applicable annual Code limits. Employees' pre-tax contributions are allocated to each participant's individual account and are then invested in selected investment alternatives according to the participants' directions. Employees are immediately and fully vested in their contributions. Our 401(k) Plan is intended to be qualified under Section 401(a) of the Code with our 401(k) Plan's related trust intended to be tax exempt under Section 501(a) of the Code. As a tax-qualified retirement plan, contributions to our 401(k) Plan and earnings on those contributions are not taxable to the employees until distributed from our 401(k) Plan. We also pay, on behalf of our employees, the premiums for health, life and disability insurance.

Pension Benefits, Non-Qualified Contribution Plans and other Non-Qualified Defined Compensation Plans

We do not provide a pension plan or non-qualified defined contribution plans for any of our employees, and none of our named executive officers participated in a non-qualified defined compensation plan during the fiscal year ended December 31, 2014.

CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS

Other than the compensation agreements and other arrangements described under "Executive and Director Compensation" in this prospectus and the transactions described below, since January 1, 2012, there has not been and there is not currently proposed, any transaction or series of similar transactions to which we were, or will be, a party in which the amount involved exceeded, or will exceed, $120,000 and in which any director, executive officer, holder of five percent or more of any class of our capital stock or any member of the immediate family of, or entities affiliated with, any of the foregoing persons, had, or will have, a direct or indirect material interest.

Private Placements of Securities

2013 Convertible Note Financing

In March 2013, we issued convertible promissory notes, or the 2013 Notes, in an aggregate principal amount of $10,000,000 to certain existing stockholders. A portion of the principal amount of the 2013 Notes converted into Series D redeemable convertible preferred stock in April 2013. The remainder of the principal amount of the 2013 Notes was repaid through cancellation of indebtedness pursuant to the Securities Purchase Agreements entered into with the Affiliates (as defined in "Management's Discussion and Analysis of Financial Condition and Results of Operations—Financial Operations Overview"). The following table summarizes participation in our convertible note financing by related persons:

Stockholder	Principal Amount of Notes Purchased	Amount of Notes Converted into Series D Redeemable Convertible Preferred Stock
Entities affiliated with Paul Schimmel, Ph.D.	$ 697,574.30	$ 665,266.10
John D. Mendlein, Ph.D.	$ 31,888.71	$ 30,413.76
CHP II, L.P.	$ 2,331,981.85	$ 2,223,969.73
Entities affiliated with Polaris Venture Management Co. V, LLC	$ 2,300,891.40	$ 2,194,322.28
Entities affiliated with Alta Partners Management VIII, LLC	$ 2,300,891.40	$ 2,194,319.73
Entities affiliated with Domain Partners VIII, L.P.	$ 2,291,930.35	$ 2,185,774.25

Series D Redeemable Convertible Preferred Stock Financing

In April 2013 and May 2013, we sold an aggregate of 18,275,830 shares of our Series D redeemable convertible preferred stock at a purchase price of $2.529 per share for an aggregate purchase price of $46,219,574.22, $9,536,813.24 of which was paid in cancellation of indebtedness under the 2013 Notes. The Affiliates also sold an aggregate of 19,364,416 of their Series D redeemable convertible preferred stock at an average purchase price of $0.022, for an aggregate purchase price of $2,575,467.33. We and the Affiliates entered into an Amended and Restated Affiliate Agreement under which each of our stockholders was entitled to receive stock in each Affiliate in proportion to the amount of our stock held by such stockholder, subject to certain adjustments. Under the Series D redeemable convertible preferred stock Securities Purchase Agreement, each investor in the our Series D redeemable convertible preferred stock was required to enter into a Securities Purchase Agreement with each of the Affiliates for the sale and issuance of Series D Preferred Stock of such Affiliates. The following table summarizes purchases of our Series D redeemable convertible preferred stock by related persons:

Stockholder	Shares of our Series D Redeemable Convertible Preferred Stock	Total Purchase Price (1)
Entities affiliated with Paul Schimmel, Ph.D.	263,055	$ 700,252.41
John D. Mendlein, Ph.D.	21,122	$ 56,226.71
CHP II, L.P.	1,536,787	$ 4,090,926.99
Entities affiliated with Polaris Venture Management Co. V, LLC	1,524,018	$ 4,056,935.92
Entities affiliated with Alta Partners Management VIII, LLC	1,126,866	$ 2,999,717.29
Entities affiliated with Domain Partners VIII, L.P.	1,518,083	$ 4,041,136.95
Entities affiliated with FMR LLC	12,002,254	$ 31,950,000.15

(1) The table reflects the total purchase price of $2.662 per share. The Company received $2.529 per share, with the Affiliates receiving the remaining $0.133 per share.

Series E Redeemable Convertible Preferred Stock Financing

In March 2015, we sold an aggregate of 68,166,894 shares of our Series E redeemable convertible preferred stock at a purchase price of $1.119 per share for an aggregate purchase price of $76,278,754.55. Each share of Series E redeemable convertible preferred stock is convertible into shares of our common stock at a rate of one share of preferred stock into approximately 0.8216 of a share of common stock, assuming this offering is completed on or before March 1, 2016. The following table summarizes purchases of our Series E redeemable convertible preferred stock by related persons:

Stockholder	Shares of our Series E Redeemable Convertible Preferred Stock	Total Purchase Price
John K. Clarke	893,655	$ 999,999.95
Paul Schimmel, Ph.D. and affiliated entities	446,827	$ 499,999.42
Entities affiliated with Polaris Venture Management Co. V, LLC	893,653	$ 999,997.73
Entities affiliated with Alta Partners Management Co. V, LLC	893,655	$ 999,999.95
Entities affiliated with Domain Partners VIII, L.P.	893,654	$ 999,998.83
Entities affiliated with FMR LLC	8,113,286	$ 9,078,767.04
Sofinnova Venture Partners IX, L.P.	14,968,722	$ 16,749,999.92
Entities affiliated with Baker Brothers Life Sciences, L.P.	14,968,722	$ 16,749,999.92

Loan to Chief Executive Officer and Executive Chairman

In July 2010, we loaned $69,432.30 in principal amount to John D. Mendlein, Ph.D., our Chief Executive Officer and Executive Chairman, in connection with Dr. Mendlein's purchase of restricted shares of our common stock. The loan was evidenced by a Secured Promissory Note and Pledge Agreement and bore interest at an annual rate of 5%. The loan was secured by 771,470 shares of our common stock. In January 2015, Dr. Mendlein repaid the full outstanding principal and accrued interest under the loan, totaling $85,021.27 in the aggregate.

Payments and Stock Issuance to The Scripps Research Institute

We provide funding to The Scripps Research Institute, or TSRI, under an amended and restated research funding and option agreement. See "Business" for more information about this agreement. Since January 1, 2012, we have paid $2,229,720.50 to TSRI under the agreement. Pursuant to the terms of the amended and restated research funding and option agreement, in March 2015, we issued 953,228 shares of our common stock to TSRI in consideration of certain rights granted by TSRI to us. Paul Schimmel, Ph.D., one of our directors, is a faculty member at TSRI and such payments fund a portion of his research activities conducted at TSRI.

Charitable Donations to National Foundation for Cancer Research

Since January 1, 2012, we have provided charitable donations to the National Foundation for Cancer Research, or NFCR, in the aggregate amount of $1,172,000. We have requested that the donations be restricted to a laboratory that performs basic research on the role of aminoacyl tRNA synthetase fragments and splice variants in cancer biology and therapeutics. The NFCR in its discretion selected Dr. Schimmel's laboratory at TSRI as the laboratory to receive these funds.

Executive Officer and Director Compensation

Employment Agreements

We have entered into offer letters or employment related agreements with each of John D. Mendlein, Ph.D., Frederic Chereau, David M. Weiner, M.D. and certain of our executive officers. For more information regarding these arrangements, see "Executive and Director Compensation—Employment Arrangements with Our Named Executive Officers."

Consulting Agreement

In January 2012, we entered into a Consulting Agreement with Holly D. Chrzanowski, our current Vice President, Enterprise Talent and Organization. Under this agreement, we paid Ms. Chrzanowski an aggregate total of $151,322.50 in the fiscal year ending December 31, 2012 and an aggregate total of $101,197.50 in the fiscal year ending December 31, 2013. We hired Ms. Chrzanowski as our Vice President, Enterprise Talent and Organization in April 2013.

Restricted Stock and Stock Option Awards

For information regarding restricted stock and stock option awards granted to our named executive officers and directors, see "Executive and Director Compensation."

Indemnification Agreements

We have entered into agreements to indemnify our directors and executive officers. These agreements will, among other things, require us to indemnify these individuals for certain expenses (including attorneys' fees), judgments, fines and settlement amounts reasonably incurred by such person in any action or proceeding, including any action by or in our right, on account of any services undertaken by such person on behalf of our company or that person's status as a member of our board of directors to the maximum extent allowed under Delaware law.

Registration Rights and Voting Agreement

We and certain holders of our capital stock have entered into a registration rights agreement pursuant to which these stockholders will have, among other things, registration rights under the Securities Act of 1933, or the Securities Act, with respect to common stock that they will hold following this offering. In addition, pursuant to this agreement, certain holders of our capital stock who previously held our Series E redeemable convertible preferred stock prior to the completion of this offering may designate one individual as a nominee to serve on our board of directors and certain of such holders have a right of first offer with respect to any proposed sales of our common stock or securities convertible into or exercisable or exchangeable for our common stock, subject to certain conditions. See "Description of Capital Stock—Registration and Voting Rights" for a further description of the terms of this agreement.

Policies for Approval of Related Party Transactions

Our board of directors reviews and approves transactions with directors, officers and holders of five percent or more of our voting securities and their affiliates, each a related party. Prior to this offering, the material facts as to the related party's relationship or interest in the transaction are disclosed to our board of directors prior to their consideration of such transaction, and the transaction is not considered approved by our board of directors unless a majority of the directors who are not interested in the transaction approve the transaction. Further, when stockholders are entitled to vote on a transaction with a related party, the material facts of the related party's relationship or interest in the transaction are disclosed to the stockholders, who must approve the transaction in good faith.

In connection with this offering, we intend to adopt a written related party transactions policy that such transactions must be approved by our audit committee or another independent body of our board of directors.

PRINCIPAL STOCKHOLDERS

The following table sets forth certain information known to us regarding beneficial ownership of our capital stock as of March 31, 2015, as adjusted to reflect the sale of common stock offered by us in this offering, for:

- each person or group of affiliated persons known by us to be the beneficial owner of more than five percent of our capital stock;
- our named executive officers;
- each of our other directors; and
- all executive officers and directors as a group.

To the extent that the underwriters sell more than shares in this offering, the underwriters have the option to purchase up to an additional shares at the initial public offering price less the underwriting discount.

Beneficial ownership is determined in accordance with the rules of the Securities and Exchange Commission and generally includes voting or investment power with respect to securities. Except as noted by footnote, and subject to community property laws where applicable, we believe based on the information provided to us that the persons and entities named in the table below have sole voting and investment power with respect to all common stock shown as beneficially owned by them.

The percentage of beneficial ownership prior to this offering in the table below is based on 137,683,246 shares of common stock deemed to be outstanding as of March 31, 2015, and the percentage of beneficial ownership after this offering in the table below is based on shares of common stock assumed to be outstanding after the closing of the offering. The information in the table below assumes no exercise of the underwriters' option to purchase additional shares. Options to purchase shares of common stock that are exercisable within 60 days of March 31, 2015 are deemed to be beneficially owned by the persons holding these options for the purpose of computing percentage ownership of that person, but are not treated as outstanding for the purpose of computing any other person's ownership percentage.

Name and Address of Beneficial Owner (1)	Number of Shares Beneficially Owned before Offering	Percentage of Shares Beneficially Owned before Offering	Number of Shares Beneficially Owned after Offering	Percentage of Shares Beneficially Owned after Offering
5% Stockholders:				
CHP II, L.P. (2)	13,984,620	10.16%		
Entities affiliated with Polaris Venture Management Co. V, LLC (3)	14,540,105	10.56%		
Entities affiliated with Alta Partners Management VIII, LLC (4)	14,142,956	10.27%		
Entities affiliated with Domain Partners VIII, L.P. (5)	14,486,338	10.52%		
Entities affiliated with FMR LLC (6)	18,668,014	13.56%		
Sofinnova Venture Partners IX, L.P. (7)	12,298,090	8.93%		
Entities affiliated with Baker Brothers Life Sciences, L.P. (8)	12,298,090	8.93%		
Executive Officers and Directors:				
John D. Mendlein, Ph.D. (9)	3,502,048	2.52%		
Frederic Chereau (10)	441,732	*		
David M. Weiner, M.D. (11)	187,024	*		
James C. Blair, Ph.D. (5)(12)	14,586,338	10.59%		
John K. Clarke (2)(13)	14,818,834	10.76%		
Srinivas Akkaraju, M.D., Ph.D.(7)	12,298,090	8.93%		
Kathryn E. Falberg (14)	100,000	*		
Amir H. Nashat, Sc.D. (3)(15)	14,640,105	10.63%		
Paul Schimmel, Ph.D. (16)	5,487,727	3.98%		
All executive officers and directors as a group (16 persons)(17)	67,385,667	47.67%		

* Represents beneficial ownership of less than one percent.

(1) Unless otherwise indicated, the address for each beneficial owner is c/o aTyr Pharma, Inc., 3545 John Hopkins Court, Suite #250, San Diego, CA 92121.

(2) Consists of: 2,400,000 shares of Series A redeemable convertible preferred stock, 3,600,000 shares of Series B redeemable convertible preferred stock, 4,320,173 shares of Series B-2 redeemable convertible preferred stock, 2,127,660 shares of Series C redeemable convertible preferred stock and 1,536,787 shares of Series D redeemable convertible preferred stock, all held by CHP II, L.P. ("CHP"). The general partner of CHP is CHP II Management, LLC ("CHP Management"), which may be deemed to beneficially own certain of the shares held by CHP. CHP Management disclaims beneficial ownership of all shares held by CHP in which it does not have an actual pecuniary interest. One of our directors, John Clarke, Brandon Hull and John Park are managing members of CHP Management and as members of the general partner, they may be deemed to beneficially own certain of the shares held by CHP Management. The managing members disclaim beneficial ownership of all shares held by CHP Management in which they do not have an actual pecuniary interest. The mailing address of the beneficial owner is c/o Cardinal Partners, 230 Nassau Street, Princeton, NJ 08542.

(3) Consists of: (i) 3,473,763 shares of Series B redeemable convertible preferred stock, 4,168,683 shares of Series B-2 redeemable convertible preferred stock, 4,208,756 shares of Series C redeemable convertible preferred stock, 1,470,577 shares of Series D redeemable convertible preferred stock and 862,318 shares of Series E redeemable convertible preferred stock, which shares are convertible into 708,468 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Polaris Venture Partners V, L.P. ("Polaris Ventures"), (ii) 67,704 shares of Series B redeemable convertible preferred stock, 81,248 shares of Series B-2 redeemable convertible preferred stock, 82,029 shares of Series C redeemable convertible preferred stock, 28,661 shares of Series D redeemable convertible preferred stock and 16,806 shares of Series E redeemable convertible preferred stock, which shares are convertible into 13,807 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Polaris Venture Partners Entrepreneurs' Fund V, L.P. ("Polaris Entrepreneurs' Fund"), (iii) 23,796 shares of Series B redeemable convertible preferred stock, 28,556 shares of Series B-2 redeemable convertible preferred stock, 28,831 shares of Series C redeemable convertible preferred stock, 10,074 shares of Series D redeemable convertible preferred stock and 5,906 shares of Series E redeemable convertible preferred stock, which shares are convertible into 4,852 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Polaris Venture Partners Founders' Fund V, L.P. ("Polaris Founders' Fund") and (iv) 34,737 shares of Series B redeemable convertible preferred stock, 41,686 shares of Series B-2 redeemable convertible preferred stock, 42,087 shares of Series C redeemable convertible preferred stock, 14,706 shares of Series D redeemable convertible preferred stock and 8,623 shares of Series E redeemable convertible preferred stock, which shares are convertible into 7,084 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Polaris Venture Partners Special Founders' Fund V, L.P. ("Polaris Special Founders' Fund"). Each of the funds has sole voting and investment power with respect to the shares held by such funds. The general partner of Polaris Ventures, Polaris Entrepreneurs' Fund, Polaris Founders' Fund and Polaris Special Founders' Fund is Polaris Venture Management Co. V, LLC ("Polaris Management"), and Polaris Management may be deemed to have sole voting and investment power over such shares. Director Amir H. Nashat is one of six members of Polaris Management. He has shared voting and investment power over such shares and may be deemed the indirect beneficial owner of such shares. The members of North Star Venture Management 2010 LLC are also members of Polaris Management, and as members of the general partner, they may be deemed to share voting and investment power over such shares. The mailing address of the beneficial owner is 1000 Winter Street, Suite 3350, Waltham, MA 02451.

(4) Consists of 3,600,000 shares of Series B redeemable convertible preferred stock, 4,320,173 shares of Series B-2 redeemable convertible preferred stock, 4,361,703 shares of Series C redeemable convertible preferred

stock, 1,126,866 shares of Series D redeemable convertible preferred stock and 893,655 shares of Series E redeemable convertible preferred stock, which shares are convertible into 734,214 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Alta Partners VIII, L.P. ("Alta Partners"). Alta Partners Management VIII, LLC ("Alta Management") is the general partner of Alta Partners and as the general partner may be deemed to have beneficial ownership of the shares held by Alta Partners. Alta Managers disclaims beneficial ownership of all such shares in which they do not have an actual pecuniary interest. The managing directors of Alta Management are Daniel Janney, Farah Champsi and Guy Nohra, and as managing directors of the general partner, they may be deemed to share voting and investment power over such shares. The managing directors disclaim beneficial ownership of all shares held by Alta Management in which they do not have an actual pecuniary interest. The mailing address of the beneficial owner is One Embarcadero Center, 37th Floor, San Francisco, CA 94111.

(5) Consists of: (i) 12,143,933 shares of Series C redeemable convertible preferred stock, 1,506,901 shares of Series D redeemable convertible preferred stock and 887,073 shares of Series E redeemable convertible preferred stock, which shares are convertible into 728,806 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Domain Partners VIII, L.P. ("Domain Partners") and (ii) 90,110 shares of Series C redeemable convertible preferred stock, 11,182 shares of Series D redeemable convertible preferred stock and 6,581 shares of Series E redeemable convertible preferred stock, which shares are convertible into 5,406 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by DP VIII Associates, L.P. ("Domain Associates"). One Palmer Square Associates VIII, L.L.C. ("One Palmer") is the general partner of Domain Partners and Domain Associates and may be deemed to have sole voting and investment power over such shares. One Palmer disclaims beneficial ownership of all shares held by Domain Partners and Domain Associates in which it does not have an actual pecuniary interest. One of our directors, Dr. Blair, is a managing member of One Palmer. Dr. Blair disclaims beneficial ownership of all shares held by One Palmer in which he does not have an actual pecuniary interest. The mailing address of the beneficial owner is One Palmer Square, Suite 515, Princeton, New Jersey 08542.

(6) Consists of: (i) 3,455,296 shares of Series D redeemable convertible preferred stock and 2,335,712 shares of Series E redeemable convertible preferred stock, which shares are convertible into 1,918,988 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Fidelity Select Portfolios: Biotechnology Portfolio ("Fidelity Select"), (ii) 282,494 shares of Series D redeemable convertible preferred stock and 190,960 shares of Series E redeemable convertible preferred stock, which shares are convertible into 156,890 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Fidelity Advisor Series VII: Fidelity Advisor Biotechnology Fund ("Fidelity Advisor Biotechnology"), (iii) 7,513,149 shares of Series D redeemable convertible preferred stock and 5,078,740 shares of Series E redeemable convertible preferred stock, which shares are convertible into 4,172,621 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Fidelity Mt. Vernon Street Trust: Fidelity Growth Company Fund ("Fidelity Mt. Vernon Street"), (iv) 112,697 shares of Series D redeemable convertible preferred stock and 76,181 shares of Series E redeemable convertible preferred stock, which shares are convertible into 62,589 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Variable Insurance Products Fund III: Growth Opportunities Portfolio ("Fidelity Variable Insurance") and (v) 638,618 shares of Series D redeemable convertible preferred stock and 431,693 shares of Series E redeemable convertible preferred stock, which shares are convertible into 354,672 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by Fidelity Advisor Series I: Fidelity Advisor Growth Opportunities Fund ("Fidelity Advisor Growth"). Fidelity Select, Fidelity Advisor Biotechnology, Fidelity Mt. Vernon Street, Fidelity Variable Insurance and Fidelity Advisor Growth are managed by direct or indirect subsidiaries of FMR LLC. Edward C. Johnson 3d is a

Director and the Chairman of FMR LLC and Abigail P. Johnson is a Director, the Vice Chairman and the President of FMR LLC. Members of the family of Edward C. Johnson 3d, including Abigail P. Johnson, are the predominant owners, directly or through trusts, of Series B voting common shares of FMR LLC, representing 49% of the voting power of FMR LLC. The Johnson family group and all other Series B shareholders have entered into a shareholders' voting agreement under which all Series B voting common shares will be voted in accordance with the majority vote of Series B voting common shares. Accordingly, through their ownership of voting common shares and the execution of the shareholders' voting agreement, members of the Johnson family may be deemed, under the Investment Company Act of 1940, to form a controlling group with respect to FMR LLC. Neither FMR LLC nor Edward C. Johnson 3d nor Abigail P. Johnson has the sole power to vote or direct the voting of the shares owned directly by the various investment companies registered under the Investment Company Act (Fidelity Funds) advised by Fidelity Management & Research Company (FMR Co), a wholly owned subsidiary of FMR LLC, which power resides with the Fidelity Funds' Boards of Trustees. Fidelity Management & Research Company carries out the voting of the shares under written guidelines established by the Fidelity Funds' Boards of Trustees.

(7) Consists of 14,968,722 shares of Series E redeemable convertible preferred stock, which shares are convertible into 12,298,090 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, held by Sofinnova Venture Partners IX, L.P. ("SVP IX"). Sofinnova Management IX, L.L.C. ("SM IX"), the general partner of SVP IX, may be deemed to have sole voting and dispositive power, and Dr. James I. Healy, Michael F. Powell, Ph.D., Dr. Srinivas Akkaraju and Dr. Anand Mehra, the managing members of SM IX, may be deemed to have shared voting and dispositive power, with respect to such shares. Such persons and entities disclaim beneficial ownership of the shares listed herein, except to the extent of any pecuniary interest therein. The address of SVP IX is c/o Sofinnova Ventures, Inc., 3000 Sand Hill Road, Bldg. 4, Suite 250, Menlo Park, California 94025.

(8) Consists of (i) 13,953,918 shares of Series E redeemable convertible preferred stock, which shares are convertible into 11,464,342 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, held by Baker Brothers Life Sciences, L.P. and (ii) 1,014,804 shares of Series E redeemable convertible preferred stock, which shares are convertible into 833,748 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, held by 667, L.P. These entities are direct holders of Series E redeemable convertible preferred stock and are under the advisement of Baker Bros. Advisors LP. As advisor to the above entities, Baker Bros. Advisors LP has beneficial ownership over 14,968,722 shares in total.

(9) Consists of: (i) 1,765,162 shares of common stock, 192,870 of which are subject to our right of repurchase, which will lapse upon the completion of a firm commitment underwritten initial public offering of our securities in which our pre-money valuation exceeds $200 million, (ii) 170,218 shares of Series C redeemable convertible preferred stock, (iii) 21,122 shares of Series D redeemable convertible preferred stock and (iv) options to purchase an additional 1,545,546 shares of common stock that are exercisable within 60 days of March 31, 2015, held by Dr. Mendlein.

(10) Consists of options to purchase 441,732 shares of common stock that are exercisable within 60 days of March 31, 2015, held by Mr. Chereau.

(11) Consists of options to purchase 187,024 shares of common stock that are exercisable within 60 days of March 31, 2015, held by Dr. Weiner.

(12) Consists of options to purchase 100,000 shares of common stock that are exercisable within 60 days of March 31, 2015, 69,444 shares of which would be subject to our right of repurchase, held by Dr. Blair.

(13) Consists of: (i) 893,655 shares of Series E redeemable convertible preferred stock, which shares are convertible into 734,214 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, and (ii) options to purchase 100,000 shares of common stock that are exercisable within 60 days of March 31, 2015, 69,444 shares of which would be subject to our right of repurchase, held by Mr. Clarke.

(14) Consists of options to purchase 100,000 shares of common stock that are exercisable within 60 days of March 31, 2015, 69,444 shares of which would be subject to our right of repurchase, held by Ms. Falberg.

(15) Consists of options to purchase 100,000 shares of common stock that are exercisable within 60 days of March 31, 2015, 69,444 shares of which would be subject to our right of repurchase, held by Dr. Nashat.

(16) Consists of: (i) 248,024 shares of Series D redeemable convertible preferred stock held by the Paul R. Schimmel Prototype PSP, (ii) 1,034,000 shares of common stock, 525,000 shares of Series A redeemable convertible preferred stock, 1,200,000 shares of Series B redeemable convertible preferred stock, 1,440,058 shares of Series B-2 redeemable convertible preferred stock, 558,508 shares of Series C redeemable convertible preferred stock, 15,031 shares of Series D redeemable convertible preferred stock and 446,827 shares of Series E redeemable convertible preferred stock, which shares are convertible into 367,106 shares of common stock at a rate of one share of Series E redeemable convertible preferred stock into approximately 0.8216 of a share of common stock, all held by the Schimmel Revocable Trust U/A Dtd 9/6/2000 and (iii) options to purchase an additional 100,000 shares of common stock that are exercisable within 60 days of March 31, 2015, 69,444 shares of which would be subject to our right of repurchase, held by Dr. Schimmel.

(17) Includes the number of shares beneficially owned by the named executive officers and directors listed in the above table, as well as (i) 323,366 shares of common stock and options to purchase 226,379 shares of common stock that are exercisable within 60 days of March 31, 2015, held by Dr. Ashlock, (ii) options to purchase 42,381 shares of common stock that are exercisable within 60 days of March 31, 2015, held by Dr. Ramsdell, (iii) 2,222 shares of common stock and options to purchase 140,806 shares of common stock that are exercisable within 60 days of March 31, 2015, held by Ms. Blackburn, (iv) options to purchase 415,258 shares of common stock that are exercisable within 60 days of March 31, 2015, held by Dr. Cubitt, and (v) options to purchase 173,358 shares of common stock that are exercisable within 60 days of March 31, 2015, held by Ms. Chrzanowski.

DESCRIPTION OF CAPITAL STOCK

The following descriptions are summaries of the material terms of our amended and restated certificate of incorporation and amended and restated bylaws, which will be effective upon completion of this offering. The descriptions of the common stock and preferred stock give effect to changes to our capital structure that will occur immediately prior to the completion of this offering. We refer in this section to our amended and restated certificate of incorporation as our certificate of incorporation, and we refer to our amended and restated bylaws as our bylaws.

General

Upon completion of this offering, our authorized capital stock will consist of shares of common stock, par value $0.001 per share, and shares of preferred stock, par value $0.001 per share, all of which shares of preferred stock will be undesignated.

As of March 31, 2015, 8,190,890 shares of our common stock were outstanding and held by 102 stockholders of record. This amount assumes the conversion of all outstanding shares of our redeemable convertible preferred stock into common stock, which will occur immediately prior to the closing of this offering. In addition, as of March 31, 2015, we had outstanding options to purchase 14,313,833 shares of our common stock under our 2014 Plan, at a weighted average exercise price of $0.67 per share.

Common Stock

The holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of the stockholders. The holders of our common stock do not have any cumulative voting rights. Holders of our common stock are entitled to receive ratably any dividends declared by our board of directors out of funds legally available for that purpose, subject to any preferential dividend rights of any outstanding preferred stock. Our common stock has no preemptive rights, conversion rights or other subscription rights or redemption or sinking fund provisions.

In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in all assets remaining after payment of all debts and other liabilities and any liquidation preference of any outstanding preferred stock. The shares to be issued by us in this offering will be, when issued and paid for, validly issued, fully paid and non-assessable.

Preferred Stock

Immediately prior to the completion of this offering, all outstanding shares of our redeemable convertible preferred stock will be converted into shares of our common stock. Immediately prior to the completion of this offering, our amended and restated certificate of incorporation will be amended and restated to delete all references to such shares of redeemable convertible preferred stock. Upon the consummation of this offering, our board of directors will have the authority, without further action by our stockholders, to issue up to shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences, sinking fund terms and the number of shares constituting, or the designation of, such series, any or all of which may be greater than the rights of common stock. The issuance of our preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon our liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change in control of our company or other corporate action. Immediately after consummation of this offering, no shares of preferred stock will be outstanding, and we have no present plan to issue any shares of preferred stock.

Warrants

As of March 31, 2015, we had outstanding warrants to purchase 72,000 shares of Series B redeemable convertible preferred stock, 15,957 shares of Series C redeemable convertible preferred stock and 118,624 shares of Series D redeemable convertible preferred stock.

In September 2007, in connection with a loan and security agreement entered into with Comerica Bank, or Comerica, we issued to Comerica a warrant to purchase 72,000 shares of our Series B redeemable convertible preferred stock. The warrant contains provisions for the adjustment of the exercise price and the number of shares issuable upon the exercise of the warrant in the event of certain stock dividends, stock splits, recapitalizations, reclassifications, exchanges, substitutions, consolidations, combinations and other similar events. In addition, the number of shares of common stock issuable upon conversion of the shares of Series B redeemable convertible preferred stock underlying the warrant are subject to adjustment for certain dilutive issuances pursuant to our certificate of incorporation as in effect prior to the completion of this offering. The provision for adjustment upon dilutive issuances is an element of the preferred stock into which the warrant is currently exercisable. Upon completion of this offering, the warrants will become exercisable for common stock and will no longer be subject to adjustment for dilutive issuances because our common stock is not subject to any provision for adjustment for dilutive issuances. The warrant expires on September 18, 2017, unless the Company is acquired prior to that time in a transaction in which the consideration paid by the acquirer is comprised solely of cash, promissory notes, or assumption of indebtedness.

In March 2011, in connection with a loan and security agreement entered into with Comerica, we issued to Comerica a warrant to purchase 15,957 shares of our Series C redeemable convertible preferred stock. The warrant contains provisions for the adjustment of the exercise price and the number of shares issuable upon the exercise of the warrant in the event of certain stock dividends, stock splits, recapitalizations, reclassifications, exchanges, substitutions, consolidations, combinations and other similar events. In addition, the number of shares of common stock issuable upon conversion of the shares of Series C redeemable convertible preferred stock underlying the warrant are subject to adjustment for certain dilutive issuances pursuant to our certificate of incorporation as in effect prior to the completion of this offering. The provision for adjustment upon dilutive issuances is an element of the preferred stock into which the warrant is currently exercisable. Upon completion of this offering, the warrant will become exercisable for common stock and will no longer be subject to adjustment for dilutive issuances because our common stock is not subject to any provision for adjustment for dilutive issuances. The warrant expires on March 18, 2021, unless the Company is acquired prior to that time in a transaction in which the consideration paid by the acquirer is comprised solely of cash, promissory notes, or assumption of indebtedness. Both of our loan and security agreements with Comerica terminated upon our full repayment of all outstanding obligations under the agreements.

In July 2013, in connection with an amendment to a loan and security agreement entered into with Silicon Valley Bank, or SVB, we issued to SVB a warrant to purchase 59,312 shares of our Series D redeemable convertible preferred stock. Upon the funding of an additional tranche of financing, the number of shares exercisable under the warrant increased to 118,624. The warrant has a net exercise provision and contains provisions for the adjustment of the exercise price and the number of shares issuable upon the exercise of the warrant in the event of certain stock dividends, stock splits, reclassifications, exchanges, combinations, substitutions, replacements or other similar events. In addition, the number of shares of common stock issuable upon conversion of the shares of Series D redeemable convertible preferred stock underlying the warrant are subject to adjustment for certain dilutive issuances pursuant to our certificate of incorporation as in effect prior to the completion of this offering. The provision for adjustment upon dilutive issuances is an element of the preferred stock into which the warrant is currently exercisable. Upon the completion of this offering, the warrant will become exercisable for common stock and will no longer be subject to adjustment for dilutive issuances because our common stock is not subject to any provision for adjustment for dilutive issuances. The warrant expires on July 24, 2023. If the warrant has not been exercised prior to July 24, 2023, upon the expiration date the warrant will be deemed to automatically be exercised on a net exercise basis.

Registration and Voting Rights

Upon the completion of this offering, the holders of shares of our common stock, including those issuable upon the conversion of our redeemable convertible preferred stock, are entitled to rights with respect to the registration of these securities under the Securities Act. These rights are provided under the terms of a registration and voting rights agreement between us and certain holders our common stock, Series A redeemable convertible preferred stock, Series B redeemable convertible preferred stock, Series B-2 redeemable convertible preferred stock, Series C redeemable convertible preferred stock, Series D redeemable convertible preferred stock and Series E redeemable convertible preferred stock. The registration rights agreement includes demand registration rights, short-form registration rights and piggyback registration rights. All fees, costs and expenses of underwritten registrations under these agreements will be borne by us and all selling expenses, including underwriting discounts and selling commissions, will be borne by the holders of the shares being registered.

Demand Registration Rights

Beginning 180 days after the completion of this offering, the holders of shares of our common stock are entitled to demand registration rights. Under the terms of the registration and voting rights agreement, we will be required, upon the written request of holders of a majority of these securities, to use our best efforts to file a registration statement and use reasonable, diligent efforts to effect the registration of all or a portion of these shares for public resale. We are required to effect only two registrations pursuant to this provision of the registration rights agreement.

Short-Form Registration Rights

Upon the completion of this offering, the holders of shares of our common stock, including those issuable upon the conversion of our redeemable convertible preferred stock are also entitled to short form registration rights. Pursuant to the registration and voting rights agreement, if we are eligible to file a registration statement on Form S-3, upon the written request of 10% in interest of these holders to sell registrable securities at an aggregate price of at least $1.0 million, we will be required to use our best efforts to effect a registration of such shares. We are required to effect only two registrations in any twelve month period pursuant to this provision of the registration rights agreement.

Piggyback Registration Rights

Upon the completion of this offering, the holders of shares of our common stock, including those issuable upon the conversion of our redeemable convertible preferred stock, are entitled to piggyback registration rights. If we register any of our securities either for our own account or for the account of other security holders, the holders of these shares are entitled to include their shares in the registration. Subject to certain exceptions contained in the registration and voting rights agreement, we and the underwriters may limit the number of shares included in the underwritten offering if the underwriters determine in good faith that marketing factors require a limitation of the number of shares to be underwritten.

Indemnification

Our registration and voting rights agreement contains customary cross-indemnification provisions, under which we are obligated to indemnify holders of registrable securities in the event of material misstatements or omissions in the registration statement attributable to us, and they are obligated to indemnify us for material misstatements or omissions attributable to them.

Expiration of Registration Rights

The demand registration rights and short form registration rights granted under the registration and voting rights agreement will terminate on the seventh anniversary of the completion of this offering.

Right of First Offer

Our registration and voting rights agreement provides certain holders of our capital stock who previously held our Series E redeemable convertible preferred stock prior to the completion of this offering with a right of first offer after March 31, 2016 with respect to any proposed sales of our common stock or securities convertible into or exercisable or exchangeable for, our common stock pursuant to a public offering registered under the Securities Act. This right of first offer entitles such holders to purchase, upon the same terms and conditions as other purchasers in the proposed sale, a percentage of our securities in proportion to the amount of our securities currently held by such holders, subject to certain limitations contained in the registration and voting rights agreement. Such rights will terminate upon the earliest of (i) two years from the closing of this offering, (ii) March 31, 2018, (iii) the time when such holders no longer hold at least 50% of the shares of Series E redeemable convertible preferred stock (or at least 50% of the shares of common stock issued upon conversion of such preferred stock) initially purchased by such holders, and (iv) upon the consummation of a liquidation, merger, consolidation, change in control, or sale of all or substantially all of our assets.

Board Designation Rights

Beginning upon the completion of this offering, certain holders of our capital stock who previously held our Series E redeemable convertible preferred stock prior to the completion of this offering may designate one individual as a nominee to serve on our board of directors, which rights will terminate upon the earliest of (i) two years from the closing of this offering, (ii) the time when such holders no longer hold at least 50% of the shares of Series E redeemable convertible preferred stock (or at least 50% of the shares of common stock issued upon conversion of such preferred stock) initially purchased by such holders, and (iii) upon the consummation of a liquidation, merger, consolidation, change in control, or sale of all or substantially all of our assets.

Anti-Takeover Effects of our Certificate of Incorporation and Bylaws and Delaware Law

Our certificate of incorporation and bylaws include a number of provisions that may have the effect of delaying, deferring or preventing another party from acquiring control of us and encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Board Composition and Filling Vacancies

Our certificate of incorporation provides for the division of our board of directors into three classes serving staggered three-year terms, with one class being elected each year. Our certificate of incorporation also provides that directors may be removed only for cause and then only by the affirmative vote of the holders of % or more of the shares then entitled to vote at an election of directors. Furthermore, any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of our board, may only be filled by the affirmative vote of a majority of our directors then in office even if less than a quorum. The classification of directors, together with the limitations on removal of directors and treatment of vacancies, has the effect of making it more difficult for stockholders to change the composition of our board of directors.

No Written Consent of Stockholders

Our certificate of incorporation provides that all stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting, and that stockholders may not take any action by written consent in lieu of a meeting. This limit may lengthen the amount of time required to take stockholder actions and would prevent the amendment of our bylaws or removal of directors by our stockholders without holding a meeting of stockholders.

Meetings of Stockholders

Our certificate of incorporation and bylaws provide that only a majority of the members of our board of directors then in office may call special meetings of stockholders and only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of stockholders. Our bylaws limit the business that may be conducted at an annual meeting of stockholders to those matters properly brought before the meeting.

Advance Notice Requirements

Our bylaws establish advance notice procedures with regard to stockholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our stockholders. These procedures provide that notice of stockholder proposals must be timely given in writing to our corporate secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary date of the annual meeting for the preceding year. Our bylaws specify the requirements as to form and content of all stockholders' notices. These requirements may preclude stockholders from bringing matters before the stockholders at an annual or special meeting.

Amendment to Certificate of Incorporation and Bylaws

Any amendment of our certificate of incorporation must first be approved by a majority of our board of directors, and if required by law or our certificate of incorporation, must thereafter be approved by a majority of the outstanding shares entitled to vote on the amendment and a majority of the outstanding shares of each class entitled to vote thereon as a class, except that the amendment of the provisions relating to stockholder action, board composition, limitation of liability and the amendment of our bylaws and certificate of incorporation must be approved by not less than 75% of the outstanding shares entitled to vote on the amendment, and not less than 75% of the outstanding shares of each class entitled to vote thereon as a class. Our bylaws may be amended by the affirmative vote of a majority of the directors then in office, subject to any limitations set forth in the bylaws; and may also be amended by the affirmative vote of at least 75% of the outstanding shares entitled to vote on the amendment, or, if our board of directors recommends that the stockholders approve the amendment, by the affirmative vote of the majority of the outstanding shares entitled to vote on the amendment, in each case voting together as a single class.

Undesignated Preferred Stock

Our certificate of incorporation provides for authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of our stockholders, our board of directors could cause shares of preferred stock to be issued without stockholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent stockholder or stockholder group. In this regard, our certificate of incorporation grants our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Section 203 of the Delaware General Corporation Law

Upon completion of this offering, we will be subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this

stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions:

- before the stockholder became interested, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances, but not the outstanding voting stock owned by the interested stockholder; or
- at or after the time the stockholder became interested, the business combination was approved by our board of directors and authorized at an annual or special meeting of the stockholders by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Section 203 defines a business combination to include:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, lease, pledge or other disposition involving the interested stockholder of 10% or more of the assets of the corporation;
- subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;
- subject to exceptions, any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder; and
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

In general, Section 203 defines an interested stockholder as any entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by the entity or person.

Exchange Listing

We have applied to list our common stock on The NASDAQ Global Market under the trading symbol “LIFE.”

Transfer Agent and Registrar

The transfer agent and registrar for our common stock will be . The transfer agent and registrar’s address is .

SHARES ELIGIBLE FOR FUTURE SALE

Prior to this offering, there has been no public market for our shares. Future sales of our common stock in the public market, or the availability of such shares for sale in the public market, could adversely affect market prices prevailing from time to time. As described below, only a limited number of shares will be available for sale shortly after this offering due to contractual and legal restrictions on resale. Nevertheless, sales of our common stock in the public market after such restrictions lapse, or the perception that those sales may occur, could adversely affect the prevailing market price at such time and our ability to raise equity capital in the future.

Based on the number of shares outstanding as of December 31, 2014, upon the completion of this offering, shares of our common stock will be outstanding, assuming no exercise of the underwriters' option to purchase additional shares and no exercise of outstanding options or warrants. Of the outstanding shares, all of the shares sold in this offering will be freely tradable, except that any shares held by our affiliates, as that term is defined in Rule 144 under the Securities Act, may only be sold in compliance with the limitations described below.

As a result of the lock-up agreements described below and the provisions of Rule 144 and Rule 701 under the Securities Act, the shares of our common stock (excluding the shares sold in this offering) that will be available for sale in the public market are as follows:

Date of Availability of Sale	Approximate Number of Shares
As of the date of this prospectus	
90 days after the date of this prospectus	
180 days after the date of this prospectus, although a portion of such shares held by our affiliates will be subject to volume limitations pursuant to Rule 144	

Rule 144

In general, a person who has beneficially owned restricted stock for at least six months would be entitled to sell their securities provided that (i) such person is not deemed to have been one of our affiliates at the time of, or at any time during the 90 days preceding, a sale and (ii) we are subject to the Exchange Act periodic reporting requirements for at least 90 days before the sale. Persons who have beneficially owned restricted shares for at least six months but who are our affiliates at the time of, or any time during the 90 days preceding, a sale, would be subject to additional restrictions, by which such person would be entitled to sell within any three-month period only a number of securities that does not exceed the greater of either of the following:

- 1% of the number of shares then outstanding, which will equal approximately shares immediately after this offering assuming no exercise of the underwriters' option to purchase additional shares, based on the number of shares outstanding as of December 31, 2014; or
- the average weekly trading volume of our common stock on The NASDAQ Global Market during the four calendar weeks preceding the filing of a notice on Form 144 with respect to the sale;

provided, in each case, that we are subject to the Exchange Act periodic reporting requirements for at least 90 days before the sale. Such sales both by affiliates and by non-affiliates must also comply with the manner of sale, current public information and notice provisions of Rule 144.

Rule 701

Rule 701 under the Securities Act, as in effect on the date of this prospectus, permits resales of shares in reliance upon Rule 144 but without compliance with certain restrictions of Rule 144, including the holding period requirement. Most of our employees, executive officers or directors who purchased shares under a written

compensatory plan or contract may be entitled to rely on the resale provisions of Rule 701, but all holders of Rule 701 shares are required to wait until 90 days after the date of this prospectus before selling their shares. However, substantially all Rule 701 shares are subject to lock-up agreements as described below and under "Underwriting" included elsewhere in this prospectus and will become eligible for sale upon the expiration of the restrictions set forth in those agreements.

Lock-Up Agreements

All of our directors and executive officers and substantially all holders of our shares, who collectively hold shares of common stock (including shares of common stock issuable upon the conversion of shares of our redeemable convertible preferred stock), have signed a lock-up agreement which prevents them from selling any of our common stock or any securities convertible into or exercisable or exchangeable for common stock for a period of not less than 180 days from the date of this prospectus without the prior written consent of the representatives, subject to certain exceptions. See "Underwriting."

Rule 10b5-1 Trading Plans

Following the closing of this offering, certain of our officers and directors may adopt written plans, known as Rule 10b5-1 trading plans, in which they will contract with a broker to buy or sell shares of our common stock on a periodic basis to diversify their assets and investments. Under these 10b5-1 trading plans, a broker may execute trades pursuant to parameters established by the officer or director when entering into the plan, without further direction from such officer or director. Such sales would not commence until the expiration of the applicable lock-up agreements entered into by such officer or director in connection with this offering.

Registration Rights

Upon completion of this offering, certain holders of our securities will be entitled to various rights with respect to registration of their shares under the Securities Act. Registration of these shares under the Securities Act would result in these shares becoming fully tradable without restriction under the Securities Act immediately upon the effectiveness of the registration. See "Description of Capital Stock—Registration Rights" for additional information.

Equity Incentive Plans

We intend to file one or more registration statements on Form S-8 under the Securities Act to register our shares issued or reserved for issuance under our equity incentive plans. The first such registration statement is expected to be filed soon after the date of this prospectus and will automatically become effective upon filing with the Securities and Exchange Commission. Accordingly, shares registered under such registration statement will be available for sale in the open market, unless such shares are subject to vesting restrictions with us or the lock-up restrictions described above. As of , 2015, we estimate that such registration statement on Form S-8 will cover approximately shares.

CERTAIN MATERIAL UNITED STATES FEDERAL INCOME TAX CONSIDERATIONS FOR NON-U.S. HOLDERS

The following is a summary of certain material U.S. federal income tax considerations of the ownership and disposition of our common stock to non-U.S. holders (as defined below). It is not intended to be a complete analysis of all the U.S. federal income tax considerations that may be relevant to non-U.S. holders. This summary is based upon the provisions of the Internal Revenue Code, or the Code, Treasury regulations promulgated thereunder, administrative rulings and judicial decisions, all as of the date hereof. These authorities may be changed, possibly with retroactive effect, which may result in U.S. federal income tax consequences different from those set forth below. We have not sought any ruling from the Internal Revenue Service, or IRS, with respect to the statements made and the conclusions reached in the following summary. There can be no assurance that the IRS will agree with such statements and conclusions or that any contrary position taken by the IRS would not be sustained by a court.

This summary also does not address alternative minimum tax consequences, estate or gift tax consequences, or the tax considerations arising under the laws of any foreign, state or local jurisdiction. In addition, this discussion does not address tax considerations applicable to an investor's particular circumstances or to investors that may be subject to special tax rules, including, without limitation:

- banks, insurance companies or other financial institutions;
- tax-exempt organizations;
- an integral part or controlled entity of a foreign sovereign;
- dealers in securities or currencies;
- traders in securities that elect to use a mark-to-market method of accounting for their securities holdings;
- persons that own, or are deemed to own, more than five percent of our capital stock (except to the extent specifically set forth below);
- controlled foreign corporations or passive foreign investment companies
- certain former citizens or long-term residents of the United States;
- persons who hold our common stock as a position in a hedging transaction, "straddle," "conversion transaction" or other risk reduction transaction;
- persons deemed to sell our common stock under the constructive sale provisions of the Code;
- an entity that is treated as a partnership for U.S. federal income tax purposes; or
- persons who hold our common stock other than as a capital asset (generally, an asset held for investment purposes).

If a partnership holds our common stock, the tax treatment of a partner generally will depend on the status of the partner and upon the activities of the partnership. Accordingly, partnerships that hold our common stock, and partners in such partnerships, should consult their tax advisors.

YOU ARE URGED TO CONSULT YOUR TAX ADVISOR WITH RESPECT TO THE APPLICATION OF THE UNITED STATES FEDERAL INCOME TAX LAWS TO YOUR PARTICULAR SITUATION, AS WELL AS ANY TAX CONSEQUENCES OF THE PURCHASE, OWNERSHIP AND DISPOSITION OF OUR COMMON STOCK ARISING UNDER THE UNITED STATES FEDERAL ESTATE OR GIFT TAX RULES OR UNDER THE LAWS OF ANY STATE, LOCAL, FOREIGN OR OTHER TAXING JURISDICTION OR UNDER ANY APPLICABLE TAX TREATY.

Non-U.S. Holder Defined

For purposes of this discussion, a "non-U.S. holder" is a beneficial owner of a share of common stock received that is (i) a foreign corporation, (ii) a nonresident alien individual, or (iii) a foreign trust or a foreign estate that is not subject to United States federal income tax on a net income basis.

Distributions

We have not made any distributions on our common stock and do not plan to make any distributions for the foreseeable future. However, if we do make distributions on our common stock, those payments will constitute dividends for U.S. tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. To the extent those distributions exceed both our current and our accumulated earnings and profits, they will constitute a return of capital and will first reduce your basis in our common stock, but not below zero, and then will be treated as gain from the sale of stock, which will be subject to tax as described in "Gain on Disposition of Common Stock", below.

Any dividend paid to you generally will be subject to U.S. withholding tax either at a rate of 30% of the gross amount of the dividend or such lower rate as may be specified by an applicable income tax treaty. In order to receive a reduced treaty rate, you must provide us with an IRS Form W-8BEN, IRS Form W-8BEN-E, or other appropriate version of IRS Form W-8 or successor form certifying qualification for the reduced rate.

Dividends received by you that are effectively connected with your conduct of a U.S. trade or business and, if required by an applicable income tax treaty, are attributable to a U.S. permanent establishment, are exempt from such withholding tax. In order to obtain this exemption, you must provide us with an IRS Form W-8ECI or successor form properly certifying such exemption. Such effectively connected dividends, although not subject to withholding tax, are taxed at the same graduated rates applicable to U.S. persons, net of certain deductions and credits. In addition, if you are a corporate non-U.S. holder, dividends you receive that are effectively connected with your conduct of a U.S. trade or business may also be subject to a branch profits tax at a rate of 30% or such lower rate as may be specified by an applicable income tax treaty. Non-U.S. holders are urged to consult their tax advisers regarding their entitlement to benefits under an applicable income tax treaty.

If you are eligible for a reduced rate of withholding tax pursuant to a tax treaty, you may obtain a refund of any excess amounts withheld if you file an appropriate claim for refund with the IRS.

Gain on Disposition of Common Stock

Subject to the discussions below regarding backup withholding and FATCA (as defined below), you generally will not be subject to U.S. federal income tax on any gain realized upon the sale or other disposition of our common stock unless:

- the gain is effectively connected with your conduct of a U.S. trade or business and, if required by an applicable income tax treaty, is attributable to a U.S. permanent establishment;
- you are an individual non-U.S. holder who holds our common stock as a capital asset, you are present in the United States for a period or periods aggregating 183 days or more during the calendar year in which the sale or disposition occurs and certain other conditions are met; or
- our common stock constitutes a U.S. real property interest by reason of our status as a "United States real property holding corporation" for U.S. federal income tax purposes, or USRPHC, at any time within the shorter of the five-year period preceding the disposition or your holding period for our common stock.

If you are a non-U.S. holder described in the first bullet above, you will be required to pay tax on the net gain derived from the sale under regular graduated U.S. federal income tax rates. Corporate non-U.S. holders described in the first bullet above may be subject to the branch profits tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty. If you are an individual non-U.S. holder described in the second

bullet above, you will be required to pay a flat 30% tax on the gain derived from the sale, which may be offset by U.S.-source capital losses (even though you are not considered a resident of the United States) provided that you have timely filed a federal income tax return with respect to such losses. You should consult any applicable income tax or other treaties, which may provide different rules.

We believe that we are not currently and will not become a USRPHC. However, because the determination of whether we are a USRPHC depends on the fair market value of our U.S. real property relative to the fair market value of our other business assets, there can be no assurance that we will not become a USRPHC in the future. Even if we become a USRPHC, however, as long as our common stock is regularly traded on an established securities market, such common stock will be treated as U.S. real property interests only if you actually or constructively hold more than five percent of such regularly traded common stock at any time during the shorter of the five-year period preceding the disposition or your holding period for our common stock.

Backup Withholding and Information Reporting

Generally, we must report annually to the IRS the amount of dividends paid to you, your name and address, and the amount of tax withheld, if any. A similar report will be sent to you. Pursuant to applicable income tax treaties or other agreements, the IRS may make these reports available to tax authorities in your country of residence.

Payments of dividends or of proceeds on the disposition of stock made to you may be subject to additional information reporting and backup withholding (currently at a rate of 28%) unless you establish an exemption, for example by properly certifying your non-U.S. status on a Form W-8BEN, Form W-8BEN-E, or another appropriate version of IRS Form W-8 or successor form. Notwithstanding the foregoing, backup withholding and information reporting may apply if the applicable withholding agent has actual knowledge, or reason to know, that you are a U.S. person.

Backup withholding is not an additional tax; rather, the U.S. income tax liability of persons subject to backup withholding will be reduced by the amount of tax withheld. If withholding results in an overpayment of taxes, a refund or credit may be obtained, provided that the required information is furnished to the IRS in a timely manner.

FATCA

Legislation known as the Foreign Account Tax Compliance Act and guidance issued thereunder (together, FATCA) imposes withholding taxes on certain types of payments made to “foreign financial institutions” and certain other non-U.S. entities (including financial intermediaries). FATCA imposes a 30% withholding tax on certain payments of dividends, and, for dispositions that occur on or after January 1, 2017, the gross proceeds from such dispositions of our common stock paid to a foreign financial institution or to certain non-financial foreign entities unless certain certification, information reporting and other specified requirements are met or an exemption applies. Prospective investors should consult their tax advisors regarding FATCA.

UNDERWRITING

We are offering the shares of common stock described in this prospectus through a number of underwriters. J.P. Morgan Securities LLC and Citigroup Global Markets Inc. are acting as joint book-running managers of the offering and as representatives of the underwriters. We have entered into an underwriting agreement with the underwriters. Subject to the terms and conditions of the underwriting agreement, we have agreed to sell to the underwriters, and each underwriter has severally agreed to purchase, at the public offering price less the underwriting discounts and commissions set forth on the cover page of this prospectus, the number of shares of common stock listed next to its name in the following table:

Name	Number of Shares
J.P. Morgan Securities LLC	
Citigroup Global Markets Inc.	
BMO Capital Markets Corp.	
William Blair & Company, L.L.C.	
Total	

The underwriters are committed to purchase all the common shares offered by us if they purchase any shares. The underwriting agreement also provides that if an underwriter defaults, the purchase commitments of non-defaulting underwriters may also be increased or the offering may be terminated.

The underwriters propose to offer the common shares directly to the public at the initial public offering price set forth on the cover page of this prospectus and to certain dealers at that price less a concession not in excess of $ per share. Any such dealers may resell shares of certain brokers or dealers at a discount of up to $ per share from the initial offering price. After the initial offering of the shares to the public, the offering price and other selling terms may be changed by the underwriters. Sales of shares made outside of the United States may be made by affiliates of the underwriters.

The underwriters have an option to buy up to additional shares of common stock from us to cover sales by the underwriters which exceed the number of shares specified in the table above. The underwriters have 30 days from the date of this prospectus to exercise this option to purchase additional shares. If any shares are purchased with this option to purchase additional shares, the underwriters will purchase shares in approximately the same proportion as shown in the table above. If any additional shares of common stock are purchased, the underwriters will offer the additional shares on the same terms as those on which the shares are being offered.

The underwriting fee is equal to the public offering price per share of common stock less the amount paid by the underwriters to us per share of common stock. The underwriting fee is $ per share. The following table shows the per share and total underwriting discounts and commissions to be paid to the underwriters assuming both no exercise and full exercise of the underwriters' option to purchase additional shares.

	Without option to purchase additional shares exercise	With full option to purchase additional shares exercise
Per share	$	$
Total	$	$

We estimate that the total expenses of this offering, including registration, filing and listing fees, printing fees and legal and accounting expenses, but excluding the underwriting discounts and commissions, will be approximately $ million. We have agreed to reimburse the underwriters for expenses of $ relating to the clearance of this offering with the Financial Industry Regulatory Authority.

A prospectus in electronic format may be made available on the web sites maintained by one or more underwriters or selling group members, if any, participating in the offering. The underwriters may agree to

allocate a number of shares to underwriters and selling group members for sale to their online brokerage account holders. Internet distributions will be allocated by the representatives to underwriters and selling group members that may make Internet distributions on the same basis as other allocations.

We have agreed that we will not (i) offer, pledge, announce the intention to sell, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase or otherwise dispose of, directly or indirectly, or file with the Securities and Exchange Commission, or SEC, a registration statement under the Securities Act of 1933, or Securities Act, relating to, any shares of our common stock or securities convertible into or exchangeable or exercisable for any shares of our common stock, or publicly disclose the intention to make any offer, sale, pledge, disposition or filing, or (ii) enter into any swap or other arrangement that transfers all or a portion of the economic consequences associated with the ownership of any shares of common stock or any such other securities (regardless of whether any of these transactions are to be settled by the delivery of shares of common stock or such other securities, in cash or otherwise), in each case without the prior written consent of J.P. Morgan Securities LLC and Citigroup Global Markets Inc. for a period of 180 days after the date of this prospectus (the "restricted period"), other than the shares of our common stock to be sold hereunder and any shares of our common stock issued upon the exercise of options granted under our existing stock-based compensation plans.

Our directors, executive officers and substantially all of our equity holders have entered into lock-up agreements with the underwriters prior to the commencement of this offering pursuant to which each of these persons or entities, with limited exceptions, during the restricted period, may not, without the prior written consent of J.P. Morgan Securities LLC and Citigroup Global Markets Inc., (1) offer, pledge, announce the intention to sell, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, or otherwise transfer or dispose of, directly or indirectly, any shares of our common stock or any securities convertible into or exercisable or exchangeable for our common stock (including, without limitation, common stock or such other securities which may be deemed to be beneficially owned by such directors, executive officers, managers and members in accordance with the rules and regulations of the SEC and securities which may be issued upon exercise of a stock option or warrant) or (2) enter into any swap or other agreement that transfers, in whole or in part, any of the economic consequences of ownership of the common stock or such other securities, whether any such transaction described in clause (1) or (2) above is to be settled by delivery of common stock or such other securities, in cash or otherwise, or (3) make any demand for or exercise any right with respect to the registration of any shares of our common stock or any security convertible into or exercisable or exchangeable for our common stock.

The restrictions described above are subject to certain exceptions, including for (i) transfers by our stockholders of our common stock (or any security convertible into or exercisable or exchangeable for our common stock) pursuant to a bona fide third party tender offer, merger, consolidation or other similar transaction approved by our board of directors and made to all holders of our common stock involving a "change in control" and (ii) the issuance of securities by us in connection with a transaction with an unaffiliated third party that includes a bona fide commercial relationship (including joint ventures, marketing or distribution arrangements, collaboration agreements or intellectual property license agreements) or any acquisition of assets or acquisition of not less than a majority or controlling portion of the equity of another entity, provided that the aggregate number of shares issued shall not exceed 5% of the total number of outstanding shares of common stock immediately following the completion of this offering and provided that the recipient of the securities enters into a lock-up agreement with the underwriters for the remainder of the restricted period.

We have agreed to indemnify the underwriters against certain liabilities, including liabilities under the Securities Act.

We have applied to have our common stock approved for listing/quotation on The NASDAQ Global Market under the symbol "LIFE."

In connection with this offering, the underwriters may engage in stabilizing transactions, which involves making bids for, purchasing and selling shares of common stock in the open market for the purpose of preventing or retarding a decline in the market price of the common stock while this offering is in progress. These stabilizing transactions may include making short sales of the common stock, which involves the sale by the underwriters of a greater number of shares of common stock than they are required to purchase in this offering, and purchasing shares of common stock on the open market to cover positions created by short sales. Short sales may be "covered" shorts, which are short positions in an amount not greater than the underwriters' option to purchase additional shares referred to above, or may be "naked" shorts, which are short positions in excess of that amount. The underwriters may close out any covered short position either by exercising their option to purchase additional shares, in whole or in part, or by purchasing shares in the open market. In making this determination, the underwriters will consider, among other things, the price of shares available for purchase in the open market compared to the price at which the underwriters may purchase shares through the option to purchase additional shares. A naked short position is more likely to be created if the underwriters are concerned that there may be downward pressure on the price of the common stock in the open market that could adversely affect investors who purchase in this offering. To the extent that the underwriters create a naked short position, they will purchase shares in the open market to cover the position.

The underwriters have advised us that, pursuant to Regulation M of the Securities Act of 1933, they may also engage in other activities that stabilize, maintain or otherwise affect the price of the common stock, including the imposition of penalty bids. This means that if the representatives of the underwriters purchase common stock in the open market in stabilizing transactions or to cover short sales, the representatives can require the underwriters that sold those shares as part of this offering to repay the underwriting discount received by them.

These activities may have the effect of raising or maintaining the market price of the common stock or preventing or retarding a decline in the market price of the common stock, and, as a result, the price of the common stock may be higher than the price that otherwise might exist in the open market. If the underwriters commence these activities, they may discontinue them at any time. The underwriters may carry out these transactions on The NASDAQ Global Market, in the over-the-counter market or otherwise.

Prior to this offering, there has been no public market for our common stock. The initial public offering price will be determined by negotiations between us and the representatives of the underwriters. In determining the initial public offering price, we and the representatives of the underwriters expect to consider a number of factors including:

- the information set forth in this prospectus and otherwise available to the representatives;
- our prospects and the history and prospects for the industry in which we compete;
- an assessment of our management;
- our prospects for future earnings;
- the general condition of the securities markets at the time of this offering;
- the recent market prices of, and demand for, publicly traded common stock of generally comparable companies; and
- other factors deemed relevant by the underwriters and us.

Neither we nor the underwriters can assure investors that an active trading market will develop for our common shares, or that the shares will trade in the public market at or above the initial public offering price.

Selling Restrictions

General

Other than in the United States, no action has been taken by us or the underwriters that would permit a public offering of the securities offered by this prospectus in any jurisdiction where action for that purpose is required. The securities offered by this prospectus may not be offered or sold, directly or indirectly, nor may this prospectus or any other offering material or advertisements in connection with the offer and sale of any such securities be distributed or published in any jurisdiction, except under circumstances that will result in compliance with the applicable rules and regulations of that jurisdiction. Persons into whose possession this prospectus comes are advised to inform themselves about and to observe any restrictions relating to the offering and the distribution of this prospectus. This prospectus does not constitute an offer to sell or a solicitation of an offer to buy any securities offered by this prospectus in any jurisdiction in which such an offer or a solicitation is unlawful.

European Economic Area

In relation to each Member State of the European Economic Area (each, a "Relevant Member State"), no offer of shares may be made to the public in that Relevant Member State other than:

- to any legal entity which is a qualified investor as defined in the Prospectus Directive;
- to fewer than 100 or, if the Relevant Member State has implemented the relevant provision of the 2010 PD Amending Directive, 150, natural or legal persons (other than qualified investors as defined in the Prospectus Directive), as permitted under the Prospectus Directive, subject to obtaining the prior consent of the representatives; or
- in any other circumstances falling within Article 3(2) of the Prospectus Directive,

provided that no such offer of shares shall require the Company or the representatives to publish a prospectus pursuant to Article 3 of the Prospectus Directive or supplement a prospectus pursuant to Article 16 of the Prospectus Directive.

Each person in a Relevant Member State who initially acquires any shares or to whom any offer is made will be deemed to have represented, acknowledged and agreed that it is a "qualified investor" within the meaning of the law in that Relevant Member State implementing Article 2(1)(e) of the Prospectus Directive. In the case of any shares being offered to a financial intermediary as that term is used in Article 3(2) of the Prospectus Directive, each such financial intermediary will be deemed to have represented, acknowledged and agreed that the shares acquired by it in the offer have not been acquired on a non-discretionary basis on behalf of, nor have they been acquired with a view to their offer or resale to, persons in circumstances which may give rise to an offer of any shares to the public other than their offer or resale in a Relevant Member State to qualified investors as so defined or in circumstances in which the prior consent of the representatives has been obtained to each such proposed offer or resale.

The Company, the representatives and their affiliates will rely upon the truth and accuracy of the foregoing representations, acknowledgements and agreements.

This prospectus has been prepared on the basis that any offer of shares in any Relevant Member State will be made pursuant to an exemption under the Prospectus Directive from the requirement to publish a prospectus for offers of shares. Accordingly any person making or intending to make an offer in that Relevant Member State of shares which are the subject of the offering contemplated in this prospectus may only do so in circumstances in which no obligation arises for the Company or any of the underwriters to publish a prospectus pursuant to Article 3 of the Prospectus Directive in relation to such offer. Neither the Company nor the underwriters have authorized, nor do they authorize, the making of any offer of shares in circumstances in which an obligation arises for the Company or the underwriters to publish a prospectus for such offer.

For the purpose of the above provisions, the expression "an offer to the public" in relation to any shares in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and the shares to be offered so as to enable an investor to decide to purchase or subscribe the shares, as the same may be varied in the Relevant Member State by any measure implementing the Prospectus Directive in the Relevant Member State and the expression "Prospectus Directive" means Directive 2003/71/EC (including the 2010 PD Amending Directive, to the extent implemented in the Relevant Member States) and includes any relevant implementing measure in the Relevant Member State and the expression "2010 PD Amending Directive" means Directive 2010/73/EU.

United Kingdom

In the United Kingdom, this document is being distributed only to, and is directed only at, and any offer subsequently made may only be directed at persons who are "qualified investors" (as defined in the Prospectus Directive) (i) who have professional experience in matters relating to investments falling within Article 19 (5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005, as amended (the "Order") and/or (ii) who are high net worth companies (or persons to whom it may otherwise be lawfully communicated) falling within Article 49(2)(a) to (d) of the Order (all such persons together being referred to as "relevant persons").

Any person in the United Kingdom that is not a relevant person should not act or rely on the information included in this document or use it as basis for taking any action. In the United Kingdom, any investment or investment activity that this document relates to may be made or taken exclusively by relevant persons. Any person in the United Kingdom that is not a relevant person should not act or rely on this document or any of its contents.

Switzerland

The shares may not be publicly offered in Switzerland and will not be listed on the SIX Swiss Exchange, or the SIX, or on any other stock exchange or regulated trading facility in Switzerland. This document has been prepared without regard to the disclosure standards for issuance prospectuses under art. 652a or art. 1156 of the Swiss Code of Obligations or the disclosure standards for listing prospectuses under art. 27 ff. of the SIX Listing Rules or the listing rules of any other stock exchange or regulated trading facility in Switzerland. Neither this prospectus nor any other offering or marketing material relating to the shares or the offering may be publicly distributed or otherwise made publicly available in Switzerland.

Neither this prospectus nor any other offering or marketing material relating to the offering, the Company, or the shares have been or will be filed with or approved by any Swiss regulatory authority. In particular, this document will not be filed with, and the offer of shares will not be supervised by, the Swiss Financial Market Supervisory Authority FINMA, and the offer of shares has not been and will not be authorized under the Swiss Federal Act on Collective Investment Schemes, or the CISA. The investor protection afforded to acquirers of interests in collective investment schemes under the CISA does not extend to acquirers of shares.

Hong Kong

The shares have not been offered or sold and will not be offered or sold in Hong Kong, by means of any document, other than (a) to "professional investors" as defined in the Securities and Futures Ordinance (Cap. 571) of Hong Kong and any rules made under that Ordinance; or (b) in other circumstances which do not result in the document being a "prospectus" as defined in the Companies Ordinance (Cap. 32) of Hong Kong or which do not constitute an offer to the public within the meaning of that Ordinance. No advertisement, invitation or document relating to the shares has been or may be issued or has been or may be in the possession of any person for the purposes of issue, whether in Hong Kong or elsewhere, which is directed at, or the contents of which are likely to be accessed or read by, the public of Hong Kong (except if permitted to do so under the securities laws of Hong Kong) other than with respect to shares which are or are intended to be disposed of only to persons

outside Hong Kong or only to "professional investors" as defined in the Securities and Futures Ordinance and any rules made thereunder.

Singapore

This prospectus has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, this prospectus and any other document or material in connection with the offer or sale or invitation for subscription or purchase, of shares may not be circulated or distributed, nor may the shares be offered or sold or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor under Section 274 of the Securities and Futures Act, Chapter 289 of Singapore, or SFA, (ii) to a relevant person pursuant to Section 275(1), or any person pursuant to Section 275(1A), and in accordance with the conditions specified in Section 275, of the SFA, or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA.

Where the shares are subscribed or purchased under Section 275 of the SFA by a relevant person which is: (a) a corporation (which is not an accredited investor (as defined in Section 4A of the SFA)) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or (b) a trust (where the trustee is not an accredited investor) whose sole purpose is to hold investments and each beneficiary of the trust is an individual who is an accredited investor, securities (as defined in Section 239(1) of the SFA) of that corporation or the beneficiaries' rights and interest (howsoever described) in that trust shall not be transferred within six months after that corporation or that trust has acquired the shares pursuant to an offer made under Section 275 of the SFA except: (1) to an institutional investor or to a relevant person defined in Section 275(2) of the SFA, or to any person arising from an offer referred to in Section 275(1A) or Section 276(4)(i)(B) of the SFA; (2) where no consideration is or will be given for the transfer; (3) where the transfer is by operation of law; (4) as specified in Section 276(7) of the SFA; or (5) as specified in Regulation 32 of the Securities and Futures (Offers of Investments) (Shares and Debentures) Regulations 2005 of Singapore.

Japan

The shares have not been and will not be registered under the Financial Instruments and Exchange Law of Japan (Law No. 25 of 1948, as amended) and, accordingly, will not be offered or sold, directly or indirectly, in Japan, or for the benefit of any Japanese Person or to others for re-offering or resale, directly or indirectly, in Japan or to any Japanese Person, except in compliance with all applicable laws, regulations and ministerial guidelines promulgated by relevant Japanese governmental or regulatory authorities in effect at the relevant time. For the purposes of this paragraph, "Japanese Person" shall mean any person resident in Japan, including any corporation or other entity organized under the laws of Japan.

Qatar

The shares described in this prospectus have not been, and will not be, offered, sold or delivered, at any time, directly or indirectly in the State of Qatar in a manner that would constitute a public offering. This prospectus has not been, and will not be, registered with or approved by the Qatar Financial Markets Authority or Qatar Central Bank and may not be publicly distributed. This prospectus is intended for the original recipient only and must not be provided to any other person. It is not for general circulation in the State of Qatar and may not be reproduced or used for any other purpose.

Saudi Arabia

No offering, whether directly or indirectly, will be made to an investor in the Kingdom of Saudi Arabia unless such offering is in accordance with the applicable laws of the Kingdom of Saudi Arabia and the rules and regulations of the Capital Market Authority, including the Capital Market Law of the Kingdom of Saudi Arabia. The shares will not be marketed or sold in the Kingdom of Saudi Arabia by us or the underwriters.

This prospectus may not be distributed in the Kingdom of Saudi Arabia except to such persons as are permitted under the Office of Securities Regulation issued by the Capital Market Authority. The Saudi Arabian Capital Market Authority does not make any representation as to the accuracy or completeness of this prospectus and expressly disclaims any liability whatsoever for any loss arising from, or incurred in reliance upon, any part of this prospectus. Prospective purchasers of the shares offered hereby should conduct their own due diligence on the accuracy of the information relating to the shares. If you do not understand the contents of this prospectus, you should consult an authorized financial advisor.

United Arab Emirates

This offering has not been approved or licensed by the Central Bank of the United Arab Emirates (UAE), Securities and Commodities Authority of the UAE or any other relevant licensing authority in the UAE including any licensing authority incorporated under the laws and regulations of any of the free zones established and operating in the territory of the UAE, in particular the Dubai Financial Services Authority (DFSA), a regulatory authority of the Dubai International Financial Centre (DIFC). The offering does not constitute a public offer of securities in the UAE, DIFC or any other free zone in accordance with the Commercial Companies Law, Federal Law No. 8 of 1984 (as amended), DFSA Offered Securities Rules and NASDAQ Dubai Listing Rules, accordingly, or otherwise. The shares may not be offered to the public in the UAE or any of the free zones.

The shares may be offered and issued only to a limited number of investors in the UAE or any of its free zones who qualify as sophisticated investors under the relevant laws and regulations of the UAE or the free zone concerned.

Certain of the underwriters and their affiliates have provided in the past to us and our affiliates and may provide from time to time in the future certain commercial banking, financial advisory, investment banking and other services for us and such affiliates in the ordinary course of their business, for which they have received and may continue to receive customary fees and commissions. In addition, from time to time, certain of the underwriters and their affiliates may effect transactions for their own account or the account of customers, and hold on behalf of themselves or their customers, long or short positions in our debt or equity securities or loans, and may do so in the future.

LEGAL MATTERS

The validity of the shares of common stock offered by this prospectus will be passed upon for us by Goodwin Procter LLP, San Francisco, California. Certain legal matters will be passed upon for the underwriters by Davis Polk & Wardwell LLP, Menlo Park, California.

EXPERTS

Ernst & Young LLP, independent registered public accounting firm, has audited our consolidated financial statements at December 31, 2013 and 2014 and for each of the two years in the period ended December 31, 2014, as set forth in their report. We have included our financial statements in the prospectus and elsewhere in the registration statement in reliance on Ernst & Young LLP's report, given on their authority as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We have filed with the Securities and Exchange Commission, or SEC, a registration statement on Form S-1 (File Number 333-) under the Securities Act of 1933, or the Securities Act, with respect to the common stock we are offering by this prospectus. This prospectus does not contain all of the information included in the registration statement. For further information pertaining to us and our common stock, you should refer to the registration statement and to its exhibits. Whenever we make reference in this prospectus to any of our contracts, agreements or other documents, the references are not necessarily complete, and you should refer to the exhibits attached to the registration statement for copies of the actual contract, agreement or other document.

Upon the completion of the offering, we will be subject to the informational requirements of the Securities Exchange Act of 1934, or the Exchange Act, and will file annual, quarterly and current reports, proxy statements and other information with the SEC. You can read our SEC filings, including the registration statement, over the Internet at the SEC's website at www.sec.gov. You may also read and copy any document we file with the SEC at its public reference facility at 100 F Street, N.E., Room 1580, Washington, D.C. 20549. We also maintain a website at www.atyrpharma.com. Upon completion of the offering, you may access, free of charge, our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendment to those reported filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after such material is electronically filed with, or furnished to, the SEC.

You may also obtain copies of the documents at prescribed rates by writing to the Public Reference Section of the SEC at 100 F Street, N.E., Washington, D.C. 20549. Please call the SEC at 1-800-SEC-0330 for further information on the operation of the public reference facilities.

aTyr Pharma, Inc.

Index to Consolidated Financial Statements

Report of Independent Registered Public Accounting Firm

The Board of Directors and Stockholders of
aTyr Pharma, Inc.

We have audited the accompanying consolidated balance sheets of aTyr Pharma, Inc. as of December 31, 2013 and 2014, and the related consolidated statements of operations, redeemable convertible preferred stock and stockholders' equity (deficit) and cash flows for the years then ended. These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. We were not engaged to perform an audit of the Company's internal control over financial reporting. Our audits included consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, and evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the consolidated financial position of aTyr Pharma, Inc. at December 31, 2013 and 2014, and the consolidated results of its operations and its cash flows for the years then ended, in conformity with U.S. generally accepted accounting principles.

/s/ Ernst & Young LLP

San Diego, California
April 3, 2015

aTyr Pharma, Inc.

Consolidated Balance Sheets
(in thousands, except share and per share data)

	December 31,		Pro Forma December 31,
	2013	2014	2014
			(unaudited)
Assets			
Current assets:			
Cash and cash equivalents	$ 36,457	$ 13,899	
Investment securities	-	1,954	
Prepaid expenses and other assets	564	656	
Total current assets	37,021	16,509	
Property and equipment, net	2,505	1,925	
Other assets	260	2,210	
Total assets	$ 39,786	$ 20,644	
Liabilities, Redeemable Convertible Preferred Stock and Stockholders' Equity (Deficit)			
Current liabilities:			
Accounts payable	$ 1,055	$ 1,433	
Accrued expenses	2,941	2,932	
Current portion of deferred rent	276	295	
Current portion of commercial bank debt	728	3,134	
Current portion of convertible promissory note	-	2,000	
Preferred stock warrant liabilities	207	319	$ -
Total current liabilities	5,207	10,113	
Deferred rent, net of current portion	741	445	
Commercial bank debt, net of current portion	4,158	5,142	
Convertible promissory note	2,000	-	
Other long-term liabilities	597	335	
Commitments and contingencies (Note 6)			
Redeemable convertible preferred stock, $0.001 par value; authorized shares - 75,772,871 at December 31, 2013 and 2014; issued and outstanding shares - 73,487,415 at December 31, 2013 and 2014; liquidation preference of $95,619 at December 31, 2013 and 2014; no shares issued and outstanding, pro forma (unaudited)	93,165	95,619	-
Stockholders' equity (deficit):			
Common stock, $0.001 par value; authorized shares - 94,000,000 at December 31, 2013 and 95,500,000 at December 31, 2014; issued and outstanding - 6,813,699 shares and 7,237,571 shares at December 31, 2013 and 2014, respectively; 80,724,986 shares issued and outstanding, pro forma (unaudited)	7	7	81
Additional paid-in capital	17,367	19,203	115,067
Stockholder note receivable	(69)	(69)	(69)
Accumulated deficit	(85,801)	(110,151)	(110,151)
Total stockholders' equity (deficit) of aTyr Pharma, Inc.	(68,496)	(91,010)	4,928
Noncontrolling interest	2,414	-	-
Total stockholders' equity (deficit)	(66,082)	(91,010)	$ 4,928
Total liabilities, redeemable convertible preferred stock and stockholders' equity (deficit)	$ 39,786	$ 20,644	

See accompanying notes.

aTyr Pharma, Inc.

Consolidated Statements of Operations
(in thousands, except share and per share data)

	Years Ended December 31,	
	2013	**2014**
Operating expenses:		
Research and development	$ 13,832	$ 16,777
General and administrative	5,710	6,777
Total operating expenses	19,542	23,554
Loss from operations	(19,542)	(23,554)
Other income (expense):		
Interest expense, net	(444)	(832)
Change in fair value of warrant liabilities	(28)	36
Total other income (expense)	(472)	(796)
Net loss	(20,014)	(24,350)
Accretion to redemption value of redeemable convertible preferred stock	(1,637)	(416)
Net loss attributable to common stockholders	$ (21,651)	$ (24,766)
Net loss per share attributable to common stockholders, basic and diluted	$ (3.57)	$ (3.73)
Weighted average shares outstanding, basic and diluted	6,067,342	6,635,778
Pro forma net loss per share attributable to common stockholders, basic and diluted (unaudited)		$ (0.30)
Pro forma weighted average shares outstanding, basic and diluted (unaudited)		80,123,193

See accompanying notes.

aTyr Pharma, Inc.

Consolidated Statements of Redeemable Convertible Preferred Stock and Stockholders' Equity (Deficit)
(in thousands, except share data)

	Redeemable Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Stockholder Note Receivable	Accumulated Deficit	Non-Controlling Interest	Total Stockholders' Equity (Deficit)
	Shares	Amount	Shares	Amount					
Balance at December 31, 2012	55,211,585	$ 63,225	6,275,574	$ 6	$ -	$ (69)	$ (64,516)	$ 25	$ (64,554)
Issuance of Series D redeemable convertible preferred stock for cash	14,504,841	36,683	-	-	-	-	-	2,431	2,431
Issuance of Series D redeemable convertible preferred stock for conversion of debt and accrued interest	3,770,989	9,537	-	-	-	-	-	-	-
Series D redeemable convertible preferred stock issuance costs	-	(389)	-	-	-	-	-	(65)	(65)
Exercise of common stock options	-	-	538,125	1	53	-	-	23	77
Vested shares related to repurchase liability, net	-	-	-	-	(3)	-	-	-	(3)
Stock-based compensation	-	-	-	-	155	-	-	-	155
Accretion to redemption value of redeemable convertible preferred stock	-	1,637	-	-	(366)	-	(1,271)	-	(1,637)
Capital contribution related to reversal of historical accretion of redeemable convertible preferred stock	-	(17,528)	-	-	17,528	-	-	-	17,528
Net loss	-	-	-	-	-	-	(20,014)	-	(20,014)
Balance at December 31, 2013	73,487,415	93,165	6,813,699	7	17,367	(69)	(85,801)	2,414	(66,082)
Exercise of common stock options	-	-	423,872	-	43	-	-	29	72
Vested shares related to repurchase liability	-	-	-	-	13	-	-	-	13
Stock-based compensation	-	-	-	-	1,791	-	-	-	1,791
Dissolution of Affiliates	-	2,038	-	-	405	-	-	(2,443)	(2,038)
Accretion to redemption value of redeemable convertible preferred stock	-	416	-	-	(416)	-	-	-	(416)
Net loss	-	-	-	-	-	-	(24,350)	-	(24,350)
Balance at December 31, 2014	73,487,415	$ 95,619	7,237,571	$ 7	$ 19,203	$ (69)	$ (110,151)	$ -	$ (91,010)

See accompanying notes.

aTyr Pharma, Inc.

Consolidated Statements of Cash Flows
(in thousands)

	Years Ended December 31,	
	2013	**2014**
Cash flows from operating activities		
Net loss	$(20,014)	$(24,350)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	714	829
Stock-based compensation	155	1,791
Amortization of debt discount	211	426
Change in fair value of preferred stock warrant liability	28	(36)
Amortization of investment premium (discount)	-	43
Deferred rent	(254)	(277)
Changes in assets and liabilities:		
Prepaid expenses and other assets	323	(1,043)
Accounts payable and accrued expenses	1,526	(207)
Net cash used in operating activities	(17,311)	(22,824)
Cash flows from investing activities		
Purchase of property and equipment	(644)	(249)
Purchases of investment securities	-	(5,397)
Maturities of investment securities	-	3,400
Net cash used in investing activities	(644)	(2,246)
Cash flows from financing activities		
Issuance of preferred stock for cash, net of issuance costs	38,660	-
Proceeds from stock option exercises	77	72
Proceeds from commercial bank debt	5,000	5,000
Repayment of commercial bank debt	(2,500)	(1,561)
Proceeds from convertible debt	10,000	-
Repayment of convertible debt	(500)	-
Costs paid in connection with initial public offering	-	(999)
Net cash provided by financing activities	50,737	2,512
Net increase (decrease) in cash and cash equivalents	32,782	(22,558)
Cash at beginning of period	3,675	36,457
Cash at end of period	$ 36,457	$ 13,899
Supplemental disclosure of cash flow information		
Interest paid	$ 254	$ 415
Supplemental schedule of noncash investing and financing activities		
Issuance of warrants in connection with long-term debt	$ 137	$ 148
Change in unvested share liability	$ (3)	$ 13
Capital contribution related to reversal of historical accretion of redeemable convertible preferred stock	$ 17,528	$ -
Conversion of convertible debt and accrued interest	$ 9,537	$ -

See accompanying notes.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements

1. Organization, Business and Basis of Presentation

Organization and Business

aTyr Pharma, Inc. (the Company) was incorporated in the state of Delaware on September 8, 2005. The Company is focused on the discovery and clinical development of innovative medicines for patients suffering from severe rare diseases.

Principles of Consolidation

The consolidated financial statements include the accounts of aTyr Pharma, Inc., its 98% majority-owned subsidiary in Hong Kong, Pangu BioPharma Limited (Pangu BioPharma), and six variable interest entities (Affiliates), in which aTyr Pharma, Inc. was considered to be the primary beneficiary (see Note 3). The Affiliates were dissolved in the fourth quarter of 2014. All intercompany transactions and balances are eliminated in consolidation.

Liquidity

The Company has a limited operating history and the revenue and income potential of the Company's business and market are unproven. The Company has experienced net losses and negative cash flows from operating activities since its inception. The Company expects to continue to incur net losses and negative cash flows from operating activities into the foreseeable future. Successful transition to attaining profitable operations is dependent upon achieving a level of revenues adequate to support the Company's cost structure.

The Company plans to continue to fund its losses from operations and capital funding needs through public or private equity or debt financings or other sources. If the Company is not able to secure adequate additional funding, the Company may be forced to make reductions in spending, extend payment terms with suppliers, liquidate assets where possible, or suspend or curtail planned programs. Any of these actions could materially harm the Company's business, results of operations and future prospects.

Use of Estimates

The Company's consolidated financial statements are prepared in accordance with accounting principles generally accepted in the United States (GAAP). The preparation of the Company's consolidated financial statements requires it to make estimates and assumptions that impact the reported amounts of assets, liabilities and expenses and the disclosure of contingent assets and liabilities in the Company's consolidated financial statements and accompanying notes. The most significant estimates in the Company's consolidated financial statements relate to the fair value of equity awards and research and development expense accruals. Although these estimates are based on the Company's knowledge of current events and actions it may undertake in the future, actual results may ultimately materially differ from these estimates and assumptions.

Unaudited Pro Forma Balance Sheet Information

The unaudited pro forma balance sheet information as of December 31, 2014 assumes the conversion of all outstanding shares of redeemable convertible preferred stock into 73,487,415 shares of the Company's common stock and the related reclassification of the carrying value of the redeemable convertible preferred stock and warrant liabilities to additional paid-in capital upon completion of the Company's initial public offering (IPO). Shares of common stock issued in such IPO and any related net proceeds are excluded from the pro forma information.

Segment Reporting

Operating segments are identified as components of an enterprise about which separate discrete financial information is available for evaluation by the chief operating decision-maker in making decisions regarding resource allocation and assessing performance. The Company views its operations and manages its business in one operating segment.

2. Summary of Significant Accounting Policies

Cash and Cash Equivalents

Cash and cash equivalents consists primarily of readily available checking, money market accounts and money market funds. The Company considers all highly liquid investments that have maturities of three months or less when purchased to be cash equivalents.

Investment Securities

Investment securities primarily consist of investment grade corporate debt securities and commercial paper. The Company classifies all investment securities as available-for-sale and as current assets, as the sale of such securities may be required prior to maturity to execute management strategies. Investment securities are carried at fair value, with the unrealized gains and losses, if any, reported as a component of other comprehensive income (loss) in stockholders' equity (deficit) until realized. Realized gains and losses from the sale of investment securities, if any, are determined on a specific identification basis. A decline in the market value of any investment security below cost that is determined to be other than temporary will result in an impairment charge to earnings and a new cost basis for the security is established. No such impairment charges were recorded for any period presented. Premiums and discounts are amortized or accreted over the life of the related security as an adjustment to yield using the straight-line method and are included in interest income. Interest income is recognized when earned. As of December 31, 2013 the Company had no investment securities. As of December 31, 2014, the Company held $2.0 million of corporate debt securities, all of which mature in less than three months, and there was no difference between the amortized cost and fair value of these investment securities.

Concentration of Credit Risk

Financial instruments that potentially subject the Company to significant concentration of credit risk consist primarily of cash, cash equivalents and investment securities. The Company has established guidelines regarding diversification of investments and their maturities, which are designed to maintain principal and maximize liquidity. The Company maintains deposits in federally insured financial institutions in excess of federally insured limits. The Company has not experienced any losses in such accounts and management believes that the Company is not exposed to significant credit risk due to the financial position of the depository institutions in which those deposits are held.

Property and Equipment

Property and equipment are stated at cost and depreciated on a straight-line basis over the estimated useful life of the related assets (generally three to seven years). Leasehold improvements are stated at cost and amortized on a straight-line basis over the lesser of the remaining term of the related lease or the estimated useful life of the leasehold improvements. Repairs and maintenance costs are charged to expense as incurred.

Impairment of Long-Lived Assets

Long-lived assets consist primarily of property and equipment. An impairment loss is recorded if and when events and circumstances indicate that assets might be impaired and the undiscounted cash flows estimated to be generated by those assets are less than the carrying amount of those assets. While the Company's current and historical operating losses and negative cash flows from operations are indicators of impairment, management believes that future cash flows to be received support the carrying value of its long-lived assets and, accordingly, has not recognized any impairment losses since inception.

Accrued Expenses

As part of the process of preparing its consolidated financial statements, the Company is required to estimate its accrued expenses, including accrued research and development expenses for fees paid to investigative sites and CROs in connection with clinical trials; service providers in connection with preclinical development activities; service providers related to product manufacturing; and other professional services. The accrual process involves reviewing open contracts and purchase orders, communicating with its personnel to identify services that have been performed on its behalf and estimating the level of service performed and the associated cost incurred for the service when the Company has not yet been invoiced or otherwise notified of the actual cost. The Company makes estimates of its accrued expenses as of each balance sheet date in its consolidated financial statements based on facts and circumstances known to it at that time. Although the Company does not expect its estimates to be materially different from amounts actually incurred, if its estimates of the status and timing of services performed differs from the actual status and timing of services performed, it may report amounts that are too high or too low in any particular period.

Deferred Rent

Rent expense, including the value of tenant improvement allowances received, is recorded on a straight-line basis over the term of the lease. The difference between rent expense and amounts paid under the lease agreements is recorded as deferred rent in in the accompanying consolidated balance sheets.

Preferred Stock Warrant Liabilities

The Company has issued freestanding warrants to purchase shares of its Series B, Series C and Series D redeemable convertible preferred stock. Since the underlying redeemable convertible preferred stock is classified outside of permanent equity, these warrants are classified as liabilities in the accompanying consolidated balance sheets. The Company adjusts the carrying value of such warrants to their estimated fair value at each reporting date, with any related increase or decrease in the fair value recorded as an increase or decrease to other income (expense) in the consolidated statements of operations. The warrant liabilities will continue to be adjusted to fair value until such time as the warrants are no longer outstanding or the underlying securities are no longer redeemable outside the control of the Company, including at the completion of the IPO.

Research and Development Costs

Research and development costs are expensed as incurred. Research and development costs include: salaries and employee-related expenses, including stock-based compensation and benefits for personnel in research and product development functions; costs associated with conducting our preclinical, development and regulatory activities, including fees paid to third-party professional consultants, service providers and our scientific, therapeutic and clinical advisory board; costs to acquire, develop and manufacture preclinical study and clinical trial materials; costs incurred under clinical trial agreements with clinical research organizations and investigative sites; costs for laboratory supplies; payments related to licensed products and technologies; allocated facilities and information technology costs; and depreciation.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

Patent Costs

Costs related to filing and pursuing patent applications are recorded as general and administrative expense and expensed as incurred since recoverability of such expenditures is uncertain.

Stock-Based Compensation

Stock-based compensation expense represents the cost of the grant date fair value of employee stock option grants recognized over the requisite service period of the awards (usually the vesting period) on a straight-line basis, net of estimated forfeitures. For stock option grants with performance-based milestones, the expense is recorded over the service period after the achievement of the milestone is probable or the performance condition is achieved. The Company accounts for stock options granted to non-employees using the fair value approach. These option grants are subject to periodic revaluation over their vesting terms. The Company estimates the fair value of employee and non-employee stock option grants using the Black-Scholes option pricing model.

Income Taxes

The Company accounts for income taxes under the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements. Under this method, deferred tax assets and liabilities are determined on the basis of the differences between the financial statements and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. The effect of a change in tax rates on deferred tax assets and liabilities is recognized as income in the period that includes the enactment date.

The Company recognizes net deferred tax assets to the extent that the Company believes these assets are more likely than not to be realized. In making such a determination, management considers all available positive and negative evidence, including future reversals of existing taxable temporary differences, projected future taxable income, tax-planning strategies and results of recent operations. If management determines that the Company would be able to realize its deferred tax assets in the future in excess of their net recorded amount, management would make an adjustment to the deferred tax asset valuation allowance, which would reduce the provision for income taxes.

The Company records uncertain tax positions on the basis of a two-step process whereby (1) management determines whether it is more likely than not that the tax positions will be sustained on the basis of the technical merits of the position and (2) for those tax positions that meet the more-likely-than-not recognition threshold, management recognizes the largest amount of tax benefit that is more than 50% likely to be realized upon ultimate settlement with the related tax authority. The Company recognizes interest and penalties related to unrecognized tax benefits within income tax expense. Any accrued interest and penalties are included within the related tax liability.

In July 2013, the Financial Accounting Standards Board (FASB) issued guidance that requires an unrecognized tax benefit, or a portion of an unrecognized tax benefit, to be presented in the financial statements as a reduction to a deferred tax asset for a net operating loss carryforward, a similar tax loss, or a tax credit carryforward, unless an exception applies. The guidance is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2013. The Company early adopted this guidance for the year ended December 31, 2013, which is reflected in the financial statements as of and for the year ended December 31, 2013. There was no material impact on the financial statements upon adoption.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

Comprehensive Loss

Comprehensive loss is defined as a change in equity during a period from transactions and other events and circumstances from non-owner sources. Net loss and comprehensive loss were the same for all periods presented.

Net Loss Per Share

Basic net loss per share is calculated by dividing the net loss attributable to common stockholders by the weighted average number of common shares outstanding for the period, without consideration for common stock equivalents and adjusted for the weighted average number of common shares outstanding that are subject to repurchase. The Company has excluded weighted average shares subject to repurchase of 609,185 shares and 488,833 shares from the weighted average number of common shares outstanding for the years ended December 31, 2013 and 2014, respectively. Diluted net loss per share attributable to common stockholders is calculated by dividing the net loss attributable to common stockholders by the weighted average number of common stock equivalents outstanding for the period determined using the treasury-stock method. Dilutive common stock equivalents are comprised of redeemable convertible preferred stock, warrants for the purchase of redeemable convertible preferred stock and options outstanding under the Company's stock option plan. For all periods presented, there is no difference in the number of shares used to calculate basic and diluted shares outstanding due to the Company's net loss position.

Potentially dilutive securities not included in the calculation of diluted net loss per share because to do so would be anti-dilutive are as follows:

	December 31,	
	2013	2014
Redeemable convertible preferred stock outstanding	73,487,415	73,487,415
Redeemable convertible preferred stock issuable upon conversion of convertible promissory note	751,314	751,314
Warrants for redeemable convertible preferred stock	147,269	206,581
Common stock options	6,531,417	12,047,225
	80,917,415	86,492,535

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

Unaudited Pro Forma Net Loss Per Share

The following table summarizes the Company's unaudited pro forma net loss per share (in thousands, except share and per share data):

	Year Ended December 31, 2014 (unaudited)
Numerator:	
Net loss attributable to common stockholders	$ (24,766)
Change in fair value of warrant liabilities	(36)
Accretion to redemption value of redeemable convertible preferred stock	416
Pro forma net loss attributable to common stockholders	$ (24,386)
Denominator:	
Weighted average shares outstanding, basic and diluted	6,635,778
Pro forma adjustments to reflect assumed weighted average effect of conversion of redeemable convertible preferred stock	73,487,415
Pro forma weighted average shares outstanding, basic and diluted	80,123,193
Pro forma net loss per share attributable to common stockholders, basic and diluted	$ (0.30)

Recent Accounting Pronouncements

In June 2014, the FASB issued ASU No. 2014-10, *Development Stage Entities (Topic 915) Elimination of Certain Financial Reporting Requirements, Including an Amendment to Variable Interest Entities Guidance in Topic 810, Consolidation*. This ASU does the following, among other things: (1) eliminates the requirement to present inception-to-date information on the statements of income, cash flows, and stockholders' equity; (2) eliminates the need to label the financial statements as those of a development stage entity; (3) eliminates the need to disclose a description of the development stage activities in which the entity is engaged; and (4) amends FASB ASC 275, *Risks and Uncertainties*, to clarify that information on risks and uncertainties for entities that have not commenced planned principal operations is required. The amendments in ASU No. 2014-10 related to the elimination of Topic 915 disclosures and the additional disclosure for Topic 275 are effective for public companies for annual and interim reporting periods beginning after December 15, 2014. Early adoption is permitted. The Company has early adopted this new guidance in its consolidated financial statements for the year ended December 31, 2013, and therefore has not labeled its consolidated financial statements as those of a development stage entity or included the previously required inception-to-date information.

In August 2014, the FASB issued ASU 2014-15, *Disclosure of Uncertainties about an Entity's Ability to Continue as a Going Concern*. ASU 2014-15 requires management to evaluate relevant conditions, events and certain management plans that are known or reasonably knowable that when, considered in the aggregate, raise substantial doubt about the entity's ability to continue as a going concern within one year after the date that the consolidated financial statements are issued, for both annual and interim periods. ASU 2014-15 also requires certain disclosures around management's plans and evaluation, as well as the plans, if any, that are intended to mitigate those conditions or events that will alleviate the substantial doubt. ASU 2014-15 is effective for fiscal years ending after December 15, 2016. The Company is currently evaluating the impact that the adoption of ASU 2014-15 will have on its consolidated financial statements and related disclosures.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

3. Affiliates

In October and November 2011, the Company established the Affiliates to perform research and development for specified programs. In April 2012, the Company purchased preferred and common stock of each Affiliate and subsequently issued those shares to each of the Company shareholders in the form of dividends, in proportion to their relative holdings of aTyr Pharma, Inc., in order to effectuate the spin-out of the Affiliates into stand-alone entities. The Company and each Affiliate entered into nonexclusive license agreements allowing each of the six Affiliates to utilize certain intellectual property owned by the Company. The Company and each Affiliate also entered into research and development services agreements in the Company's therapeutic program area of interest covered by the respective nonexclusive license agreement. The working capital of the Affiliates was primarily provided by amounts borrowed from aTyr Pharma, Inc. under convertible promissory note agreements. The Affiliates were not capitalized with sufficient equity to finance their operations and were therefore each considered a variable interest entity, or VIE. In May 2012, the Affiliates commenced operations. The Affiliates have no employees and substantially all of their expenses relate to the services provided to them by aTyr Pharma, Inc. The expenses related to services provided by aTyr Pharma, Inc. are eliminated in consolidation. The liquidation preference structure underlying the preferred stock issued by the Affiliates and the convertible promissory notes issued by the Affiliates to aTyr Pharma, Inc. in exchange for cash effectively protected the Affiliate stockholders from absorbing the losses of the Affiliates and, as a result, no losses were allocated to these noncontrolling interests and such losses were included in the consolidated net loss of the Company. None of the related parties to the Affiliates individually had the power and benefits to control the Affiliates. aTyr Pharma, Inc. is the related party that is most closely associated with the Affiliates and therefore is considered to be the primary beneficiary, and has consolidated the six Affiliates for financial reporting purposes.

In the fourth quarter of 2014, the board of directors and stockholders of each of the Affiliates approved the dissolution of each applicable Affiliate in accordance with the laws of its respective jurisdiction of organization. In connection with the dissolution of the Affiliates, the license and operating agreements by and between aTyr Pharma, Inc. and each Affiliate were terminated. The Company's consolidated financial statements for periods after the effectiveness of the dissolution of the Affiliates no longer include a noncontrolling interest, and the operating activities that the Affiliates performed prior to dissolution will be continued by aTyr Pharma, Inc. The carrying value of the noncontrolling interest was reclassified to the redeemable convertible preferred stock and stockholders' equity (deficit) of aTyr Pharma, Inc. upon dissolution.

From May 2012 through December 2014, the Company provided research and development and management services to the six Affiliates through utilization of its employees, equipment, and facilities. In addition, the Company provided financial support through loans to the Affiliates.

The aggregate carrying amount and classification of the Affiliates' assets and liabilities were as follows (in thousands):

	December 31, 2013
Cash and cash equivalents	$ 1,914
Total assets of Affiliates	$ 1,914
Amounts due to aTyr Pharma, Inc.	$ 12,864
Total liabilities of Affiliates	$ 12,864

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

The aggregate statements of operations and statements of cash flows of the Affiliates are as follows (in thousands):

	Years Ended December 31,	
	2013	2014
Operating expenses	$(8,856)	$(7,193)
Other expense	(18)	(33)
Net loss of Affiliates	$(8,874)	$(7,226)
Cash used in operating activities	$(8,861)	$(7,193)
Cash provided by financing activities – aTyr Pharma, Inc.	8,047	5,250
Cash provided by financing activities – issuance of common and preferred stock of Affiliates	2,388	29
Increase (decrease) in cash and cash equivalents of Affiliates	$ 1,574	$(1,914)

4. Balance Sheet Details

Property and equipment consist of the following (in thousands):

	December 31,	
	2013	2014
Computer and office equipment	$ 364	$ 372
Scientific and laboratory equipment	2,607	2,848
Tenant improvements	1,668	1,668
	4,639	4,888
Less accumulated depreciation and amortization	(2,134)	(2,963)
	$ 2,505	$ 1,925

Accrued expenses consist of the following (in thousands):

	December 31,	
	2013	2014
Compensation and benefits	$1,533	$ 684
Other accrued expenses	1,408	2,248
	$2,941	$2,932

5. Fair Value Measurements

The carrying amounts of cash equivalents, prepaid and other assets, accounts payable and accrued liabilities are considered to be representative of their respective fair values because of the short-term nature of those instruments. Based on the borrowing rates currently available to the Company for loans with similar terms, which is considered a Level 2 input, the Company believes that the fair value of its commercial bank debt and convertible promissory notes approximate their carrying values. Investment securities and preferred stock warrant liabilities are recorded at fair value.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

The accounting guidance defines fair value, establishes a consistent framework for measuring fair value and expands disclosure for each major asset and liability category measured at fair value on either a recurring or nonrecurring basis. Fair value is defined as an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability. As a basis for considering such assumptions, the accounting guidance establishes a three-tier fair value hierarchy, which prioritizes the inputs used in measuring fair value as follows:

Level 1: Observable inputs such as quoted prices in active markets.

Level 2: Inputs, other than the quoted prices in active markets that are observable either directly or indirectly.

Level 3: Unobservable inputs in which there is little or no market data, which require the reporting entity to develop its own assumptions.

Financial assets measured at fair value on a recurring basis consist of investment securities. Investment securities are recorded at fair value, defined as the exit price in the principal market in which the Company would transact, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. Level 2 securities are valued using quoted market prices for similar instruments, non-binding market prices that are corroborated by observable market data, or discounted cash flow techniques and include the Company's investments in corporate debt securities and commercial paper. Financial liabilities measured at fair value on a recurring basis include the Company's preferred stock warrant liabilities. None of the Company's non-financial assets and liabilities are recorded at fair value on a non-recurring basis. No transfers between levels have occurred during the periods presented.

Assets and liabilities measured at fair value on a recurring basis are as follows (in thousands):

		Fair Value Measurements Using		
		Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
As of December 31, 2014:				
Assets:				
Corporate debt securities	$1,954	$ -	$1,954	$ -
Liabilities:				
Preferred stock warrant liabilities	$ 319	$ -	$ -	$ 319
As of December 31, 2013:				
Liabilities:				
Preferred stock warrant liabilities	$ 207	$ -	$ -	$ 207

All warrant liabilities are recorded at fair value utilizing the Black-Scholes option pricing model using significant unobservable inputs consistent with the inputs used for the Company's stock-based compensation expense adjusted for the warrants' expected life.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

The following table provides a reconciliation of all liabilities measured at fair value using Level 3 significant unobservable inputs (in thousands):

	Warrant Liabilities
Balance at December 31, 2012	$ 42
Issuance of preferred stock warrants	137
Increase in fair value of warrant liabilities	28
Balance at December 31, 2013	207
Issuance of preferred stock warrants	148
Decrease in fair value of warrant liabilities	(36)
Balance at December 31, 2014	$ 319

6. Debt, Commitments and Contingencies

Commercial Bank Debt

Commercial bank debt and unamortized discount balances are as follows (in thousands):

	December 31,	
	2013	2014
Commercial bank debt	$5,000	$ 8,439
Less debt discount, net of current portion	(61)	(60)
Commercial bank debt, net of debt discount	4,939	8,379
Less current portion of commercial bank debt	(781)	(3,237)
Commercial bank debt, net of current portion	$4,158	$ 5,142
Current portion of commercial bank debt	$ 781	$ 3,237
Current portion of debt discount	(53)	(103)
Current portion of commercial bank debt	$ 728	$ 3,134

In each of April 2012 and August 2012, the Company borrowed $1.25 million under a loan and security agreement with Silicon Valley Bank (SVB Loan), at fixed interest rates of 4.89% and 4.85%, respectively. The Company was obligated to make interest-only payments through December 2012 and, beginning in December 2013, equal monthly payments of principal and interest through the maturity date in December 2015. The SVB Loan was amended in July 2013 to increase the available credit under the agreement to $10.0 million. In July 2013, the Company borrowed $5.0 million under the SVB Loan at a fixed interest rate of 5.0% and received $2.9 million of cash proceeds after repayment of the existing principal balance and related accrued interest and fees. In June 2014, the Company borrowed the remaining $5.0 million of available credit at a fixed interest rate of 5.88% and, subsequent to June 2014, had no available credit under the SVB Loan. The Company was obligated to make interest-only payments on each $5.0 million borrowing through June 2014 and, beginning in July 2014, equal monthly payments of principal and interest through the maturity date in June 2017. The final payment due in June 2017 includes an additional fee of $0.5 million, which is being accreted over the term of the debt using the effective interest method and is included in interest expense. The loan is collateralized by all assets of the Company, other than intellectual property, and contains customary affirmative and negative covenants, reporting requirements and events of default.

In July 2013, in connection with the SVB Loan, the Company issued a warrant to purchase 59,312 shares of Series D redeemable convertible preferred stock at an exercise price of $2.529 per share. In June 2014, the

warrant became exercisable for a total of 118,624 shares of Series D redeemable convertible preferred stock when the Company borrowed the remaining $5.0 million of available credit under the SVB Loan. The warrant is fully exercisable and expires on July 24, 2023.

The initial fair value of the warrant in July 2013 was estimated to be $0.1 million and the initial fair value of the additional 59,312 additional warrant shares earned in June 2014 was estimated to be $0.1 million, based on the application of the Black-Scholes option pricing model, and this discount is amortized to interest expense using the effective interest method over the term of the debt.

Future minimum principal and interest payments under the SVB Loan, including the final payment, are as follows (in thousands):

	As of December 31, 2014
2015	$ 3,622
2016	3,622
2017	2,310
	9,554
Less interest and final payment	(1,115)
Commercial bank debt	$ 8,439

Facility Lease

In December 2011, the Company entered into a noncancelable operating lease that included certain tenant improvement allowances and is subject to base lease payments, which escalate over the term of the lease, additional charges for common area maintenance and other costs. The lease expires in May 2017 and the Company has an option to extend the lease for a period of five years. Rent expense for the years ended December 31, 2013 and 2014 was $0.2 million.

In conjunction with this lease, the Company borrowed $2.0 million under a subordinated unsecured convertible promissory note issued to the venture arm of its landlord. The convertible promissory note carries an annual interest rate of 8.0% and matures at the earlier of (i) May 2015, (ii) a liquidation event, or (iii) the closing of an initial firm commitment underwritten public offering of the Company's common stock pursuant to a registration statement under the Act, at which time all outstanding principal and accrued interest amounts would be due, unless previously converted. At any time prior to maturity, the holder may elect to convert the promissory note into shares of the Company's Series D redeemable convertible preferred stock at the price of $2.662 per share. Upon conversion, all then accrued interest will be forgiven. As of December 31, 2013 and 2014, the outstanding principal balance of the convertible promissory note was $2.0 million. As of December 31, 2013 and 2014, the accrued interest on the convertible promissory note was $0.3 million and $0.5 million, respectively.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

Future minimum payments under the non-cancelable operating lease as of December 31, 2014 were as follows (in thousands):

	Operating Lease
2015	$ 590
2016	610
2017	231
	$1,431

Research Agreements and Funding Obligations

In October 2007, the Company entered into a research funding and option agreement for certain technologies from The Scripps Research Institute (TSRI). Under the agreement (as amended), the Company provides funding to TSRI to conduct certain research activities. The agreement renews automatically for successive 12 month periods starting on May 31st of each year unless the Company provides 30 days' prior written notice to terminate the agreement. TSRI has the right to terminate the agreement if the Company fails to make any payment under the agreement or for breach or insolvency. Under the research funding and option agreement, TSRI has granted the Company options to enter into license agreements to acquire rights and exclusive licenses to develop, make, have made, use, have used, import, have imported, offer to sell, sell, and have sold certain licensed products, processes and services based on certain technology arising from the sponsored research activities. Pursuant to the terms of these license agreements, TSRI is entitled to receive tiered royalties as a percentage of net sales and a percentage of nonroyalty revenue the Company may receive from its sublicensees or partners, with the amount owed decreasing if it enters into the applicable sublicense or partnering agreement after meeting a specified clinical milestone. In addition, the Company is obligated to pay TSRI up to an aggregate of $2.75 million under each license agreement upon the achievement of specific clinical and regulatory milestone events. A member of the Company's board of directors is a faculty member at TSRI and such payments fund a portion of his research activities conducted at TSRI. For the years ended December 31, 2013 and 2014, the Company recognized expense under the agreement in the amount of $0.6 million and $0.7 million, respectively. The agreement was amended in January 2015 (see Note 10).

During the years ended December 31, 2013 and 2014, the Company provided charitable donations to the National Foundation for Cancer Research of $0.4 million. The Company has requested that the donations be restricted to certain basic research in cancer biology and therapeutics, a portion of which fund research activities conducted at TSRI in the laboratory of a member of the Company's board of directors.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

7. Redeemable Convertible Preferred Stock and Stockholders' Equity (Deficit)

Redeemable Convertible Preferred Stock

The authorized, issued and outstanding shares of redeemable convertible preferred stock by series were as follows (in thousands, except share and per share amounts):

	Shares Authorized	Shares Outstanding	Liquidation Preference Per Share	Liquidation Preference and Redemption Value	Carrying Value as of December 31, 2013	Carrying Value as of December 31, 2014
Series A	2,925,000	2,925,000	$0.2500	$ 731	$ 731	$ 731
Series B	12,672,000	12,600,000	0.8333	10,500	10,500	10,500
Series B-2	14,686,583	14,686,583	0.8333	12,238	12,238	12,238
Series C	25,015,959	25,000,002	0.9400	23,500	23,500	23,500
Series D	20,473,329	18,275,830	2.6620	48,650	46,196	48,650
	75,772,871	73,487,415		$ 95,619	$ 93,165	$ 95,619

During 2005, the Company sold 2,925,000 shares of Series A redeemable convertible preferred stock at $0.25 per share for gross proceeds of $0.7 million in cash.

During 2006, the Company sold 12,600,000 shares of Series B redeemable convertible redeemable preferred stock at $0.8333 per share for gross proceeds of $10.5 million in cash. The Company incurred $44,000 of offering costs in connection with this stock issuance.

During 2009, the Company sold 14,686,583 shares of Series B-2 redeemable convertible preferred stock at $0.8333 per share for gross proceeds of $12.2 million in cash. The Company incurred $0.1 million of offering costs in connection with this stock issuance.

During 2010 and 2011, the Company sold an aggregate of 25,000,002 shares of Series C redeemable convertible preferred stock at $0.94 per share for gross proceeds of $23.5 million in cash. The Company incurred $0.1 million of offering costs in connection with this stock issuance.

In March 2013, the Company issued convertible notes to investors totaling $10.0 million. The notes carried a 7.0% interest rate. In April and May 2013, the Company sold an aggregate of 18,275,830 shares of Series D redeemable convertible preferred stock for aggregate gross proceeds of $48.7 million, inclusive of the conversion of the convertible notes and related accrued interest and shares of Series D redeemable convertible preferred stock sold by the Affiliates. The Company incurred $0.5 million of offering costs in connection with this stock issuance.

Conversion

The shares of Series A, Series B, Series B-2, Series C, and the Series D redeemable convertible preferred stock (together, the Series Preferred) are convertible into an equal number of shares of common stock, at the option of the holder. Each share of the Series Preferred is automatically converted into common stock upon either (i) the Company's sale of its common stock in an underwritten public offering pursuant to a registration statement under the Securities Act of 1933, as amended, in which the per share price is at least $5.324 (as adjusted), the net cash proceeds are at least $25,000,000, and the result of offering is listing on a national securities exchange or (ii) upon the majority vote of the holders of Series B-2, Series C and Series D redeemable convertible preferred stock, voting together as a single class, including at least a majority of the Series D stockholders.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

Liquidation

The Series D redeemable preferred stock has a liquidation preference of $2.662 per share, plus any declared but unpaid dividends, in priority to the Series A, Series B, Series B-2, and Series C redeemable convertible preferred stock, in which the Series D holders shall receive their full liquidation preference in advance of the other classes of preferred stock. Upon payment of the full liquidation preference of Series D holders, the holders of Series C and Series B-2 redeemable convertible preferred stock are entitled to receive their liquidation preference of $0.94 and $0.8333 per share, respectively, plus any declared but unpaid dividends. Upon payment of the full liquidation preference of Series C and Series B-2 holders, the holders of Series B and Series A redeemable convertible preferred stock are entitled to receive their liquidation preference of $0.8333 and $0.25 per share, respectively, plus any declared but unpaid dividends, prior to and in preference to any distribution of the assets of the Company to common stockholders. The remaining assets of the Company are to be distributed to the common stockholders based on the number of shares of common stock held by each stockholder.

Dividends

The holders of Series Preferred Stock are entitled to non-cumulative dividends at a rate of 8.0% of the purchase price for the applicable series of redeemable convertible preferred stock per share per annum and are payable only if and when declared by the Company's board of directors. The Series Preferred Stock participates in any dividends paid to the holders of common stock on an as-converted to common stock basis. As of December 31, 2014, the board of directors had not declared any dividends.

Redemption

The Series Preferred Stock may be redeemed, in whole or in part, at the option of the holders any time after April 2018, upon the majority vote of the holders of Series B-2, Series C and Series D, voting together as a single class, including at least a majority of the Series D stockholders. The redemption amount is equal to the then current liquidation preference of each share of redeemable convertible preferred stock and is payable in three equal annual installments.

Prior to closing of the Series D redeemable convertible preferred stock financing in April 2013, the redemption amount of the Series Preferred Stock was based on the original liquidation preference of each series of redeemable convertible preferred stock and increased each period at a rate of 10% per annum. The Company recorded the accretion of such amounts as increases to the carrying value of the Series Preferred Stock. In connection with the Series D redeemable convertible preferred stock financing in April 2013, the cumulative increase over the original liquidation preference of the Series Preferred Stock of the Company was eliminated. The Company deemed this change to represent a modification to the Series Preferred Stock which was accounted for as a capital contribution from stockholders who are considered related parties of the Company as they owned approximately 90% of the outstanding capital stock at that date. Accordingly, the resulting adjustment to the carrying value of the redeemable convertible preferred stock was reclassified from mezzanine equity to additional paid-in capital in April 2013.

Voting

The holders of each share of Series Preferred Stock are entitled to one vote for each share of common stock into which the Series Preferred would convert.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

Stock Options

The Company adopted a stock option plan in 2007 (the 2007 Plan), which was subsequently amended, restated and renamed in July 2014 (the 2014 Plan) to provide for the grant of incentive stock options, nonstatutory stock options, stock, and rights to purchase restricted stock to eligible recipients. Recipients of incentive stock options are eligible to purchase shares of the Company's common stock at an exercise price equal to no less than the estimated fair market value of such stock on the date of grant. The maximum term of options granted under the 2014 Plan is ten years. Options granted prior to September 2012 generally vest over four years and options granted thereafter generally vest over six years. As of December 31, 2014, the Company had 16,219,000 shares authorized for issuance to employees, nonemployee directors, and consultants of the Company under the 2014 Plan.

Stock option activity under the 2014 Plan is summarized as follows:

	Number of Options	Weighted-Average Exercise Price
Outstanding at December 31, 2012	5,613,487	$ 0.10
Granted	2,300,787	$ 0.51
Exercised	(538,125)	$ 0.10
Forfeited	(844,732)	$ 0.10
Outstanding at December 31, 2013	6,531,417	$ 0.24
Granted	5,993,114	$ 0.91
Exercised	(423,872)	$ 0.10
Forfeited	(53,434)	$ 0.49
Outstanding at December 31, 2014	12,047,225	$ 0.58

Information about the Company's outstanding stock options is as follows (in thousands, except share and per share data):

	Number of Shares	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value
December 31, 2014:				
Options outstanding	12,047,225	$0.58	8.44	$11,905
Options vested and expected to vest	12,047,225	$0.58	8.44	$11,905
Options exercisable	3,236,804	$0.21	7.06	$ 4,116
December 31, 2013:				
Options outstanding	6,531,417	$0.24	8.43	$ 1,735
Options vested and expected to vest	6,195,527	$0.25	8.50	$ 1,594
Options exercisable	2,035,803	$0.13	7.56	$ 768

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

Stock-Based Compensation Expense

The assumptions used in the Black-Scholes option pricing model to determine the fair value of the employee stock option grants were as follows:

	Years Ended December 31,	
	2013	2014
Expected term (in years)	6.52 – 6.56	5.77 – 6.56
Risk-free interest rate	2.0% – 2.2%	1.7% – 2.7%
Expected volatility	109%	111%
Expected dividend yield	-	-

Expected term. The expected term represents the period of time that options are expected to be outstanding. Because the Company does not have sufficient historical exercise behavior, it determines the expected life assumption using the simplified method, which is an average of the contractual term of the option and its vesting period.

Risk-free interest rate. The Company bases the risk-free interest rate assumption on the U.S. Treasury's rates for U.S. Treasury zero-coupon bonds with maturities similar to those of the expected term of the award being valued.

Expected volatility. The expected volatility assumption is based on volatilities of a peer group of similar companies whose share prices are publicly available. The peer group was developed based on companies in the biotechnology industry.

Expected dividend yield. The Company bases the expected dividend yield assumption on the fact that it has never paid cash dividends and has no present intention to pay cash dividends.

The allocation of stock-based compensation is as follows (in thousands):

	Years Ended December 31,	
	2013	2014
Research and development	$ 96	$ 527
General and administrative	59	1,264
	$155	$1,791

During the fourth quarter of 2014 the Company modified certain vesting conditions of performance based equity awards for the Company's Chief Executive Officer resulting in incremental share-based compensation costs of $0.7 million, of which $0.6 million was recognized as expense during 2014.

The weighted-average grant date fair values of stock options granted by the Company during the years ended December 31, 2013 and 2014 was $0.43 per share and $1.28 per share, respectively. The aggregate intrinsic value of stock options exercised during the years ended December 31, 2013 and 2014 was $47,000 and $0.4 million, respectively. As of December 31, 2014, total unrecognized share-based compensation costs related to unvested stock options of the Company were approximately $8.0 million. This unrecognized cost is expected to be recognized over a weighted-average period of approximately 4.9 years on a straight-line basis.

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

Warrants

Information about the Company's outstanding and fully exercisable redeemable convertible preferred stock warrants is as follows:

	Outstanding Warrants		Exercise Price Per Share	Expiration Date
	December 31, 2013	December 31, 2014		
Series B	72,000	72,000	$ 0.8334	September 2017
Series C	15,957	15,957	0.9400	March 2021
Series D	59,312	118,624	2.5290	July 2023
	147,269	206,581		

Common Stock Reserved for Future Issuance

Common stock reserved for future issuance is as follows:

	December 31,	
	2013	2014
Conversion of redeemable convertible preferred stock	73,487,415	73,487,415
Conversion of redeemable convertible preferred stock issuable upon conversion of promissory note	751,314	751,314
Redeemable convertible preferred stock warrants	147,269	206,581
Common stock options granted and outstanding	6,531,417	12,047,225
Awards available under the 2014 Plan	4,623,636	1,432,144
	85,541,051	87,924,679

8. Income Taxes

Pretax earnings (loss) were generated by both domestic and foreign operations as follows (in thousands):

	Years Ended December 31,	
	2013	2014
United States	$ (11,085)	$ (34,885)
Foreign	(8,929)	10,535
	$ (20,014)	$ (24,350)

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

A reconciliation of the expected statutory federal income tax provision to the actual income tax provision is summarized as follows (in thousands):

	Years Ended December 31,	
	2013	2014
Expected income tax benefit at federal statutory rate	$(6,804)	$ (8,279)
State income taxes, net of federal benefit	(634)	(2,023)
Permanent items and other	2	(321)
Stock-based compensation	-	396
Research credits	(397)	(372)
Unrecognized tax benefits	159	144
Foreign rate differential	2,978	(3,391)
Other, net	(26)	293
Change in valuation allowance	4,722	13,553
Income tax (benefit) expense	$ -	$ -

Deferred income taxes are provided for temporary differences in recognizing certain income and expense items for financial and tax reporting purposes. The deferred tax assets consisted primarily of the income tax benefits from net operating loss (NOL) carryforwards, research and development credits and capitalized research and development expenses, along with other accruals and reserves. Valuation allowances of $21.3 million and $34.8 million as of December 31, 2013 and 2014, respectively, have been recorded to offset deferred tax assets as realization of such assets does not meet the more-likely-than-not threshold under ASC 740, *Accounting for Income Taxes*.

Significant components of the Company's deferred tax assets are summarized as follows (in thousands):

	December 31,	
	2013	2014
Net operating loss carryforwards	$ 13,093	$ 20,066
Capitalized research and development expenses	6,684	7,855
Research credits and other state credits	1,171	1,368
Intangible assets	28	4,926
Depreciation and amortization	(360)	(260)
Reserve and accruals	677	891
Valuation allowance	(21,293)	(34,846)
Net deferred tax assets	$ -	$ -

In the fourth quarter of 2014, the Company dissolved all of the Affiliates and, as a result, acquired intellectual property originally developed by the Affiliates. For book purposes, as this was a transaction between consolidated entities, no intangible asset was recognized. For tax purposes, the intellectual property will be amortized over 15 years resulting in an increase to deferred tax assets as of December 31, 2014. The increase in deferred tax assets was offset by a corresponding adjustment to the valuation allowance. As a result of the dissolution, the Company forgave intercompany loans and recorded a corresponding tax deduction; whereas the Affiliates recognized cancellation of debt income which was offset by net operating losses.

At December 31, 2014, the Company had approximately $47.8 million, $49.7 million, and $5.4 million of net operating loss carryforwards for federal, state, and foreign purposes, respectively, net of Section 382 limitations, available to offset future taxable income. The federal and state net operating loss carryforwards begin to expire in 2025 and 2016, respectively. The foreign net operating losses carry over indefinitely. At December 31, 2014, the Company had federal and state research and development credit carryforwards of

approximately $1.3 million and $1.4 million, respectively, net of Section 382 limitations, which begin to expire in 2026 for federal purposes and carry over indefinitely for state purposes.

Utilization of the domestic NOL and research and development credit carryforwards may be subject to a substantial annual limitation due to ownership change limitations that may have occurred or that could occur in the future, as required by Section 382 and 383 of the Internal Revenue Code of 1986, as amended (the Code), as well as similar state and foreign provisions. These ownership changes may limit the amount of NOL and research and development credit carryforwards that can be utilized annually to offset future taxable income and tax, respectively. In general, an "ownership change" as defined by Section 382 of the Code results from a transaction or series of transactions over a three-year period resulting in an ownership change of more than 50 percentage points of the outstanding stock of a company by certain stockholders. Since the Company's formation, the Company has raised capital through the issuance of capital stock on several occasions which on its own or combined with the purchasing stockholders' subsequent disposition of those shares, has resulted in such an ownership change, and could result in an ownership change in the future.

Upon the occurrence of an ownership change under Section 382 as outlined above, utilization of the NOL and research and development credit carryforwards become subject to an annual limitation under Section 382 of the Code, which is determined by first multiplying the value of the Company's stock at the time of the ownership change by the applicable long-term, tax-exempt rate, which could be subject to additional adjustments. Any limitation may result in expiration of a portion of the NOL or research and development credit carryforwards before utilization. The Company completed an analysis through September 7, 2011, and has adjusted its NOL and research and development tax credit carryforwards accordingly. Ownership changes that may have occurred subsequent to September 7, 2011, and future ownership changes, including any ownership change resulting from this offering, may further limit the Company's ability to utilize its remaining tax attributes.

The Company recognizes a tax benefit from an uncertain tax position when it is more likely than not that the position will be sustained upon examination, including resolutions of any related appeals or litigation processes, based on the technical merits. Income tax positions must meet a more-likely-than-not recognition threshold to be recognized.

The Company's practice is to recognize interest and penalties related to income tax matters in income tax expense. The Company had no accrual for interest and penalties on the Company's balance sheet and has not recognized interest or penalties in the consolidated statements of operations for the years ended December 31, 2013 and 2014.

Due to the existence of the valuation allowance, future changes in unrecognized tax benefits will not impact the Company's effective tax rate.

Uncertain tax positions are evaluated based upon the facts and circumstances that exist at each reporting period. Subsequent changes in judgment based upon new information may lead to changes in recognition, derecognition, and measurement. Adjustments may result, for example, upon resolution of an issue with the taxing authorities, or expiration of a statute of limitations barring an assessment for an issue.

The activity related to the Company's unrecognized tax benefits is summarized as follows (in thousands):

Balance at December 31, 2012	$ 774
Increase related to prior year tax positions	79
Increase related to current year tax positions	94
Balance at December 31, 2013	947
Other decreases	(18)
Increase related to current year tax positions	177
Balance at December 31, 2014	$1,106

aTyr Pharma, Inc.

Notes to Consolidated Financial Statements—(Continued)

The Company does not anticipate that the amount of unrecognized tax benefits as of December 31, 2014 will change within the next twelve months.

The Company is subject to taxation in the United States, Hong Kong and state jurisdictions. The Company's tax years from inception are subject to examination by the United States, Hong Kong and California authorities due to the carry forward of unutilized NOLs and research and development credits.

9. 401(k) Plan

The Company maintains a defined contribution 401(k) plan available to eligible employees. Employee contributions are voluntary and are determined on an individual basis, limited to the maximum amount allowable under federal tax regulations. The Company, at its discretion, may make certain matching contributions to the 401(k) plan. As of December 31, 2014, the Company had not made any matching contributions.

10. Subsequent Events

The Company has completed an evaluation of all subsequent events through April 3, 2015 to ensure that this filing includes appropriate disclosure of events both recognized in the December 31, 2014 consolidated financial statements and events which occurred but were not recognized in the consolidated financial statements. Except as described below, the Company has concluded that no subsequent event has occurred that requires disclosure.

Amended Research Funding and Option Agreement and Assignment Agreement

In January 2015, the Company and TSRI entered into an amended and restated research funding and option agreement pursuant to which the Company agreed to issue 953,228 shares of its common stock to TSRI for a purchase price of $0.001 per share in consideration for the adjustment of sublicense payments and the assignment of certain intellectual property rights by TSRI to the Company. The Company issued the shares of common stock to TSRI on March 31, 2015.

Increase in Shares of Common Stock Reserved for Issuance under the 2014 Plan

On January 1, 2015, the number of shares of common stock reserved for issuance under the 2014 Plan increased from 16,219,000 shares to 19,447,999 shares as a result of the evergreen provisions of the plan. On March 31, 2015, the Company's board of directors and stockholders approved an increase in the number of shares of common stock reserved for issuance under the 2014 Plan from 19,447,999 shares to 27,681,002 shares.

Amended and Restated Certificate of Incorporation

On March 30, 2015, the Company amended and restated its certificate of incorporation to, among other things, (1) increase its authorized shares of common stock from 95,500,000 to 185,000,000 shares, (2) increase its authorized shares of preferred stock from 75,772,871 to 143,939,765 shares, of which 68,166,894 shares are designated as Series E preferred stock, and (3) set forth the rights, preferences and privileges of the Series E preferred stock.

Sale of Series E Redeemable Convertible Preferred Stock

On March 31, 2015, pursuant to a Series E stock purchase agreement, the Company issued an aggregate of 68,166,894 shares of its Series E redeemable convertible preferred stock at a purchase price of $1.119 per share, for aggregate cash consideration of $76.3 million. Each share of Series E redeemable convertible preferred stock

is convertible into one share of the Company's common stock. If the Company completes a qualified public offering on or before March 1, 2016, each share of preferred stock would convert into approximately 0.8216 of a share of common stock.

Stock Option Grants

On March 31, 2015 and April 2, 2015, the Company granted options to purchase an aggregate of 2,388,777 shares of common stock to employees, board members and consultants at an exercise price of $1.15 per share.

Shares

Common Stock

J.P. Morgan **Citigroup**

BMO Capital Markets

William Blair

, 2015

PART II

Information Not Required in Prospectus

Item 13. Other Expenses of Issuance and Distribution.

The following table sets forth the fees and expenses, other than underwriting discounts and commissions, payable in connection with the registration of the common stock hereunder. All amounts are estimates except the Securities and Exchange Commission, or SEC, registration fee.

	Amount to Be Paid
SEC registration fee	$ 10,022
FINRA filing fee	13,438
The NASDAQ Global Market listing fee	*
Printing and mailing	*
Legal fees and expenses	*
Accounting fees and expenses	*
Transfer agent and registrar fees and expenses	*
Miscellaneous	*
Total	$ *

* To be filed by amendment.

Item 14. Indemnification of Directors and Officers.

Section 145 of the Delaware General Corporation Law, or the DGCL, authorizes a corporation to indemnify its directors and officers against liabilities arising out of actions, suits and proceedings to which they are made or threatened to be made a party by reason of the fact that they have served or are currently serving as a director or officer to a corporation. The indemnity may cover expenses (including attorneys' fees) judgments, fines and amounts paid in settlement actually and reasonably incurred by the director or officer in connection with any such action, suit or proceeding. Section 145 permits corporations to pay expenses (including attorneys' fees) incurred by directors and officers in advance of the final disposition of such action, suit or proceeding. In addition, Section 145 provides that a corporation has the power to purchase and maintain insurance on behalf of its directors and officers against any liability asserted against them and incurred by them in their capacity as a director or officer, or arising out of their status as such, whether or not the corporation would have the power to indemnify the director or officer against such liability under Section 145.

We have adopted provisions in our certificate of incorporation and bylaws to be in effect at the completion of this offering that limit or eliminate the personal liability of our directors to the fullest extent permitted by the DGCL, as it now exists or may in the future be amended. Consequently, a director will not be personally liable to us or our stockholders for monetary damages or breach of fiduciary duty as a director, except for liability for:

- any breach of the director's duty of loyalty to us or our stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- any unlawful payments related to dividends or unlawful stock purchases, redemptions or other distributions; or
- any transaction from which the director derived an improper personal benefit.

These limitations of liability do not alter director liability under the federal securities laws and do not affect the availability of equitable remedies such as an injunction or rescission.

In addition, our bylaws provide that:

- we will indemnify our directors, officers and, in the discretion of our board of directors, certain employees to the fullest extent permitted by the DGCL, as it now exists or may in the future be amended; and
- we will advance reasonable expenses, including attorneys' fees, to our directors and, in the discretion of our board of directors, to our officers and certain employees, in connection with legal proceedings relating to their service for or on behalf of us, subject to limited exceptions.

We have entered into indemnification agreements with each of our directors and certain of our executive officers. These agreements provide that we will indemnify each of our directors, certain of our executive officers and, at times, their affiliates to the fullest extent permitted by Delaware law. We will advance expenses, including attorneys' fees (but excluding judgments, fines and settlement amounts), to each indemnified director, executive officer or affiliate in connection with any proceeding in which indemnification is available and we will indemnify our directors and officers for any action or proceeding arising out of that person's services as a director or officer brought on behalf of the Company or in furtherance of our rights. Additionally, certain of our directors may have certain rights to indemnification, advancement of expenses or insurance provided by their affiliates, which indemnification relates to and might apply to the same proceedings arising out of such director's services as a director referenced herein. Nonetheless, we have agreed in the indemnification agreements that the Company's obligations to those same directors are primary and any obligation of the affiliates of those directors to advance expenses or to provide indemnification for the expenses or liabilities incurred by those directors are secondary.

We also maintain general liability insurance which covers certain liabilities of our directors and officers arising out of claims based on acts or omissions in their capacities as directors or officers, including liabilities under the Securities Act of 1933, or the Securities Act.

The underwriting agreement filed as Exhibit 1.1 to this registration statement provides for indemnification of us and our directors and officers by the underwriters against certain liabilities under the Securities Act and the Securities Exchange Act of 1934, or the Exchange Act.

Item 15. Recent Sales of Unregistered Securities.

In the three years preceding the filing of this registration statement, we have issued the following securities that were not registered under the Securities Act:

(a) Issuances of Capital Stock

In March 2013, we issued convertible promissory notes to thirteen existing stockholders for aggregate consideration of $10.0 million.

In April 2013 and May 2013, we issued an aggregate of 18,275,830 shares of our Series D redeemable convertible preferred stock to twenty-three investors for aggregate consideration of approximately $46.2 million.

In July 2013, we issued a warrant to purchase 59,312 shares of our Series D redeemable convertible preferred stock to a lending institution at an exercise price per share of $2.529. Pursuant to the terms of the warrant, the number of shares underlying the warrant automatically increased to an aggregate of 118,624 upon the funding of a capital advance to us in June 2014.

In March 2015, we issued an aggregate of 68,166,894 shares of our Series E redeemable convertible preferred stock to forty-two investors for aggregate consideration of approximately $76.3 million. We have filed a Form D to ensure that all securities issued in this transaction fall within the safe harbor provided pursuant to Rule 506 of Regulation D, which is promulgated under the Securities Act.

In addition, in March 2015, we issued 953,228 shares of our common stock to a licensor pursuant to an amended and restated research funding and option agreement in consideration of certain rights granted by such licensor to us.

No underwriters were involved in the foregoing sales of securities. Unless otherwise stated, the sales of securities described above were deemed to be exempt from registration pursuant to Section 4(2) of the Securities Act as transactions by an issuer not involving a public offering. All of the purchasers in these transactions represented to us in connection with their purchase that they were acquiring the securities for investment and not distribution, that they could bear the risks of the investment and could hold the securities for an indefinite period of time. Such purchasers received written disclosures that the securities had not been registered under the Securities Act and that any resale must be made pursuant to a registration or an available exemption from such registration. All of the foregoing securities are deemed restricted securities for the purposes of the Securities Act.

(b) Grants and Exercises of Stock Options

Since January 1, 2012, we have granted stock options to purchase an aggregate of 13,392,803 shares of our common stock, with exercise prices ranging from $0.11 to $2.23 per share, to employees, directors and consultants pursuant to the 2014 Plan. 854,244 shares of common stock have been issued upon the exercise of these options.

The issuances of the securities described above were deemed to be exempt from registration pursuant to Rule 701 promulgated under the Securities Act as transactions pursuant to compensatory benefit plans. The shares of common stock issued upon the exercise of options are deemed to be restricted securities for purposes of the Securities Act.

Item 16. Exhibits and Financial Statement Schedules.

(a) Exhibits:

The exhibits to the registration statement are listed in the Exhibit Index to this registration statement and are incorporated herein by reference.

(b) Financial Statements Schedules:

Schedules have been omitted because the information required to be set forth therein is not applicable or is shown in the financial statements or notes thereto.

Item 17. Undertakings.

Insofar as indemnification for liabilities arising under the Securities Act of 1933, as amended, or the Act, may be permitted to directors, officers and controlling persons of the Registrant pursuant to the foregoing provisions, or otherwise, the Registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Act and is therefore unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Act and will be governed by the final adjudication of such issue.

The Registrant hereby undertakes that:

(a) The Registrant will provide to the underwriter at the closing as specified in the underwriting agreement, certificates in such denominations and registered in such names as required by the underwriter to permit prompt delivery to each purchaser.

(b) For purposes of determining any liability under the Securities Act of 1933, as amended, the information omitted from a form of prospectus filed as part of this registration statement in reliance upon Rule 430A and contained in the form of prospectus filed by the Registrant pursuant to Rule 424(b)(1) or (4) or 497(h) under the Securities Act of 1933, as amended, shall be deemed to be part of this registration statement as of the time it was declared effective.

(c) For the purpose of determining any liability under the Securities Act of 1933, as amended, each post-effective amendment that contains a form of prospectus shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, the registrant has duly caused this Registration Statement on Form S-1 to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of San Diego, State of California, on the 6th day of April, 2015.

ATYR PHARMA, INC.

By: /s/ John D. Mendlein
John D. Mendlein, Ph.D.
Chief Executive Officer and
Executive Chairman

POWER OF ATTORNEY AND SIGNATURES

Each individual whose signature appears below hereby constitutes and appoints each of John D. Mendlein, Ph.D. and Frederic Chereau as such person's true and lawful attorney-in-fact and agent with full power of substitution and resubstitution, for such person in such person's name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this Registration Statement (or any Registration Statement for the same offering that is to be effective upon filing pursuant to Rule 462(b) under the Securities Act of 1933), and to file the same, with all exhibits thereto, and all documents in connection therewith, with the Securities and Exchange Commission granting unto each said attorney-in-fact and agent full power and authority to do and perform each and every act and thing requisite and necessary to be done in and about the premises, as fully to all intents and purposes as such person might or could do in person, hereby ratifying and confirming all that any said attorney-in-fact and agent, or any substitute or substitutes of any of them, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, as amended, this Registration Statement and Power of Attorney has been signed by the following persons in the capacities and on the date indicated.

Name	Title	Date
/s/ John D. Mendlein John D. Mendlein, Ph.D.	Chief Executive Officer and Executive Chairman *(Principal Executive Officer)*	April 6, 2015
/s/ Stan Blackburn Stan Blackburn	Principal Financial and Accounting Officer *(Principal Financial and Accounting Officer)*	April 6, 2015
/s/ John K. Clarke John K. Clarke	Chairman of the Board and Director	April 6, 2015
/s/ Srinivas Akkaraju Srinivas Akkaraju, M.D., Ph.D.	Director	April 6, 2015
/s/ James C. Blair James C. Blair, Ph.D.	Director	April 6, 2015
/s/ Kathryn E. Falberg Kathryn E. Falberg	Director	April 6, 2015
/s/ Amir H. Nashat Amir H. Nashat, Sc.D.	Director	April 6, 2015
/s/ Paul Schimmel Paul Schimmel, Ph.D.	Director	April 6, 2015

EXHIBIT INDEX

Exhibit No.	Exhibit
1.1*	Form of Underwriting Agreement
3.1	Amended and Restated Certificate of Incorporation of the Registrant, as currently in effect
3.2*	Form of Amended and Restated Certificate of Incorporation of the Registrant (to be effective upon completion of this offering)
3.3	Bylaws of the Registrant, as currently in effect
3.4*	Form of Amended and Restated Bylaws of the Registrant (to be effective upon completion of this offering)
4.1*	Specimen Common Stock Certificate
4.2	Warrant to Purchase Stock issued to Comerica Bank on September 18, 2007
4.3	Warrant to Purchase Stock issued to Comerica Bank on March 18, 2011
4.4	Warrant to Purchase Stock issued to Silicon Valley Bank on July 24, 2013
4.5	Subordinated Convertible Unsecured Promissory Note issued to BMV Direct RE LP on December 22, 2011
5.1*	Opinion of Goodwin Procter LLP
10.1#	2014 Stock Plan and forms of agreements thereunder
10.2#*	2015 Stock Option and Incentive Plan and forms of agreements thereunder
10.3#	Employment Agreement by and between the Registrant and John D. Mendlein, Ph.D., dated as of January 1, 2010
10.4#	Offer Letter by and between the Registrant and Frederic Chereau, dated December 20, 2013
10.5#	Offer Letter by and between the Registrant and David M. Weiner, M.D., dated February 20, 2014
10.6#	Amended and Restated Restricted Stock Purchase Agreement by and between the Registrant and John D. Mendlein, Ph.D., dated as of December 18, 2014
10.7†	Amended and Restated Research Funding and Option Agreement by and between the Registrant and The Scripps Research Institute, dated January 19, 2015
10.8	Master Services Agreement by and between the Registrant and Syngene International Limited, dated November 5, 2012
10.9	Lease by and between the Registrant and BMR-John Hopkins Court LLC, dated December 22, 2011
10.10	Loan and Security Agreement by and between the Registrant and Silicon Valley Bank, dated April 25, 2012, as amended by First Amendment to Loan and Security Agreement by and between the Registrant and Silicon Valley Bank, dated July 24, 2013
10.11*	Registration and Voting Rights Agreement by and among the Registrant and the stockholders named therein, dated March 31, 2015
10.12*	Form of Amended and Restated Indemnification Agreement
21.1	Subsidiaries of the Registrant
23.1	Consent of Independent Registered Public Accounting Firm
23.2*	Consent of Goodwin Procter LLP (included in Exhibit 5.1)
24.1	Power of Attorney (included in page II-5)

* To be included by amendment.

† Application has been made to the Securities and Exchange Commission for confidential treatment of certain provisions. Omitted material for which confidential treatment has been requested has been filed separately with the Securities and Exchange Commission.
# Indicates a management contract or any compensatory plan, contract or arrangement.

Exhibit 3.1

AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
aTYR PHARMA, INC.

aTYR PHARMA, INC., a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware (the "**DGCL**") hereby certifies as follows:

1. The name of the corporation is aTyr Pharma, Inc. (the "**Corporation**"). The Corporation was originally incorporated as aTyr Pharma, Inc. as of the filing of its original Certificate of Incorporation with the Secretary of State of the State of Delaware on September 8, 2005 (as heretofore amended and restated, the "**Original Certificate of Incorporation**").

2. This Amended and Restated Certificate of Incorporation ("**Certificate of Incorporation**") amends and restates the provisions of the Original Certificate of Incorporation and (i) was duly adopted by the Board of Directors in accordance with the provisions of Section 245 of the DGCL, (ii) was declared by the Board of Directors to be advisable and in the best interests of the Corporation and was directed by the Board of Directors to be submitted to and be considered by the stockholders of the Corporation entitled to vote thereon for approval by the affirmative vote of such stockholders in accordance with Section 242 of the DGCL, and (iii) was duly adopted by a stockholder consent in lieu of a meeting of the stockholders, in accordance with the provisions of Sections 228 and 242 of the DGCL and the terms of the Original Certificate of Incorporation.

3. The text of the Certificate of Incorporation is hereby amended and restated in its entirety to provide as follows:

ARTICLE I
NAME

The name of the corporation is aTyr Pharma, Inc. (the "**Corporation**").

ARTICLE II
REGISTERED OFFICE

The address of the registered office of the Corporation in the State of Delaware is 160 Greentree Drive, Suite 101, in the City of Dover, County of Kent, 19904. The name of its registered agent at such address is National Registered Agents, Inc.

ARTICLE III
PURPOSES

The nature of the business or purposes to be conducted or promoted by the Corporation is to engage in any lawful act or activity for which corporations may be organized under the DGCL.

ARTICLE IV
CAPITAL SECURITIES

The total number of shares of capital stock that the Corporation shall have authority to issue is 328,939,765 shares, consisting of:

1. 185,000,000 shares of Common Stock, par value $0.001 per share ("**Common Stock**"); and

2. 143,939,765 shares of Preferred Stock, par value $0.001 per share, of which 2,925,000 shares are designated Series A Convertible Preferred Stock ("**Series A Preferred Stock**"), 12,672,000 shares are designated Series B Convertible Preferred Stock ("**Series B Preferred Stock**"), 14,686,583 shares are designated Series B-2 Convertible Preferred Stock ("**Series B-2 Preferred Stock**"), 25,015,959 shares are designated Series C Convertible Preferred Stock ("**Series C Preferred Stock**"), 20,473,329 shares are designated Series D Convertible Preferred Stock ("**Series D Preferred Stock**"), and 68,166,894 shares are designated Series E Convertible Preferred Stock ("**Series E Preferred Stock**", and together with the Series A Preferred Stock, Series B Preferred Stock, Series B-2 Preferred Stock, Series C Preferred Stock and Series D Preferred Stock, the "**Preferred Stock**").

Except as otherwise restricted by this Certificate of Incorporation, the Corporation is authorized to issue from time to time all or any portion of the capital stock of the Corporation that is authorized but not issued or reserved for issuance to such person or persons and for such lawful consideration as it may deem appropriate, and generally in its absolute discretion to determine the terms and manner of any disposition of such authorized but unissued capital stock.

Any and all such shares issued for which the full consideration has been paid or delivered shall be deemed fully paid shares of capital stock, and the holder of such shares shall not be liable for any further call or assessment or any other payment thereon.

The voting powers, designations, preferences, privileges and relative, participating, optional or other special rights, and the qualifications, limitations and restrictions of each class (and series) of capital stock of the Corporation are as hereafter provided in Article IV hereof.

A. COMMON STOCK

1. **General**. The rights of the holders of the Common Stock are subject to and qualified by the rights of the holders of Preferred Stock as specified herein and any other class of the Corporation's Capital Securities that may hereafter be issued and outstanding having rights in accordance herewith that are senior to or *pari passu* with the rights of holders of Common Stock. Each share of Common Stock shall be treated identically to all other shares of Common Stock with respect to dividends, distributions, rights in liquidation and in all other respects.

2. **Voting**. Each holder of shares of Common Stock is entitled to one vote for each share thereof held by such holder at all meetings of stockholders (and written actions in lieu of meetings). There shall be no cumulative voting. Subject to Section C.4, the number of

authorized shares of Common Stock may, from time to time, be increased or decreased (but not below the sum of (a) the number of shares thereof then outstanding, plus (b) the number of shares then issuable upon conversion, exercise and/or exchange of all then outstanding Convertible Securities) by the affirmative vote of the holders of a majority of the combined number of shares of the Corporation's issued and outstanding (x) Common Stock, and (y) Preferred Stock (voting on an as-converted basis) that votes together with the Common Stock, voting together as a single class generally, irrespective of the provision of Section 242(b)(2) of the DGCL.

3. **Dividends**. Dividends may be declared and paid on the Common Stock from funds lawfully available therefor if, as and when determined by the Board of Directors and subject to any preferential dividend rights of any then outstanding shares of any classes or series of the Corporation's Capital Securities that have been, or may hereafter be, authorized and issued having preferred dividend rights senior to or *pari passu* with the rights of holders of Common Stock.

4. **Liquidation**. Upon the occurrence of a Liquidation Event, holders of Common Stock will be entitled to receive all assets of the Corporation available for distribution to its stockholders, subject to the rights and preferences of any then outstanding shares of Preferred Stock and any other classes or series of the Corporation's Capital Securities that are issued and outstanding having rights upon the occurrence of a Liquidation Event senior to or *pari passu* with the rights of holders of Common Stock.

B. PREFERRED STOCK

1. **Dividends**. The holders of Preferred Stock shall be entitled to receive, on a *pari passu* and pro rata basis, from funds lawfully available therefor and subject to any preferential dividend rights of any then outstanding shares of any classes or series of the Corporation's Capital Securities that have been, or may hereafter be, authorized and issued having preferred dividend rights senior to or *pari passu* with the rights of holders of Preferred Stock, and prior and in preference to any dividends payable on shares of Common Stock (other than dividends payable in shares of Common Stock), dividends at the rate of eight percent (8%) of the Purchase Price for the applicable series of Preferred Stock per share per annum. All such dividends shall be non-cumulative and shall only be payable if, when and as declared by the Board of Directors. In addition to the foregoing, the holders of Preferred Stock shall participate in all dividends and other distributions (other than stock dividends in the nature of a stock split or the like, to the extent adjusted for elsewhere herein, and repurchases of securities by the Corporation from an employee or consultant of the Corporation at the lower of the original purchase price or the then-current fair market value thereof made pursuant to an agreement approved by the Board of Directors, including a majority of the then-sitting Preferred Directors) that are declared and paid on Common Stock on the same basis as if each share of Preferred Stock had been converted into the largest number of shares of Common Stock into which each share of Preferred Stock, as the case may be, may be converted pursuant to Section B.3 of Article IV on the record date established for the declaration of such dividends. The provisions of this Section B.1. of Article IV, including the rights, obligations and limitations set forth herein, may be waived by the affirmative vote or written consent of the Requisite Stockholders, which must

include the Requisite D/E Preferred if such waiver would adversely affect the rights of the Series D Preferred Stock or the Series E Preferred Stock under this Section B.1. of Article IV.

2. **Liquidation Preference**.

(a) Payments to Holders of Series E Preferred Stock and Series D Preferred Stock. Upon (i) any liquidation, dissolution or winding up of the Corporation, whether voluntary or involuntary, or (ii) a Sale of the Corporation (each of the events referred to in clauses (i) and (ii) being referred to as a "**Liquidation Event**"), each holder of Series E Preferred Stock and Series D Preferred Stock shall be entitled, after provision for the payment of the Corporation's debts and other liabilities and in preference to, and, before any amount or property shall be paid or distributed to the holders of Series C Preferred Stock, Series B-2 Preferred Stock, Series B Preferred Stock, Series A Preferred Stock or Common Stock, to be paid in full, on a *pari passu* basis, out of the assets of the Corporation available for distribution to stockholders, with respect to each share of Series D Preferred Stock an amount equal to the greater of (iii) the Series D Liquidation Preference or (iv) such amount per share as would have been payable had all shares of Series D Preferred Stock been converted into Common Stock pursuant to Section B.3 immediately prior to such Liquidation Event (hereinafter referred to as the "**Series D Liquidation Amount**") and with respect to each share of Series E Preferred Stock an amount equal to the greater of (v) the Series E Liquidation Preference or (vi) such amount per share as would have been payable had all shares of Series E Preferred Stock been converted into Common Stock pursuant to Section B.3 immediately prior to such Liquidation Event (the amount payable pursuant to this sentence is hereinafter referred to as the "**Series E Liquidation Amount**"). If upon any Liquidation Event the amount available for distribution to its stockholders shall be insufficient to permit the payment of the Series D Liquidation Amount for each share of Series D Preferred Stock and the Series E Liquidation Amount for each share of Series E Preferred Stock in full, then the amount available for distribution shall be distributed among the holders of the Series D Preferred Stock and the Series E Preferred Stock, *pro rata* in accordance with the amount that would been distributed to such holders if the amount available for distribution had been sufficient to pay the Series D Liquidation Amount and the Series E Liquidation Amount.

(b) Payments to Holders of Series C Preferred Stock and Series B-2 Preferred Stock. Upon any Liquidation Event, after the payment of all amounts pursuant to Section 2(a) above, each holder of Series C Preferred Stock and Series B-2 Preferred Stock shall be entitled, after provision for the payment of the Corporation's debts and other liabilities and in preference to, and, before any amount or property shall be paid or distributed to the holders of Series B Preferred Stock or Series A Preferred Stock or Common Stock, to be paid in full, on a *pari passu* basis, out of the assets of the Corporation available for distribution to stockholders, with respect to each share of Series C Preferred Stock, an amount equal to the greater of (i) the Series C Liquidation Preference or (ii) such amount per share as would have been payable had all shares of Series C Preferred Stock been converted into Common Stock pursuant to Section B.3 immediately prior to such Liquidation Event (the amount payable pursuant to this sentence is hereinafter referred to as the "**Series C Liquidation Amount**") and with respect to each share of Series B-2 Preferred Stock, an amount equal to the greater of (i) the Series B-2 Liquidation Preference or (ii) such amount per share as would have been payable had all shares of Series B-2 Preferred Stock been converted into Common Stock pursuant to Section B.3 immediately prior to

such Liquidation Event (the amount payable pursuant to this sentence is hereinafter referred to as the "**Series B-2 Liquidation Amount**"). If upon any Liquidation Event the amount available for distribution to its stockholders shall be insufficient to permit the payment of the Series C Liquidation Amount for each share of Series C Preferred Stock and the Series B-2 Liquidation Amount for each share of Series B-2 Preferred Stock in full, then the amount available for distribution shall be distributed among the holders of the Series C Preferred Stock and Series B-2 Preferred Stock, *pro rata* in accordance with the amount that would been distributed to such holders if the amount available for distribution had been sufficient to pay the Series C Liquidation Amount and Series B-2 Liquidation Amount.

(c) Payments to Holders of Series B Preferred Stock and Series A Preferred Stock. Upon any Liquidation Event, after the payment of all amounts pursuant to Sections 2(a) and 2(b) above, each holder of Series B Preferred Stock and Series A Preferred Stock shall be entitled, after provision for the payment of the Corporation's debts and other liabilities and in preference to, and, before any amount or property shall be paid or distributed to the holders of Common Stock, to be paid in full, on a pari passu basis, out of the assets of the Corporation available for distribution to stockholders, with respect to each share of Series B Preferred Stock, an amount equal to the greater of (i) the Series B Liquidation Preference or (ii) such amount per share as would have been payable had all shares of Series B Preferred Stock been converted into Common Stock pursuant to Section B.3 immediately prior to such Liquidation Event (the amount payable pursuant to this sentence is hereinafter referred to as the "**Series B Liquidation Amount**") and with respect to each share of Series A Preferred Stock, an amount equal to the greater of (i) the Series A Liquidation Preference or (ii) such amount per share as would have been payable had all shares of Series A Preferred Stock been converted into Common Stock pursuant to Section B.3 immediately prior to such Liquidation Event (the amount payable pursuant to this sentence is hereinafter referred to as the "**Series A Liquidation Amount**"). If upon any Liquidation Event the amount available for distribution to its stockholders shall be insufficient to permit the payment of the Series B Liquidation Amount for each share of Series B Preferred Stock and the Series A Liquidation Amount for each share of Series A Preferred Stock in full, then the amount available for distribution shall be distributed among the holders of the Series B Preferred Stock and Series A Preferred Stock, *pro rata* in accordance with the amount that would been distributed to such holders if the amount available for distribution had been sufficient to pay the Series B Liquidation Amount and Series A Liquidation Amount.

(d) Distribution of Remaining Assets. Upon any Liquidation Event, after the payment of all amounts pursuant to Sections 2(a), 2(b) and 2(c) above, the remaining net assets of the Corporation available for distribution to stockholders shall be distributed ratably among the holders of Common Stock.

(e) Consolidation, Merger, etc. Notwithstanding Section B.2(a), a Sale of the Corporation shall not be deemed to be a Liquidation Event for the purposes of this Section B.2 if the Requisite Stockholders, which must include (i) the holders of at least 75% of the outstanding shares of Series D Preferred Stock (voting separately as a single class) and (ii) the Requisite D/E Preferred, waive in writing the provisions of this Section B.2 with respect to such event.

(f) No Effect on Conversion Rights. The provisions of this Section B.2 shall not in any way limit the right of the holders of Preferred Stock to elect to convert their shares of Preferred Stock into shares of Common Stock in accordance with Section B.3.

(g) Valuation of Distribution Securities. Any securities or other consideration to be delivered to the holders of Preferred Stock upon any Liquidation Event in accordance with the terms hereof shall be valued as follows:

(i) If the consideration consists of cash or cash equivalents, then the value shall be computed at the aggregate amount of the cash or cash equivalents so delivered;

(ii) The per share value of securities traded on a national securities exchange or a nationally recognized interdealer quotation system shall be deemed to be the average of the closing prices of the securities on such exchange or system over the 20-day period ending three (3) Business Days prior to the closing of such Liquidation Event;

(iii) The per share value of securities traded over-the-counter shall be deemed to be the average of the closing bid and asked prices over the 30-day period ending three (3) Business Days prior to the closing of such Liquidation Event; and

(iv) For all other consideration, the value shall be the fair market value thereof as determined in good faith by the Board of Directors.

(v) In the event that the Requisite Stockholders dispute any valuation determined by the Board of Directors pursuant to Section B.2(g)(iv), such holders shall have the right to obtain an independent valuation of such property, security or other non-cash consideration from one nationally recognized investment bank, not affiliated with any holder of Preferred Stock, reasonably acceptable to the Corporation, and with substantial experience pertaining to such valuations, which valuation shall be binding. If the valuation determined by such bank is within 10% of the valuation determined by the Board of Directors, the holders of Preferred Stock requesting such valuation shall pay for the fees and expenses of such bank in making such valuation, otherwise the Corporation shall pay such fees and expenses.

(h) Merger Agreement. The Corporation shall not have the power to effect an Acquisition unless the agreement or plan of merger or consolidation for such transaction (the "**Merger Agreement**") provides that the consideration payable to the stockholders of the Corporation shall be allocated among the holders of capital stock of the Corporation in accordance with Sections B.2(a)-B.2(d).

(i) In the event of a Sale of the Corporation, if the Corporation does not effect a dissolution of the Corporation under the General Corporation Law within 90 days after such Sale of the Corporation, then (i) the Corporation shall send a written notice to each holder of Preferred Stock no later than the 90th day after the Sale of the Corporation advising such holders of their right (and the requirements to be met to secure such right) pursuant to the terms of the following clause (ii) to require the redemption of such shares of Preferred Stock, and (ii) if

the holders of a majority of the then outstanding shares of Preferred Stock so request in a written instrument delivered to the Corporation not later than 120 days after such Sale of the Corporation, the Corporation shall use the consideration received by the Corporation for such Sale of the Corporation (net of any retained liabilities associated with the assets sold or technology licensed, as determined in good faith by the Board of Directors), together with any other assets of the Corporation available for distribution to its stockholders, all to the extent permitted by Delaware law governing distributions to stockholders (the "**Available Proceeds**"), on the 150th day after such Sale of the Corporation, to redeem all outstanding shares of Preferred Stock at a price per share equal to the applicable Liquidation Amount. Notwithstanding the foregoing, in the event of a redemption pursuant to the preceding sentence, if the Available Proceeds are not sufficient to redeem all outstanding shares of Preferred Stock, the Corporation shall ratably redeem each holder's shares of Preferred Stock to the fullest extent of such Available Proceeds, and shall redeem the remaining shares as soon as it may lawfully do so under Delaware law governing distributions to stockholders. The provisions of Section B.9 shall apply, with such necessary changes in the details thereof as are necessitated by the context, to the redemption of the Preferred Stock pursuant to this Section B.2(i). Prior to the distribution or redemption provided for in this Section B.2(i), the Corporation shall not expend or dissipate the consideration received for such Sale of the Corporation, except to discharge expenses incurred in connection with such Sale of the Corporation or in the ordinary course of business.

(j) Allocation of Escrow and Contingent Consideration. In the event of a Sale of the Corporation, if any portion of the consideration payable to the stockholders of the Corporation is payable only upon satisfaction of contingencies (the "**Additional Consideration**"), the Merger Agreement shall provide that (a) the portion of such consideration that is not Additional Consideration (such portion, the "**Initial Consideration**") shall be allocated among the holders of capital stock of the Corporation in accordance with Sections B.2(a)-B.2(d) as if the Initial Consideration were the only consideration payable in connection with such Sale of the Corporation and (b) any Additional Consideration which becomes payable to the stockholders of the Corporation upon satisfaction of such contingencies shall be allocated among the holders of capital stock of the Corporation in accordance with Sections B.2(a)-B.2(d) after taking into account the previous payment of the Initial Consideration as part of the same transaction. For the purposes of this Section B.2(j), consideration placed into escrow or retained as holdback to be available for satisfaction of indemnification or similar obligations in connection with such Sale of the Corporation shall be deemed to be Additional Consideration.

3. **Conversion into Common Stock**. The holders of Preferred Stock shall have the following conversion rights:

(a) Voluntary Conversion. At any time, each holder of shares of Preferred Stock shall be entitled, without the payment of any additional consideration, to cause all or any portion of the shares of Preferred Stock held by such holder to be converted into a number of shares of Common Stock determined as hereafter provided in this Section B.3(a), which shares shall upon the issuance thereof be fully paid and non-assessable. The number of shares of Common Stock issuable upon the conversion of each share of a series of Preferred Stock shall be equal to the quotient obtained by dividing (i) the applicable Purchase Price for such series of Preferred Stock by (ii) the applicable Conversion Price for such series of Preferred Stock, in each

case as in effect at the time of conversion. As of the Effective Time, the "**Series A Conversion Price**" per share of the Series A Preferred Stock equals the Series A Purchase Price, the "**Series B Conversion Price**" per share of the Series B Preferred Stock equals the Series B Purchase Price, the "**Series B-2 Conversion Price**" per share of the Series B-2 Preferred Stock equals the Series B-2 Purchase Price, the "**Series C Conversion Price**" per share of the Series C Preferred Stock equals the Series C Purchase Price, the "**Series D Conversion Price**" per share of the Series D Preferred Stock equals the Series D Purchase Price, and the "**Series E Conversion Price**" per share of the Series E Preferred Stock equals the Series E Purchase Price, subject in each case to adjustment from time to time as hereinafter provided. Notwithstanding the foregoing, in the event, and only in the event, that shares of Series E Preferred Stock are converted into shares of Common Stock in connection with a Qualified Public Offering (as defined herein) consummated on or prior to March 1, 2016, the Series E Conversion Price shall be deemed to have been equal as of the Effective Time to $1.362, subject to adjustment from time to time as hereinafter provided. For the avoidance of doubt, in the event of an adjustment to the Series E Conversion Price on or prior to March 1, 2016, and in the event that a Qualified Public Offering is consummated on or prior to March 1, 2016, such adjustment to the Series E Conversion Price shall be made after giving effect to the prior sentence (meaning that the adjustment shall be applied to the Series E Conversion Price of $1.362 and not to the Conversion Price of $1.119), including in the event that such adjustment preceded the Qualified Public Offering.

(b) Automatic Conversion. Each share of Preferred Stock shall automatically be converted, without the payment of any additional consideration, into the number of shares of Common Stock provided for in Section B.3(a) either (i) immediately upon consummation of the Corporation's first underwritten Public Offering of Common Stock pursuant to an effective registration statement under the Securities Act (A) resulting in at least $50,000,000 of gross proceeds to the Corporation, (B) reflecting a gross offering price per share of Common Stock to the public (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving Common Stock) of not less than 1.2 times the Series E Purchase Price (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving Common Stock), and (C) after giving effect to which the Common Stock is listed on a U.S. national securities exchange (a "**Qualified Public Offering**"), or (ii) upon the written request of the Requisite Stockholders, which must include the Requisite D/E Preferred (a "**Majority Conversion**"). For purposes of this Section B.3(b) only, the "Series E Purchase Price" shall mean (i) $1.362 per share if the closing of such Qualified Public Offering occurs on or prior to March 1, 2016, or (ii) $1.119 per share if the closing of such Qualified Public Offering occurs at any time after March 1, 2016 (in each case, as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving Common Stock).

(c) Procedure for Voluntary Conversion: Effective Date. Upon any election to convert any shares of Preferred Stock made in accordance with Section B.3(a), the holders of such shares of Preferred Stock making such election shall provide written notice of

such conversion (a "**Voluntary Conversion Notice**") to the Corporation setting forth the number of shares of Preferred Stock each such holder elects to convert into Common Stock (the "**Elected Preferred Stock**"). On the date the Voluntary Conversion Notice is delivered to the Corporation, such shares of Elected Preferred Stock shall thereupon be converted, without further action, into the number of shares of Common Stock provided for in Section B.3(a), and such number of shares of Common Stock into which the Elected Preferred Stock is converted shall thereupon be deemed to have been issued to such holders of the Elected Preferred Stock. Such holders shall as soon as practicable thereafter surrender to the Corporation at the Corporation's principal executive office the certificate or certificates evidencing the Elected Preferred Stock, duly assigned or endorsed for transfer to the Corporation (or accompanied by duly executed stock powers relating thereto), or an Affidavit of Loss with respect thereto. Upon surrender of such certificates or delivery of an Affidavit of Loss with respect thereto, the Corporation shall issue and deliver to the holder so surrendering such certificates or to such holder's designee, at an address designated by such holder, certificates for the number of shares of Common Stock into which such holder's Elected Preferred Stock shall have been converted. The issuance of certificates for shares of Common Stock upon conversion of Elected Preferred Stock will be made without charge to the holders of such shares for any issuance tax in respect thereof or other costs incurred by the Corporation in connection with such conversion and the related issuance of such stock. Notwithstanding anything to the contrary set forth in this Section B.3(c), in the event that holders of shares of Preferred Stock elect to convert such shares pursuant to Section B.3(a) in connection with any Public Offering or other specified event, (i) such conversion may at the election of such holders be conditioned upon the consummation of such Public Offering or the occurrence of such other specified event, in which case, such conversion shall not be deemed to be effective until the consummation of such Public Offering or the occurrence of such other specified event and (ii) if such Public Offering or other specified event is consummated or occurs, all shares of Elected Preferred Stock shall be deemed to have been converted into shares of Common Stock immediately prior thereto.

(d) Procedure for Automatic Conversion. As of the date of, and in all cases subject to, the consummation of a Qualified Public Offering or a Majority Conversion, all outstanding shares of Preferred Stock shall be converted automatically, without further action, into the number of shares of Common Stock provided for in Section B.3(a), and such number of shares of Common Stock into which such Preferred Stock is converted shall be deemed to have been issued to the holders of such Preferred Stock, as the case may be. Such holders shall, as soon as practicable thereafter, surrender the certificate or certificates evidencing the shares of Preferred Stock, as the case may be, duly assigned or endorsed for transfer to the Corporation (or accompanied by duly executed stock powers relating thereto) or an Affidavit of Loss with respect thereto. Upon surrender of such certificates or delivery of an Affidavit of Loss with respect thereto, the Corporation shall issue and deliver to such holder so surrendering such certificates or to such holder's designee, promptly (and in any event in such time as is sufficient to enable such holder to participate in such Qualified Public Offering or Majority Conversion, as applicable) at an address designated by such holder, certificates (or statements(s) of holdings if shares of Common Stock are held in book-entry form) for the number of shares of Common Stock into which such holder's Preferred Stock shall have been converted.

(e) Fractional Shares; Partial Conversion. No fractional shares shall be issued upon conversion of any shares of Preferred Stock. All shares of Common Stock (including fractions thereof) issuable upon conversion of shares of Preferred Stock by a holder thereof shall be aggregated for purposes of determining whether the conversion would result in the issuance of any fractional share. If any fractional interest in a share of Common Stock would, except for the provisions of the first sentence of this paragraph (e), be delivered upon any such conversion, the Corporation, in lieu of delivering the fractional share thereof, shall pay to the holder surrendering the shares of Preferred Stock for conversion an amount in cash equal to the current fair market value of such fractional interest as determined in good faith by the Board of Directors. In case the number of shares of Preferred Stock represented by the certificate or certificates surrendered at the time of conversion exceeds the number of shares to be converted, the Corporation shall, upon such conversion, execute and deliver to the holder thereof, at the expense of the Corporation, a new certificate or certificates for the number of shares of Preferred Stock represented by the certificate or certificates surrendered that are not to be converted.

4. **Adjustments**.

(a) Adjustments for Subdivisions, Combinations or Consolidation of Common Stock. In the event the outstanding shares of Common Stock shall be subdivided by stock split, stock dividends or otherwise, into a greater number of shares of Common Stock, the Conversion Price for each series of Preferred Stock then in effect shall, concurrently with the effectiveness of such subdivision, be proportionately decreased so that the number of shares of Common Stock issuable on conversion of any shares of Preferred Stock shall be increased in proportion to such increase in outstanding shares. In the event the outstanding shares of Common Stock shall be combined or consolidated, by reclassification or otherwise, into a lesser number of shares of Common Stock, the Conversion Price for each series of Preferred Stock then in effect shall, concurrently with the effectiveness of such combination or consolidation, be proportionately increased so that the number of shares of Common Stock issuable on conversion of any shares of Preferred Stock shall be decreased in proportion to such decrease in outstanding shares.

(b) Adjustments for Reclassification, Exchange and Substitution. If the Common Stock issuable upon conversion of the Preferred Stock shall be changed into the same or a different number of shares of any other class or classes of stock or into any other securities or property, whether by capital reorganization, reclassification, merger, combination of shares, recapitalization, consolidation, business combination or other similar transaction (other than a subdivision, consolidation or combination of shares provided for above and other than a Liquidation Event which shall be governed by Section B.2), each share of Preferred Stock shall thereafter be convertible into the number of shares of stock or other securities or property to which a holder of the number of shares of Common Stock of the Corporation deliverable upon conversion of such share of Preferred Stock shall have been entitled upon such capital reorganization, reclassification, merger, combination of shares, recapitalization, consolidation, business combination or other similar transaction if immediately prior to such capital reorganization, reclassification, merger, combination of shares, recapitalization, consolidation, business combination or other similar transaction such holder had converted such holder's Preferred Stock into Common Stock. The provisions of this Section B.4(b) shall similarly apply

to outstanding shares of Preferred Stock at the time of any successive capital reorganizations, reclassifications, mergers, combinations of shares, recapitalizations, consolidations, business combinations or other similar transactions. The Corporation shall not effect any Sale of the Corporation that is not, in accordance with Section B.2(b), a Liquidation Event unless prior to or simultaneously with the consummation thereof the successor corporation or purchaser, as the case may be, shall assume by written instrument the obligation to deliver to the holders of Preferred Stock, securities or assets as, in accordance with the foregoing provisions, each such holder is entitled to receive.

(c) Adjustment of the Conversion Price Upon Issuance of Additional Shares of Common Stock. In the event the Corporation shall on or at any time following the Effective Time issue or sell, or in accordance with Section B.4(e) is deemed to have issued or sold, any shares of Common Stock or Convertible Securities without consideration or for a consideration per share of Common Stock less than the applicable Conversion Price for any series of Preferred Stock in effect immediately prior to such issue or sale, then and in such event, such applicable Conversion Price shall be reduced, concurrently with such issue or sale, to a price (calculated to the nearest whole cent) determined by the following formula:

$$P = \frac{P1Q1 + P2Q2}{Q1 + Q2}$$

Where:

P = the applicable Conversion Price for such series of Preferred Stock in effect immediately following and after giving effect to such issue or sale

P1 = the applicable Conversion Price for such series of Preferred Stock in effect immediately prior to such issue or sale

Q1 = the number of shares of Common Stock Deemed Outstanding immediately prior to such issue or sale

P2 = the consideration per share, if any, received or receivable by the Corporation on account of such issue or sale

Q2 = the number of shares of Common Stock so issued or sold or, in accordance with Section B.4(e), deemed to have been issued or sold

(d) Multiple Closing Dates. In the event the Corporation shall issue on more than one date additional shares of Common Stock or Convertible Securities as part of one transaction or a series of related transactions, and such issuance dates occur within a period of no more than 60 days, then, upon the final such issuance (or at the time of any conversion, if

earlier), the applicable Conversion Price for each series of Preferred Stock shall be readjusted to give effect to all such issuances as if they occurred on the date of the final such issuance (and without giving effect to any adjustments as a result of such prior issuances within such period).

(e) Effect of Certain Events on Conversion Prices. For purposes of determining the adjusted Conversion Price with respect to any series of Preferred Stock under Section B.4(c), the following shall be applicable:

(i) Issuance of Convertible Securities.

(A) If the Corporation in any manner grants, issues or sells any Convertible Securities, whether or not the rights to exercise, convert or exchange any such Convertible Securities are immediately exercisable, and the price per share for which Common Stock is issuable upon such exercise, conversion or exchange is less than any Conversion Price in effect immediately prior to the time of such grant, issue or sale, then the maximum number of shares of Common Stock issuable upon the exercise, conversion or exchange of such Convertible Securities shall be deemed to be outstanding and to have been issued and sold by the Corporation at the time of the grant, issue or sale of such Convertible Securities for such price per share.

(B) For the purposes of this paragraph, the "price per share for which Common Stock is issuable" in connection with the issuance of Convertible Securities shall be determined by dividing (x) the total amount received or receivable by the Corporation as consideration for the grant, issue or sale of such Convertible Securities, plus the cumulative minimum aggregate amount of additional consideration, if any, payable to the Corporation upon the exercise, conversion or exchange thereof and, if applicable, the exercise, conversion and exchange of any other Convertible Securities that such Convertible Securities may be converted into or exercised or exchanged for (in each case, as set forth in the instruments and agreements relating thereto, without regard to any provision contained therein for a subsequent adjustment of such consideration), by (y) the total maximum number of shares of Common Stock issuable upon the exercise, conversion or exchange of all such Convertible Securities (as set forth in the instruments and agreements relating thereto, without regard to any provision contained therein for a subsequent adjustment of such number). No further adjustment of any Conversion Price shall be made when Common Stock and, if applicable, any other Convertible Securities, are actually issued upon the exercise, conversion or exchange of such Convertible Securities.

(C) If the Corporation issues any Convertible Securities that entitle the holder thereof, *inter alia*, both (i) to exercise, convert or exchange the same into or for Common Stock or otherwise to participate with the holders of Common Stock in distributions upon the occurrence of a Liquidation Event and (ii) in connection with or following such exercise, conversion or exchange, to receive payment of a fixed or defined sum (such securities being referred to herein as "**Qualified Convertible Securities**" and such fixed or defined sum being referred to as the "**Preference Payment**"), the "total maximum number of shares of Common Stock issuable upon the exercise, conversion or exchange of all such Convertible Securities" for purposes of clause (y) of Section B.4(e)(i)(B) above shall include, in addition to the total maximum number of shares of Common Stock issuable upon the exercise, conversion or exchange of all such Convertible Securities, a number of shares of Common Stock equal to the

quotient of (A) the aggregate Preference Payments of all such Qualified Convertible Securities so issued, divided by (B) the total amount received or receivable by the Corporation as consideration for the issue of one of such Qualified Convertible Securities (as set forth in the instruments and agreements relating thereto).

(ii) Change in Exercise Price or Conversion Rate. If the additional consideration payable to the Corporation upon the exercise, conversion or exchange of any Convertible Securities, or the rate at which any Convertible Securities are convertible into or exchangeable for Common Stock should change at any time, each Conversion Price that is in effect at the time of such change that was adjusted in accordance with Section B.4(e)(i) upon the issuance of such Convertible Securities shall be readjusted to the Conversion Price that would have been in effect at such time had such Convertible Securities that are still outstanding provided for such changed additional consideration or changed conversion rate, as the case may be, at the time such Convertible Securities were initially granted, issued or sold; and on the termination date of any right to exercise, convert or exchange such Convertible Securities without such right having been exercised, each Conversion Price then in effect hereunder shall be adjusted to the Conversion Price that would have been in effect at the time of such termination had such Convertible Securities, to the extent outstanding immediately prior to such termination, never been issued.

(iii) Exceptions for Excluded Securities. Notwithstanding the foregoing, no adjustments shall be made under Sections B.4(c), (d) and/or (e) with respect to the issue, grant or sale of any Excluded Securities.

(iv) Valuation of Non-Cash Consideration. The consideration received by the Corporation for the issue of any shares of Common Stock, Convertible Securities or any other Convertible Securities that such Convertible Securities may be converted into or exercised or exchanged for shall be computed in accordance with Section B.2(g).

(f) Other Dilutive Issuances. If an event not specified in this Section B.4 (other than the issuance of Excluded Securities) occurs that has substantially the same economic effect on any series of Preferred Stock as those events specifically enumerated above in this Section B.4, then this Section B.4 shall be construed liberally, *mutatis mutandis*, in order to provide the holders of such series of Preferred Stock the intended benefit of the protections provided under this Section B.4. In such event, the Board of Directors shall make an appropriate adjustment in each applicable Conversion Price so as to protect the rights of the holders of such series of Preferred Stock; *provided* that no such adjustment (other than in accordance with an event in the nature of a combination or consolidation of the Common Stock) shall increase the applicable Conversion Price above the applicable Purchase Price for such series of Preferred Stock as otherwise determined pursuant to this Section B.4 or decrease the number of shares of Common Stock issuable upon conversion of each share of Preferred Stock as otherwise determined in accordance with this Section B.4.

(g) No Impairment. The Corporation will not, by amendment of this Certificate of Incorporation or through any reorganization, transfer of assets, consolidation, merger, dissolution, issue or sale of securities or any other voluntary action, avoid or seek to

avoid the observance or performance of any of the terms to be observed or performed hereunder by the Corporation, and will at all times in good faith assist in the carrying out of all the provisions of this Section B.4 and in the taking of all such action as may be necessary or appropriate in order to protect the conversion rights of the holders of Preferred Stock hereunder against impairment by the Corporation or any successor entities. Notwithstanding the foregoing, nothing in this Section B.4(g) shall prohibit the Corporation from amending this Certificate of Incorporation with the requisite consent of its stockholders in accordance with Section C.4 and the approval of the Board.

(h) Certificate as to Adjustments. Upon the occurrence of each adjustment or readjustment of any Conversion Price pursuant to this Section B.4, the Corporation at its expense shall promptly compute such adjustment or readjustment in accordance with the terms hereof and furnish to each holder of Preferred Stock a certificate setting forth such adjustment or readjustment and showing in detail the facts upon which such adjustment or readjustment is based and the applicable Conversion Price then in effect. The Corporation shall, upon the written request at any time by any holder of Preferred Stock, furnish or cause to be furnished to such holder a like certificate setting forth (i) such adjustments and readjustments, (ii) the Conversion Price at the time in effect, and (iii) the number of shares of Common Stock and the amount, if any, of other property that at the time would be received upon the conversion of such holder's Preferred Stock.

(i) Rounding. All calculations under this Section B.4 shall be made to (i) the nearest one cent or (ii) the nearest share, as the case may be. All calculations of percentages, if any, shall be carried to three decimal points but shall not be rounded up or down.

(j) Limitations on Adjustments. Anything herein to the contrary notwithstanding, no adjustment in the Conversion Price of any series of Preferred Stock shall be required unless such adjustment, either by itself or with other adjustments not previously made, would require a change of at least $0.0001 in such Conversion Price; provided, however, that any adjustment which by reason of this paragraph (j) is not required to be made shall be carried forward and taken into account in any subsequent adjustment or immediately prior to any conversion.

5. **Reservation of Stock Issuable Upon Conversion**. The Corporation shall at all times reserve and keep available out of its authorized but unissued shares of Common Stock, solely for the purpose of effecting the conversion of the issued or issuable shares of Preferred Stock, such number of its shares of Common Stock, as the case may be, as shall from time to time be sufficient to effect the conversion of all outstanding shares of Preferred Stock, and if at any time the number of authorized but unissued shares of Common Stock shall not be sufficient to effect the conversion of all then outstanding shares of Preferred Stock, the Corporation will take all such corporate action as may be necessary to increase its authorized but unissued shares of Common Stock to such number of shares as shall be sufficient for such purpose.

6. **No Closing of Transfer Books**. The Corporation shall not close its books against the transfer of shares of Preferred Stock in any manner that would interfere with the timely conversion of any shares of Preferred Stock in accordance with the provisions hereof.

7. **Notice**.

(a) Liquidation Events, Extraordinary Transactions, Etc. In the event (i) the Corporation establishes a record date to determine the holders of any class of securities who are entitled to receive any dividend or other distribution or who are entitled to vote at a meeting (or by written consent) in connection with any Liquidation Event or (ii) any Liquidation Event is approved by the Board of Directors or the Corporation enters into any agreement with respect thereto, the Corporation shall mail or cause to be mailed by first class mail (postage prepaid) to each holder of Preferred Stock at least ten (10) days prior to such record date specified therein or the expected effective date of any such transaction, a notice specifying (A) such record date for the purpose of such dividend or distribution or meeting or consent and a description of such dividend or distribution or the action to be taken at such meeting or by such consent, (B) the date on which any such Liquidation Event is expected to become effective and, in the case of a Sale of the Corporation, the identity of the parties thereto, and (C) the date on which the books of the Corporation shall close or a record shall be taken with respect to any such event.

(b) Waiver of Notice. The Requisite Stockholders, which must include the Requisite D/E Preferred, may, at any time upon written notice to the Corporation, waive, either prospectively or retrospectively, any notice provisions specified herein, and any such waiver shall be effective as to all holders of Preferred Stock.

(c) General. In the event that the Corporation provides any notice, report or statement to holders of Common Stock, the Corporation shall at the same time provide a copy of any such notice, report or statement to each holder of outstanding Preferred Stock.

8. **No Reissuance of Preferred Stock**. No share or shares of Preferred Stock acquired by the Corporation by reason of redemption, purchase, conversion or otherwise shall be reissued, and all such shares shall be canceled, retired and eliminated from the shares that the Corporation shall be authorized to issue.

9. **Redemption**.

(a) The Preferred Stock may be redeemed, in whole or in part, at the option of the holders of such Preferred Stock pursuant to redemption proceedings which must first be initiated by the Requisite Stockholders, which must include the Requisite D/E Preferred, at any time on or after the fifth anniversary of the Effective Time. In any such case, the Requisite Stockholders, which must include the Requisite D/E Preferred, shall notify the Corporation in writing (the "**Redemption Notice**") of their election to exercise the rights afforded by this Section B.9 (including as to any shares of Series A Preferred Stock or Series B Preferred Stock held by any such holders). Upon receipt of the Redemption Notice, the Corporation shall promptly notify the remaining holders of the Preferred Stock thereof. Any holder of Preferred Stock that did not deliver the Redemption Notice may, at such holder's option, then submit to the Corporation, within thirty (30) days following receipt of the notice from the Corporation, notice of intent and election to seek redemption of all or any part of their Preferred Stock (the "**Secondary Redemption Notice**") and such Secondary Redemption Notice shall be deemed to

have been delivered on the same date that the Redemption Notice was delivered. The redemption price for each share of Preferred Stock shall be cash in an amount equal to the applicable Liquidation Preference for such series of Preferred Stock (the "**Redemption Price**"). The Redemption Price shall be payable by the Corporation to holders of the Preferred Stock in three equal annual installments the first such installment being due no later than the ninetieth (90th) day following the receipt of the Redemption Notice and on the anniversary of such first installment thereafter.

(b) If the funds of the Corporation legally available for redemption of its shares are insufficient to redeem the total number of outstanding shares of Preferred Stock for which redemption was elected, then the funds available for redemption shall be used to redeem the Preferred Stock as follows: (i) first, the holders of shares of Series E Preferred Stock and Series D Preferred Stock for which redemption was elected shall share ratably in any funds legally therefor according to the respective amounts that would be payable with respect to the full number of shares of Series E Preferred Stock and Series D Preferred Stock owned by them if all such outstanding shares were redeemed in full; (ii) second, the holders of shares of Series C Preferred Stock and Series B-2 Preferred Stock for which redemption was elected shall share ratably in any funds legally therefor according to the respective amounts that would be payable with respect to the full number of shares of Series C Preferred Stock and Series B-2 Preferred Stock owned by them if all such outstanding shares were redeemed in full; and (iii) the holders of shares of Series B Preferred Stock and Series A Preferred Stock for which redemption was elected shall share ratably in any funds legally therefor according to the respective amounts that would be payable with respect to the full number of shares of Series B Preferred Stock and Series A Preferred Stock owned by them if all such outstanding shares were redeemed in full. At any time thereafter when additional funds of the Corporation are legally available for the redemption of such shares of Preferred Stock, such funds will be used at the earliest permissible time to redeem the balance of such shares, or such portion thereof for which funds are then legally available. For the avoidance of doubt, in no event shall any shares of Series C Preferred Stock or Series B-2 Preferred Stock be redeemed prior to redemption of all of the shares of Series E Preferred Stock and Series D Preferred Stock which the holders of such shares of Series E Preferred Stock and Series D Preferred Stock, respectively, have elected to redeem pursuant to Section B.9(a). The Corporation shall be obligated to use its best efforts to take such actions as may be necessary (including, without limitation, the issuance of additional equity securities, the revaluation or recapitalization of the Corporation or the consummation of Sale of the Corporation in order to permit the full and timely redemption of the shares of Preferred Stock for which redemption was elected).

(c) Until the holders of shares of Preferred Stock have received in cash payment in full of all amounts provided in this Section B.9, any such shares of Preferred Stock shall not be considered redeemed. Such unredeemed shares shall remain outstanding and shall continue to have all rights and preferences (including, without limitation, dividend, conversion and voting rights) provided for herein; *provided, however*, that the holders of such unredeemed shares shall have the ongoing right to be redeemed, together with such rights and remedies as may be available under applicable law, at each such holder's election either (i) to have such holder's remaining outstanding shares of Preferred Stock redeemed, or (ii) rescind the

Redemption Notice with respect to all or any portion of such unredeemed shares and to continue holding such shares, free of any right of the Corporation to redeem such shares

(d) The notices provided for in this Section B.9 shall be sent, if by or on behalf of the Corporation, to the holders of the Preferred Stock at their respective addresses as shall then appear on the records of the Corporation, or if by any holder of Preferred Stock to the Corporation, at its principal executive office or registered office in Delaware, by first class mail, postage prepaid, and (i) in the case of a Redemption Notice or Secondary Redemption Notice, shall contain the number of shares of Preferred Stock to be redeemed, and (ii) in the case of any notice by or on behalf of the Corporation, stating the place or places and time at which the shares called for redemption shall, upon presentation and surrender of such certificates representing such shares, be redeemed and the redemption price therefor.

C. VOTING; ELECTION OF DIRECTORS; EXIT TRANSACTION.

1. **Voting Generally**. Except as expressly set forth herein, the holder of each share of Preferred Stock shall vote with holders of Common Stock, voting together as a single class on an as-converted basis, upon all matters submitted to a vote of stockholders. For such purpose, each holder of any share of a series of Preferred Stock shall be entitled to the number of votes per share of such series of Preferred Stock as equals the largest number of shares of Common Stock into which each share of such series of Preferred Stock may be converted pursuant to Section B.3 on the record date fixed for the determination of stockholders entitled to vote or on the effective date of any written consent of stockholders, as applicable. In determining the number of shares into which shares of any series of Preferred Stock may be converted for purposes of the preceding sentence, the applicable Conversion Price shall be deemed to be the applicable Purchase Price of such series of Preferred Stock (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving Common Stock), rather than any imputed Conversion Price to be determined in the event of a Qualified Public Offering (as defined herein) consummated on or prior to March 1, 2016. Fractional votes shall not, however, be permitted and any fractional voting rights resulting from the above formula with respect to any holder of Preferred Stock shall be rounded to the nearest whole number (with one-half rounded upward to one). Notwithstanding Section 228(a) of the DGCL and except as otherwise provided herein, no action that is required by the DGCL to be taken by stockholders at any annual or special meeting of stockholders of the Corporation or that may be taken by stockholders at any annual or special meeting of stockholders of the Corporation may be taken without a meeting, without prior notice and without a vote unless a consent or consents in writing setting forth the action so taken shall be signed by the Requisite Stockholders which must include the Requisite D/E Preferred if such consent or consents would adversely affect the rights of the Series D Preferred Stock or the Series E Preferred Stock under this Section C.1. of Article IV. There shall be no cumulative voting.

2. **Board of Directors**. The Corporation's board of directors (the "**Board**" or the "**Board of Directors**") shall be elected as follows:

(a) two directors of the Corporation shall be elected by the

holders of Common Stock, voting separately as a single class for such purpose;

(b) one director of the Corporation shall be elected by the holders of the Series A Preferred Stock, voting separately as a single class for such purpose (such director being referred to as the "**Series A Director**");

(c) two directors of the Corporation shall be elected by the holders of the Series B-2 Preferred Stock, voting separately as a single class for such purpose (such directors being referred to as the "**Series B-2 Directors**");

(d) one director of the Corporation shall be elected by the holders of the Series C Preferred Stock, voting separately as a single class for such purpose (such director being referred to as the "**Series C Director**");

(d) two directors of the Corporation shall be elected by the holders of the Series E Preferred Stock, voting separately as a single class for such purpose (such directors being referred to as the "**Series E Directors**"); and

(e) one director of the Corporation shall be elected by the holders of the Preferred Stock and Common Stock, voting together as a single class, on an as-converted basis for such purpose.

3. **Election of Directors**. The election of any director as provided in Section D.2 above by the holders of the shares of the class or series of Capital Stock entitled to elect such director or directors shall occur (i) at the annual meeting of stockholders, (ii) at any special meeting of stockholders, (iii) at any special meeting of holders of the shares of the class or series of Capital Stock entitled to elect such director or directors called by the holders of not less than a majority of such class or series then outstanding or (iv) by the written consent of holders of not less than a majority of the shares of the class or series of Capital Stock entitled to elect such director or directors then outstanding. Any director elected as provided in Section C.2 may be removed at any time with or without cause by and only by the requisite vote or written consent of the holders of the shares of the class or series of Capital Stock entitled to elect such director or directors, and any vacancy occurring by reason of such removal or by reason of the death, resignation or inability to serve of any such director, shall be filled by and only by a vote or written consent of the holders of the shares of the class or series of Capital Stock entitled to elect such director or directors. Any director so elected shall serve until such director's successor is duly elected and qualified, or such director's earlier death, resignation or removal by the holders of the shares of the class or series of Capital Stock entitled to elect such director or directors.

4. **Special Approval Rights**.

(a) Approval Rights of the Requisite Holders. So long as any shares of Preferred Stock remain outstanding, the affirmative vote or consent of the Requisite Stockholders shall be necessary to authorize the Corporation to take any of the following actions, either directly or indirectly, whether by merger, consolidation, or otherwise (together with those actions

set forth in Sections C.4(b), (c) and (d) below, the "**Restricted Actions**"), and any such action taken or transaction entered into without such consent or vote shall be null and void *ab initio*:

(i) Amend, repeal or change, directly or indirectly, any of the provisions of the Certificate of Incorporation, or the Bylaws of the Corporation in any manner that would adversely alter, change or affect the powers, preferences or special rights of the shares of any series of Preferred Stock including, without limitation, increasing the aggregate authorized number of shares of any series of Preferred Stock or altering the rights and preferences of any series of Preferred Stock; or

(ii) Authorize, or increase the authorized number of shares of, or issue additional shares of any series of Preferred Stock, or any class or series of the Corporation's capital stock or options, warrants or other rights to acquire any such capital stock ranking with respect to liquidation preference, dividends or redemption rights, senior to, or *pari passu* with, any series of Preferred Stock.

(iii) Authorize or effect a Sale of the Corporation or other change of control, liquidation, merger, re-incorporation, recapitalization of the Corporation, or sale or other transfer of all or substantially all of the Corporation's assets other than in the ordinary course of business;

(iv) Authorize or effect or permit, any acquisition of the capital stock of another entity, which results in the consolidation of that entity into the results of operations of the Corporation or acquisition of all or substantially all of the assets of another entity;

(v) Authorize or effect the creation of any indebtedness for borrowed money, in a single or related series of transactions, in an amount in excess of $5,000,000, unless approved by the Board, including a majority of the then-sitting Preferred Directors;

(vi) Authorize or effect the creation of a new plan or arrangement for the grant of stock options or the issuance of restricted stock or increase the number of shares available under such a plan or arrangement, unless approved by the Board, including a majority of the then-sitting Preferred Directors;

(vii) Authorize or effect an increase in the number of directors;

(viii) Authorize or effect the payment or declaration any dividend or distribution on any shares of the Corporation's Capital Stock (except dividends payable solely in shares of common stock), or apply of any of the Corporation's assets to the redemption or repurchase of the Corporation's Capital Stock (except as contemplated herein); or

(ix) Create, or hold capital stock in, any Subsidiary (excluding any Subsidiary existing as of the Effective Time) that is not wholly owned (either directly or through one or more other Subsidiaries) by the Corporation, or sell, transfer or otherwise dispose of any capital stock of any direct or indirect Subsidiary of the Corporation unless approved by the

Board, including a majority of the then-sitting Preferred Directors, or permit any direct or indirect Subsidiary to sell, lease, transfer, exclusively license or otherwise dispose (in a single transaction or series of related transactions) of all or substantially all of the assets of such Subsidiary, unless approved by the Board, including a majority of the then-sitting Preferred Directors.

(b) Approval Rights of the Series D Preferred Stock. So long as any shares of Series D Preferred Stock remain outstanding, the Corporation shall not, either directly or indirectly, by amendment, merger, consolidation or otherwise, do any of the following without (in addition to any other vote required by law or the Certificate of Incorporation) the written consent or affirmative vote of the holders of a majority of the then outstanding shares of Series D Preferred Stock, given in writing or by vote at a meeting, consenting or voting (as the case may be) separately as a class, and any such act or transaction entered into without such consent or vote shall be null and void *ab initio*, and of no force or effect:

(i) Amend, alter or repeal any provision of the Certificate of Incorporation or Bylaws of the Corporation in a manner that alters the powers, preferences or rights of the Series D Preferred Stock; provided, however, that the authorization and/or creation of a new series of Preferred Stock which is junior to, *pari passu* with, or senior to, the Series D Preferred Stock shall not in and of itself be deemed to adversely affect the powers, preferences or rights of the Series D Preferred Stock;

(ii) Increase or decrease the authorized number of shares of Series D Preferred Stock;

(iii) (A) Reclassify, alter or amend any existing security of the Corporation that is *pari passu* with the Series D Preferred Stock in respect of the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, if such reclassification, alteration or amendment would render such other security senior to the Series D Preferred Stock in respect of any such right, preference or privilege, or (B) reclassify, alter or amend any existing security of the Corporation that is junior to the Series D Preferred Stock in respect of the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, if such reclassification, alteration or amendment would render such other security senior to or *pari passu* with the Series D Preferred Stock in respect of any such right, preference or privilege;

(iv) Purchase or redeem (or permit any Subsidiary to purchase or redeem) or pay or declare any dividend or make any distribution on, any shares of capital stock of the Corporation other than (i) redemptions of or dividends or distributions on the Preferred Stock as expressly authorized herein, (ii) dividends or other distributions payable on the Common Stock solely in the form of additional shares of Common Stock, and (iii) repurchases of stock from former employees, officers, directors, consultants or other persons who performed services for the Corporation or any Subsidiary in connection with the cessation of such employment or service at the lower of the original purchase price or the then-current fair market value thereof; or

(v) Consummate any merger or other transaction with a Subsidiary, other than pursuant to the terms of a transaction between a Subsidiary and the Corporation whereby the Corporation's stockholders immediately prior to such transaction continue to hold Capital Securities in the same proportion and having the same economic rights, privileges and preferences immediately following such transaction, if such transaction would, directly or indirectly, have the impact of adversely affecting the rights, preferences and privileges of the Series D Preferred Stock set forth in the Certificate of Incorporation or would result in any shares of Series D Preferred Stock outstanding immediately prior to such transaction not being outstanding immediately following such transaction.

(c) Approval Rights of the Series E Preferred Stock. So long as any shares of Series E Preferred Stock remain outstanding, the Corporation shall not, either directly or indirectly, by amendment, merger, consolidation or otherwise, do any of the following without (in addition to any other vote required by law or the Certificate of Incorporation) the written consent or affirmative vote of the holders of a majority of the then outstanding shares of Series E Preferred Stock, given in writing or by vote at a meeting, consenting or voting (as the case may be) separately as a class, and any such act or transaction entered into without such consent or vote shall be null and void *ab initio*, and of no force or effect:

(i) Amend, alter or repeal any provision of the Certificate of Incorporation or Bylaws of the Corporation in a manner that alters the powers, preferences or rights of the Series E Preferred Stock; provided, however, that the authorization and/or creation of a new series of Preferred Stock which is junior to or *pari passu* with the Series E Preferred Stock shall not in and of itself be deemed to adversely affect the powers, preferences or rights of the Series E Preferred Stock;

(ii) Increase or decrease the authorized number of shares of Series E Preferred Stock;

(iii) (A) Reclassify, alter or amend any existing security of the Corporation that is pari passu with the Series E Preferred Stock in respect of the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, if such reclassification, alteration or amendment would render such other security senior to the Series E Preferred Stock in respect of any such right, preference or privilege, or (B) reclassify, alter or amend any existing security of the Corporation that is junior to the Series E Preferred Stock in respect of the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, if such reclassification, alteration or amendment would render such other security senior to or pari passu with the Series E Preferred Stock in respect of any such right, preference or privilege; or

(iv) Purchase or redeem (or permit any Subsidiary to purchase or redeem) or pay or declare any dividend or make any distribution on, any shares of capital stock of the Corporation other than (i) redemptions of or dividends or distributions on the Preferred Stock as expressly authorized herein, (ii) dividends or other distributions payable on the Common Stock solely in the form of additional shares of Common Stock, and (iii) repurchases of

stock from former employees, officers, directors, consultants or other persons who performed services for the Corporation or any Subsidiary in connection with the cessation of such employment or service at the lower of the original purchase price or the then-current fair market value thereof.

(d) Approval Rights of the Requisite D/E Preferred. So long as any shares of Series D Preferred Stock or Series E Preferred Stock remain outstanding, the Corporation shall not, either directly or indirectly, by amendment, merger, consolidation or otherwise, do any of the following without (in addition to any other vote required by law or the Certificate of Incorporation) the written consent or affirmative vote of the Requisite D/E Preferred, given in writing or by vote at a meeting, consenting or voting (as the case may be) separately as a class, and any such act or transaction entered into without such consent or vote shall be null and void *ab initio*, and of no force or effect:

(i) Authorize or effect a Sale of the Corporation or other change of control, liquidation, merger, re-incorporation, recapitalization of the Corporation, or sale or other transfer of all or substantially all of the Corporation's assets other than in the ordinary course of business, unless such Sale of the Corporation or other such event results in Initial Consideration payable at the closing of such transaction to the holders of Series E Preferred Stock and the holders of Series D Preferred Stock of an amount per share (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving Common Stock) which is equal to or more than (A) two times the Series D Purchase Price, in the case of the Series D Preferred Stock, and (B) two times the Series E Purchase Price, in the case of the Series E Preferred Stock;

(ii) Create, or authorize the creation of, any additional class or series of capital stock that ranks senior to the Series D Preferred Stock or the Series E Preferred Stock with respect to the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption;

(iii) (A) Reclassify, alter or amend any existing security of the Corporation that is *pari passu* with the Series E Preferred Stock or the Series D Preferred Stock in respect of the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, if such reclassification, alteration or amendment would render such other security senior to the Series E Preferred Stock or the Series D Preferred Stock in respect of any such right, preference or privilege, or (B) reclassify, alter or amend any existing security of the Corporation that is junior to the Series E Preferred Stock or the Series D Preferred Stock in respect of the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, if such reclassification, alteration or amendment would render such other security senior to or *pari passu* with the Series E Preferred Stock or the Series D Preferred Stock in respect of any such right, preference or privilege.

(e) Approval.

(i) The approval rights of the holders of shares of Preferred Stock to authorize the Corporation to take any Restricted Action as provided in Section C.4(a) may be exercised at any annual meeting of stockholders, at a special meeting of the holders of Preferred Stock held for such purpose or by written consent of such holders. At each meeting of stockholders at which the holders of shares of Preferred Stock shall have the right, voting together as a single class, to authorize the Corporation to take any Restricted Action as provided in Section C.4(a), the presence in person or by proxy of the Requisite Stockholders shall be necessary and sufficient to constitute a quorum. At any such meeting or at any adjournment thereof, in the absence of a quorum of the holders of shares of Preferred Stock, a majority of the holders of such shares present in person or by proxy shall have the power to adjourn the meeting as to the actions to be taken by the holders of shares of Preferred Stock from time to time and place to place without notice other than announcement at the meeting until a quorum shall be present.

(ii) The approval rights of the holders of shares of Series D Preferred Stock to authorize the Corporation to take any Restricted Action as provided in Section C.4(b) may be exercised at any annual meeting of stockholders, at a special meeting of the holders of Preferred Stock held for such purpose or by written consent of such holders. At each meeting of stockholders at which the holders of shares of Series D Preferred Stock shall have the right, voting together as a single class, to authorize the Corporation to take any Restricted Action as provided in Section C.4(b), the presence in person or by proxy of such holders shall be necessary and sufficient to constitute a quorum. At any such meeting or at any adjournment thereof, in the absence of a quorum of the holders of shares of Series D Preferred Stock, a majority of the holders of such shares present in person or by proxy shall have the power to adjourn the meeting as to the actions to be taken by the holders of shares of Series D Preferred Stock from time to time and place to place without notice other than announcement at the meeting until a quorum shall be present.

(iii) The approval rights of the holders of shares of Series E Preferred Stock to authorize the Corporation to take any Restricted Action as provided in Section C.4(c) may be exercised at any annual meeting of stockholders, at a special meeting of the holders of Preferred Stock held for such purpose or by written consent of such holders. At each meeting of stockholders at which the holders of shares of Series E Preferred Stock shall have the right, voting together as a single class, to authorize the Corporation to take any Restricted Action as provided in Section C.4(c), the presence in person or by proxy of such holders shall be necessary and sufficient to constitute a quorum. At any such meeting or at any adjournment thereof, in the absence of a quorum of the holders of shares of Series E Preferred Stock, a majority of the holders of such shares present in person or by proxy shall have the power to adjourn the meeting as to the actions to be taken by the holders of shares of Series E Preferred Stock from time to time and place to place without notice other than announcement at the meeting until a quorum shall be present.

(iv) The approval rights of the Requisite D/E Preferred to authorize the Corporation to take any Restricted Action as provided in Section C.4(d) may be exercised at any annual meeting of stockholders, at a special meeting of the holders of Preferred Stock held for such purpose or by written consent of such holders. At each meeting of

stockholders at which the holders of shares of Series D Preferred Stock or Series E Preferred Stock shall have the right, voting together as a single class, to authorize the Corporation to take any Restricted Action as provided in Section C.4(d), the presence in person or by proxy of such holders shall be necessary and sufficient to constitute a quorum. At any such meeting or at any adjournment thereof, in the absence of a quorum of the holders of shares of Series D Preferred Stock or Series E Preferred Stock, a majority of the holders of such shares present in person or by proxy shall have the power to adjourn the meeting as to the actions to be taken by the holders of shares of Series D Preferred Stock and Series E Preferred Stock from time to time and place to place without notice other than announcement at the meeting until a quorum shall be present.

5. **Renunciation of Corporate Opportunities**. Pursuant to Section 122(17) of the DGCL, the Corporation hereby renounces any interest or expectancy of the Corporation in, or in being offered an opportunity to participate in, any and all business opportunities that are presented to the holders of Preferred Stock, their Affiliates, the Series A Director, Series B-2 Directors, Series C Director or the Series E Directors (collectively, the "**Preferred Investor Parties**") at any time that a Series A Director, Series B-2 Director, Series C Director or Series E Directors sits on the Board or that such holders hold any Capital Securities of the Corporation. Without limiting the foregoing renunciation, the Corporation acknowledges that the Preferred Investor Parties are in the business of making investments in, and have investments in, other businesses similar to and that may compete with the Corporation's businesses ("**Competing Businesses**"), and agrees that the Corporation shall have no right to limit or restrict any of the Preferred Investor Parties from making additional investments in or having relationships with other Competing Businesses independent of their investments in the Corporation. By virtue of a Preferred Investor Party holding Capital Securities of the Corporation or by having persons designated by or affiliated with such Preferred Investor Party serving on or observing at meetings of the Board of Directors or otherwise, no Preferred Investor Party shall have any obligation to the Corporation, any of its Subsidiaries or any other holder of Capital Securities of the Corporation to refrain from competing with the Corporation and any of its Subsidiaries, making investments in or having relationships with Competing Businesses, or otherwise engaging in any commercial activity; and none of the Corporation, any of its Subsidiaries or any other holder of Capital Securities shall have any right with respect to any such investments or activities undertaken by such Preferred Investor Party. Without limitation of the foregoing, each Preferred Investor Party may engage in or possess any interest in other business ventures of any nature or description, independently or with others, similar or dissimilar to the business of the Corporation or any of its Subsidiaries, and none of the Corporation, any of its Subsidiaries or any other holder of Capital Securities of the Corporation shall in such capacity have any rights or expectancy by virtue of such Preferred Investor Party's relationships with the Corporation, or otherwise in and to such independent ventures or the income or profits derived therefrom; and the pursuit of any such venture, even if such investment is in a Competing Business shall not be deemed wrongful or improper. No Preferred Investor Party shall be obligated to present any particular investment opportunity to the Corporation or any of its Subsidiaries even if such opportunity is of a character that, if presented to the Corporation or such Subsidiary, could be taken by the Corporation or such Subsidiary, and the Preferred Investor Party shall continue to have the right to take for its own respective account or to recommend to others any such particular investment opportunity. The provisions of this Section C.5 shall in no way limit or eliminate any Preferred Investor

Party's duties, responsibilities and obligations with respect to the protection of any proprietary information of the Corporation and any of its Subsidiaries, including any applicable duty to not disclose or use such proprietary information improperly or to obtain therefrom an improper personal benefit.

6. **Waiver**. Except as otherwise set forth herein, (a) any of the rights, powers, preferences and other terms of the Series A Preferred Stock set forth herein may be waived on behalf of all holders of Series A Preferred Stock by the affirmative written consent or vote of the holders of a majority of the Series A Preferred Stock, (b) any of the rights, powers, preferences and other terms of the Series B Preferred Stock set forth herein may be waived on behalf of all holders of Series B Preferred Stock by the affirmative written consent or vote of the holders of a majority of the Series B Preferred Stock, (c) any of the rights, powers, preferences and other terms of the Series B-2 Preferred Stock set forth herein may be waived on behalf of all holders of Series B-2 Preferred Stock by the affirmative written consent or vote of the holders of a majority of the Series B-2 Preferred Stock, (d) any of the rights, powers, preferences and other terms of the Series C Preferred Stock set forth herein may be waived on behalf of all holders of Series C Preferred Stock by the affirmative written consent or vote of the holders of a majority of the Series C Preferred Stock, (e) any of the rights, powers, preferences and other terms of the Series D Preferred Stock set forth herein may be waived on behalf of all holders of Series D Preferred Stock by the affirmative written consent or vote of the holders of a majority of the Series D Preferred Stock, and (f) any of the rights, powers, preferences and other terms of the Series E Preferred Stock set forth herein may be waived on behalf of all holders of Series E Preferred Stock by the affirmative written consent or vote of the holders of a majority of the Series E Preferred Stock.

ARTICLE V
PERPETUAL EXISTENCE

The Corporation is to have perpetual existence.

ARTICLE VI
LIMITATION OF LIABILITY; INDEMNIFICATION

To the fullest extent permitted by the DGCL, no Director of the Corporation shall be personally liable to the Corporation or its stockholders for monetary damages for breach of fiduciary duty as a Director, except for liability (i) for any breach of the Director's duty of loyalty to the Corporation or its stockholders, (ii) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (iii) under Section 174 of the DGCL or (iv) for any transaction from which the Director derived an improper personal benefit. If the DGCL is amended after the effective date of this Certificate of Incorporation to authorize corporate action further eliminating or limiting the personal liability of Directors, then the liability of a Director of the Corporation shall be eliminated or limited to the fullest extent permitted by the DGCL, as so amended.

The Corporation shall, to the fullest extent permitted by the provisions of Section 145 of the DGCL, indemnify each person who it shall have power to indemnify under said section from

and against any and all of the expenses, liabilities or other matters referred to in or covered by said section. The indemnification provided for herein shall not be deemed exclusive of any other rights to which each such indemnified person may be entitled under any bylaw, agreement, vote of stockholders or disinterested directors or otherwise, both as to action in such indemnified person's official capacity and as to action in another capacity pursuant to service as a director, officer, employee or agent of the Corporation, and shall continue as to a person who has ceased to be a director, officer, employee or agent of the Corporation, and shall inure to the benefit of the heirs, executors and administrators of such person.

Any (i) repeal or amendment of this Article VI by the stockholders of the Corporation or (ii) amendment to the DGCL shall not adversely affect any right or protection existing at the time of such repeal or amendment with respect to any acts or omissions occurring before such repeal or amendment of a person serving as a director, officer, employee or agent of the Corporation or otherwise enjoying the benefits of this Article VI at the time of such repeal or amendment.

ARTICLE VII
AMENDMENTS

Subject to the other provisions of this Certificate of Incorporation, the Corporation reserves the right to amend, alter or repeal any provisions contained in this Certificate of Incorporation from time to time and at any time in the manner now or hereafter prescribed in this Certificate of Incorporation and by the laws of the State of Delaware, and all rights herein conferred upon stockholders are granted subject to such reservation.

ARTICLE VIII
MISCELLANEOUS

Subject to Article IV and in furtherance and not in limitation of the powers conferred by the laws of the State of Delaware:

(a) The Board of Directors of the Corporation is expressly authorized to adopt, amend or repeal the Bylaws of the Corporation.

(b) Elections of directors need not be by written ballot unless the Bylaws of the Corporation shall so provide.

(c) The books of the Corporation may be kept at such place within or without the State of Delaware as the Bylaws of the Corporation may provide or as may be designated from time to time by the Board of Directors of the Corporation.

(d) Meetings of the stockholders may be held within or without the State of Delaware, as the Bylaws may provide.

(e) To the extent any provision contained in this Certificate of Incorporation is inconsistent with the Bylaws, then the provisions of this Certificate of Incorporation shall control.

ARTICLE IX
DEFINITIONS

The following terms are used herein with the meanings indicated:

"**Acquisition**" means a merger or consolidation of the Corporation into or with any other Person or Persons in a single transaction or a series of related transactions in which the stockholders of the Corporation immediately prior to such merger, consolidation, transaction or first of such related series of transaction possess less than fifty percent (50%) of the surviving entity's issued and outstanding voting Capital Securities immediately after such merger, consolidation, transaction or related series of such transactions (provided that a Qualified Public Offering or Majority Conversion after which the stockholders of the Corporation as of immediately prior to such event continue to maintain an ownership interest in the Corporation as of immediately after such event, or the sale of Capital Securities by the Corporation for bona fide capital raising purposes, shall not be an "Acquisition").

"**Affidavit of Loss**" means an affidavit or written agreement reasonably satisfactory to the Corporation to indemnify the Corporation from any loss incurred in connection with the loss of any share certificate evidencing shares of the Corporation's Capital Securities.

"**Affiliate**" means, as applied to the Corporation or any other specified Person, any Person directly or indirectly controlling, controlled by or under direct or indirect common control with the Corporation (or such other specified Person) and shall also include (a) any Person who is an officer or director of the Corporation or any Subsidiary (or other specified Person) and (b) in the case of a specified Person who is an individual, any Family Members of any such Person.

"**Asset Transfer**" means a sale of all or substantially all of the Corporation's assets to any Person (including indirectly by the grant of an exclusive license or licenses to all or substantially all of the Corporation's intellectual property).

"**Board**" and "**Board of Directors**" each has the meaning specified in Article IV, Section C.2.

"**Business Day**" means a day other than a Saturday, Sunday or legal holiday in Delaware.

"**Capital Securities**" means, as to any Person that is a corporation, the authorized shares of such Person's capital stock, including all classes of common, preferred, voting and nonvoting capital stock, and, as to any Person that is not a corporation or an individual, the ownership interests in such Person, including, without limitation, the right to share in profits and losses, the right to receive distributions of cash and property, and the right to receive allocations of items of income, gain, loss, deduction and credit and similar items from such Person, whether or not such interests include voting or similar rights entitling the holder thereof to exercise control over such Person.

"**Certificate of Incorporation**" means this Amended and Restated Certificate of

Incorporation, as amended from time to time.

"**Common Stock**" has the meaning specified in Article IV.

"**Common Stock Deemed Outstanding**" means, at any time of measurement thereof, the number of shares of Common Stock actually outstanding at such time, plus the number of shares of Common Stock issuable upon conversion of the Preferred Stock (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving Common Stock after the Effective Time), plus (without duplication) the number of shares of Common Stock issuable upon the exercise in full of all outstanding Convertible Securities whether or not such Convertible Securities are convertible into or exchangeable or exercisable for Common Stock at such time.

"**Competing Businesses**" has the meaning specified in Article IV, Section C.5.

"**Conversion Price**" means each of the Series A Conversion Price, the Series B Conversion Price, the Series B-2 Conversion Price, the Series C Conversion Price, the Series D Conversion Price, and the Series E Conversion Price, as applicable.

"**Convertible Securities**" means securities or obligations that are directly or indirectly exercisable for, convertible into or exchangeable for shares of Common Stock. The term includes, without limitation, shares of Preferred Stock, warrants or other rights to subscribe for or purchase Common Stock or to subscribe for or purchase other Capital Securities or obligations that are, directly or indirectly, exercisable for, convertible into or exchangeable for Common Stock.

"**DGCL**" means the General Corporation Law of the State of Delaware, as in effect from time to time.

"**Effective Time**" means the consummation by the Corporation of the first sale of any shares of Series E Preferred Stock following the filing of this Amended and Restated Certificate of Incorporation with the Office of the Secretary of State of Delaware in accordance with the DGCL.

"**Elected Preferred Stock**" has the meaning specified in Article IV, Section B.3(c).

"**Excluded Securities**" means (i) Capital Securities issued by the Corporation in a Qualified Public Offering, (ii) Convertible Securities or restricted stock grants issued to officers, employees or members of the Board of Directors of, or consultants or other service providers to, the Corporation or any Subsidiary that are options to purchase or grants of shares of Common Stock, and the issuance of shares of Common Stock upon the exercise of any such options or grants, (iii) Capital Securities issued by the Corporation as direct consideration to any Persons (including the stockholders or owners of Persons) as all or part of the consideration paid for the acquisition of ownership interests in, or assets of, such Person in a transaction in which there is not a readily determinable value being ascribed to such shares unless (A) such Person is an

Affiliate of the Corporation (other than a Subsidiary) or (B) Affiliates of the Corporation collectively own more than ten percent (10%) of the ownership interests in such Person, (iv) Convertible Securities (including Capital Securities issued upon exercise, conversion or exchange thereof) and/or Capital Securities issued by the Corporation to Persons who are not Affiliates of the Corporation as partial consideration for senior debt financing, real estate leases, equipment lease financing or licensing, (v) Convertible Securities (including Capital Securities issued upon exercise, conversion or exchange thereof) and/or Capital Securities issued by the Corporation in connection with a stock split, stock dividend, combination, consolidation, reorganization, recapitalization or other similar event for which adjustment is made in accordance with Article IV, Section B.4, (vi) Capital Securities issued by the Corporation upon the conversion of shares of Preferred Stock, (vii) shares of Series E Preferred Stock issued pursuant to that certain Stock Purchase Agreement, entered into on or around March 31, 2015, (viii) Capital Securities issued by the Corporation upon conversion of the convertible promissory note issued to BioMed Realty, L.P., and/or (ix) Capital Securities issued to The Scripps Research Institute in connection with the Amended and Restated Research Funding and Option Agreement, dated as of January 19, 2015.

"**Family Member**" means, as applied to any individual, such individual's spouse, children (including stepchildren or adopted children), grandchildren, parent, or any spouse of any of the foregoing, and each trust or partnership created for the exclusive benefit of any one or more of them.

"**Liquidation Amount**" means each of the Series A Liquidation Amount, Series B Liquidation Amount, Series B-2 Liquidation Amount, Series C Liquidation Amount, the Series D Liquidation Amount, and Series E Liquidation Amount, as applicable.

"**Liquidation Event**" has the meaning specified in Article IV, Section B.2(a).

"**Liquidation Preference**" means each of the Series A Liquidation Preference, Series B Liquidation Preference, Series B-2 Liquidation Preference, Series C Liquidation Preference, the Series D Liquidation Preference, and Series E Liquidation Preference, as applicable.

"**Majority Conversion**" has the meaning specified in Article IV, Section B.3(b).

"**New Securities**" means any Capital Securities and Convertible Securities of the Corporation or any other security, obligation or instrument (whether denominated as equity, debt or otherwise) that has significant equity-like economic attributes; *provided, however*, that Excluded Securities shall not constitute New Securities.

"**Person**" **or** "**person**" means an individual, partnership, corporation, limited liability company, association, trust, joint venture, unincorporated organization or other entity and any government, governmental department or agency or political subdivision thereof.

"**Preferred Directors**" shall mean the Series A Director, the Series B-2 Directors, the Series C Director, and the Series E Directors.

"**Preferred Investor Parties**" has the meaning specified in Article IV, Section C.5.

"**Public Offering**" means any offering by the Corporation of its Common Stock to the public pursuant to an effective registration statement under the Securities Act, or any comparable statement under any similar federal statute then in force, other than an offering of shares being issued as consideration in a business acquisition or combination or an offering in connection with an employee benefit plan.

"**Purchase Price**" means each of the Series A Purchase Price, Series B Purchase Price, Series B-2 Purchase Price, Series C Purchase Price, Series D Purchase Price and Series E Purchase Price, as applicable.

"**Qualified Holder**" means a Person that can establish to the Corporation's satisfaction that such Person is at the time of the issue of Offered New Securities an "Accredited Investor" within the meaning of Rule 501 of the Securities Act and otherwise possesses qualifications such that the Corporation may offer and issue Offered New Securities to such Person in compliance with an available exemption from the registration requirements pertaining thereto under the Securities Act and other federal and state securities laws and regulations.

"**Qualified Public Offering**" has the meaning specified in Article IV, Section B.3(b).

"**Redemption Notice**" has the meaning specified in Article IV, Section B.9(a).

"**Redemption Price**" has the meaning specified in Article IV, Section B.9(a).

"**Requisite D/E Preferred**" means the holders of a majority of the issued and outstanding shares of Series D Preferred Stock and Series E Preferred Stock, voting together as a single class on an as-if-converted to Common Stock basis.

"**Requisite Stockholders**" means the holders of a majority of the issued and outstanding shares of Series B-2 Preferred Stock, Series C Preferred Stock, Series D Preferred Stock and Series E Preferred Stock, voting together as a single class on an as-if-converted to Common Stock basis.

"**Restricted Action"** has the meaning specified in Article IV, Section C.4(a).

"**Sale of the Corporation**" means an Acquisition or an Asset Transfer.

"**Securities Act**" means the Securities Act of 1933, as amended.

"**Series A Conversion Price**" has the meaning specified in Article IV, Section B.3(a).

"**Series A Director**" has the meaning specified in Article IV, Section C.2.

"**Series A Liquidation Preference**" means an amount initially equal to the Series A Purchase Price, plus any declared but unpaid dividends on the Series A Preferred Stock.

"**Series A Preferred Stock**" has the meaning specified in Article IV.

"**Series A Purchase Price**" means $0.25 per share of Series A Preferred Stock (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series A Preferred Stock after the Effective Time).

"**Series B Conversion Price**" has the meaning specified in Article IV, Section B.3(a).

"**Series B Liquidation Preference**" means an amount initially equal to the Series B Purchase Price, plus any declared but unpaid dividends on the Series B Preferred Stock.

"**Series B Preferred Stock**" has the meaning specified in Article IV.

"**Series B Purchase Price**" means $0.8333 per share of Series B Preferred Stock (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series B Preferred Stock after the Effective Time).

"**Series B-2 Conversion Price**" has the meaning specified in Article IV, Section B.3(a).

"**Series B-2 Directors**" has the meaning specified in Article IV, Section C.2.

"**Series B-2 Liquidation Preference**" means an amount initially equal to the Series B-2 Purchase Price, plus any declared but unpaid dividends on the Series B-2 Preferred Stock.

"**Series B-2 Preferred Stock**" has the meaning specified in Article IV.

"**Series B-2 Purchase Price**" means $0.8333 per share of Series B-2 Preferred Stock (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series B-2 Preferred Stock after the Effective Time).

"**Series C Conversion Price**" has the meaning specified in Article IV, Section B.3(a).

"**Series C Director**" has the meaning specified in Article IV, Section C.2.

"**Series C Liquidation Preference**" means an amount initially equal to the Series C Purchase Price, plus any declared but unpaid dividends on the Series C Preferred Stock.

"**Series C Preferred Stock**" has the meaning specified in Article IV.

"**Series C Purchase Price**" means $0.94 per share of Series C Preferred Stock (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series C Preferred Stock after the Effective Time).

"**Series D Conversion Price**" has the meaning specified in Article IV, Section B.3(a).

"**Series D Liquidation Preference**" means an amount initially equal to the Series D Purchase Price, plus any declared but unpaid dividends on the Series D Preferred Stock.

"**Series D Preferred Stock**" has the meaning specified in Article IV.

"**Series D Purchase Price**" means $2.662 per share of Series D Preferred Stock (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series D Preferred Stock after the Effective Time).

"**Series E Conversion Price**" has the meaning specified in Article IV, Section B.3(a).

"**Series E Directors**" has the meaning specified in Article IV, Section C.2.

"**Series E Liquidation Preference**" means an amount initially equal to the Series E Purchase Price, plus any declared but unpaid dividends on the Series E Preferred Stock.

"**Series E Preferred Stock**" has the meaning specified in Article IV.

"**Series E Purchase Price**" means $1.119 per share of Series E Preferred Stock (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series E Preferred Stock after the Effective Time).

"**Subsidiary**"/"**Subsidiaries**" means any corporation, partnership, limited liability company, association or other business entity of which (i) if a corporation, a majority of the total voting power of shares of stock entitled (without regard to the occurrence of any contingency) to vote in the election of directors thereof is at the time owned or controlled, directly or indirectly, by the Corporation or one or more of the other Subsidiaries of the Corporation or a combination thereof, or (ii) if a partnership, limited liability company, association or other business entity, a majority of the ownership interests therein is at the time owned or controlled, directly or indirectly, by the Corporation or one or more Subsidiaries of that person or a combination thereof. For purposes hereof, the Corporation shall be deemed to have a majority ownership interest in a partnership, limited liability company, association or other business entity if and only if the Corporation shall be allocated a majority of partnership, limited liability company, association or other business entity gains or losses and shall be or control the managing general partner of such partnership, association or other business entity or the managing member of such limited liability company.

"**Voluntary Conversion Notice**" has the meaning specified in Article IV, Section B.3(c).

* * *

I, John D. Mendlein, Ph.D., the Chief Executive Officer of the Corporation, for the purpose of amending and restating the Corporation's certificate of incorporation pursuant to the General Corporation Law of the State of Delaware, do make this certificate, hereby declaring and certifying that this is my act and deed on behalf of the Corporation, and the facts herein stated are true, and accordingly hereunto set my hand this 30th day of March, 2015.

aTYR PHARMA, INC.

By: /s/ John D. Mendlein
Name: John D. Mendlein, Ph.D.
Title: Chief Executive Officer

Exhibit 3.3

aTyr Pharma, Inc.

BYLAWS

ARTICLE 1.

OFFICES

SECTION 1.01. Registered Office. The registered office shall be in the City of Dover, County of Kent, State of Delaware. The name of the registered agent at such address is National Registered Agents, Inc.

SECTION 1.02. Other Offices. The Corporation may also have an office in the State of New Jersey, and at such other place or places either within or without the State of Delaware as the Board of Directors may from time to time determine or the business of the Corporation may require.

ARTICLE 2.

MEETINGS OF STOCKHOLDERS

SECTION 2.01. Place of Meetings. All meetings of the stockholders of the Corporation shall be held at such place either within or without the State of Delaware as shall be fixed by the Board of Directors and specified in the respective notices or waivers of notice of said meetings.

SECTION 2.02. Annual Meeting.

(a) The annual meeting of the stockholders for the election of directors and for the transaction of such other business as may come before the meeting shall be held at the principal office of the Corporation, or such place as shall be fixed by the Board of Directors.

(b) If the election of directors shall not be held on the day fixed by the Board, as the case may be, for any annual meeting, or on the day of any adjourned session thereof, the Board of Directors shall cause the election to be held at a special meeting as soon thereafter as conveniently may be. At such special meeting the stockholders may elect the directors and transact other business with the same force and effect, and subject to the same limitations, as at an annual meeting duly called and held.

(c) At an annual meeting of the stockholders, only such business shall be conducted as shall have been properly brought before the meeting. To be properly brought before an annual meeting, business must be (i) specified in the notice of meeting (or any supplement thereto) given by or at the direction of the Board of Directors, (ii) otherwise properly brought before the meeting by or at the direction of the Board of Directors, or (iii) otherwise properly brought before the meeting by a stockholder.

SECTION 2.03. Special Meetings. A special meeting of the stockholders for any purpose or purposes may be called at any time by the Chairman of the Board, the President or by order of the Board of Directors and must be called by the Secretary upon the request in writing of any stockholder(s) holding of record at least ten percent (10%) of the outstanding shares of stock of the Corporation entitled to vote at such meeting.

SECTION 2.04. Notice of Meetings.

(a) Except as otherwise required by statute, notice of each annual or special meeting of the stockholders shall be given to each stockholder of record entitled to vote at such meeting not less than ten (10) days nor more than sixty (60) days before the day on which the meeting is to be held by delivering written notice thereof to him or her personally or by mailing such notice, postage prepaid, addressed to him or her at his or her post-office address last shown in the records of the Corporation or by transmitting notice thereof to him or her by any other means permitted by statute. Every such notice shall state the time and place of the meeting and shall state briefly the purposes thereof.

(b) Notice of any meeting of stockholders shall not be required to be given to any stockholder who shall attend such meeting in person or by proxy or who shall in person or by attorney thereunto authorized, waive such notice in writing, or by any other means permitted by statute, either before or after such meeting. Notice of any adjourned meeting of the stockholders shall not be required to be given except when expressly required by statute.

SECTION 2.05. Quorum.

(a) At each meeting of the stockholders, except where otherwise provided by statute, the Certificate of Incorporation or these Bylaws, the holders of record of a majority of the issued and outstanding shares of stock of the Corporation entitled to vote at such meeting, present in person or represented by proxy, shall constitute a quorum for the transaction of business.

(b) In the absence of a quorum, a majority in interest of the stockholders of the Corporation entitled to vote, present in person or represented by proxy or, in the absence of all such stockholders, any officer entitled to preside at, or act as secretary of, such meeting, shall have the power to adjourn the meeting from time to time, until stockholders holding the requisite amount of stock shall be present or represented. At any such adjourned meeting at which a quorum shall be present any business may be transacted which might have been transacted at the meeting as originally called.

SECTION 2.06. Organization. At each meeting of the stockholders, the Chairman of the Board, or in his or her absence, the President, any Vice President, or any other officer designated by the Board of Directors, shall act as chairman, and the Secretary or an Assistant Secretary of the Corporation, or in the absence of the Secretary and all Assistant Secretaries, a person whom

the chairman of such meeting shall appoint shall act as secretary of the meeting and keep the minutes thereof.

SECTION 2.07. Voting.

(a) Except as otherwise provided by law or by the Certificate of Incorporation or these Bylaws, at every meeting of the stockholders each stockholder shall be entitled to one vote, in person or by proxy, for each share of capital stock of the Corporation registered in his or her name on the books of the Corporation:

(i) on the date fixed pursuant to Section 9.03 of these Bylaws as the record date for the determination of stockholders entitled to vote at such meeting; or

(ii) if no such record date shall have been fixed, then the record date shall be at the close of business on the day next preceding the day on which notice of such meeting is given.

(b) Persons holding stock in a fiduciary capacity shall be entitled to vote the shares so held. In the case of stock held jointly by two or more executors, administrators, guardians, conservators, trustees or other fiduciaries, such fiduciaries may designate in writing one or more of their number to represent such stock and vote the shares so held, unless there is a provision to the contrary in the instrument, if any, defining their powers and duties.

(c) Persons whose stock is pledged shall be entitled to vote thereon until such stock is transferred on the books of the Corporation to the pledgee, and thereafter only the pledgee shall be entitled to vote.

(d) Any stockholder entitled to vote may do so in person or by his or her proxy appointed by any method permitted by statute; *provided,* however, that no proxy shall be voted after three years from its date, unless said proxy provides for a longer period.

(e) At all meetings of the stockholders, all matters (except where other provision is made by statute or by the Certificate of Incorporation or these Bylaws) shall be decided by the vote of a majority in interest of the stockholders entitled to vote thereon, present in person or by proxy, at such meeting, a quorum being present. The vote upon any matter, including the election of directors, need not be by written ballot.

SECTION 2.08. Inspectors. The chairman of the meeting may at any time appoint one or more inspectors to serve at a meeting of the stockholders. Such inspectors shall decide upon the qualifications of voters, accept and count the votes for and against the questions presented, report the results of such votes, and subscribe and deliver to the secretary of the meeting a certificate stating the number of shares of stock issued and outstanding and entitled to vote thereon and the number of shares voted for and against the questions presented. The inspectors need not be stockholders of the Corporation, and any director or officer of the Corporation may be an

inspector on any question other than a vote for or against his or her election to any position with the Corporation or on any other question in which he or she may be directly interested. Before acting as herein provided, each inspector shall subscribe an oath faithfully to execute the duties of an inspector with strict impartiality and according to the best of his or her ability.

SECTION 2.09. List of Stockholders.

(a) It shall be the duty of the Secretary or other officer of the Corporation who shall have charge of its stock ledger to prepare and make, or cause to be prepared and made, at least ten days before every meeting of the stockholders, a complete list of the stockholders entitled to vote thereat, arranged in alphabetical order and showing the address of each stockholder and the number of shares registered in the name of such stockholder. Such list shall be open during ordinary business hours to the examination of any stockholder for any purpose germane to the meeting for a period of at least ten days prior to the election, either at a place within the city where the meeting is to be held, which place shall be specified in the notice of the meeting or, if not so specified, at the place where the meeting is to be held.

(b) Such list shall be produced and kept at the time and place of the meeting during the whole time thereof and may be inspected by any stockholder who is present.

(c) The stock ledger shall be conclusive evidence as to who are the stockholders entitled to examine the stock ledger and the list of stockholders required by this Section 2.09 on the books of the Corporation or to vote in person or by proxy at any meeting of stockholders.

ARTICLE 3.

BOARD OF DIRECTORS

SECTION 3.01. General Powers. The business, property and affairs of the Corporation shall be managed by the Board of Directors.

SECTION 3.02. Number, Qualifications, Terms and Removal from Office.

(a) The Board of Directors shall consist of such number of directors, not more than nine (9), as may be determined from time to time by resolution of the Board of Directors or stockholders, or as otherwise set forth in the Certificate of Incorporation, or in a written agreement among the stockholders of the Corporation holding a majority of the shares entitled to vote on an amendment to these Bylaws. Each director shall serve until the next annual meeting of the stockholders and until his successor shall have been elected and qualified, except in the event of his death, resignation or removal. Directors need not be residents of Delaware.

(b) A director need not be a stockholder.

(c) Directors may be removed from office with or without cause by the holders of a majority of the shares then entitled to vote at an election of directors.

(d) Except as otherwise contemplated by written agreement among the stockholders of the Corporation holding a majority of the shares entitled to vote on an amendment to these Bylaws, or the Certificate of Incorporation, vacancies and newly created directorships resulting from any increase in the authorized number of directors may be filled by a majority of the directors then in office, though less than a quorum, or by a sole remaining director, and the directors so chosen shall hold office until the next annual election and until their successors are duly elected and shall qualify, unless sooner displaced. If there are no directors in office, then an election of directors may be held in the manner provided by statute. Except as otherwise contemplated by written agreement among the stockholders of the Corporation holding a majority of the shares entitled to vote on an amendment to these Bylaws, or the Certificate of Incorporation, whenever the holders of any class or classes of stock or series thereof are entitled to elect one or more directors by the provisions of the Certificate of Incorporation, vacancies and newly created directorships of such class or classes or series may be filled by a majority of the directors elected by such class or classes or series thereof then in office, or by a sole remaining director so elected. If, at the time of filling any vacancy or any newly created directorship, the directors then in office shall constitute less than a majority of the whole board (as constituted immediately prior to any such increase), the Court of Chancery may, upon application of any stockholder or stockholders holding at least ten percent (10%) of the total number of the shares at the time outstanding, on a common equivalent basis, having the right to vote for such directors, summarily order an election to be held to fill any such vacancies or newly created directorships, or to replace the directors chosen by the directors then in office.

SECTION 3.03. Quorum and Manner of Acting.

(a) Except as otherwise provided by statute or by the Certificate of Incorporation or in a written agreement among the stockholders of the Corporation holding a majority of the shares entitled to vote on an amendment to these Bylaws, a majority of the directors at the time in office shall constitute a quorum for the transaction of business at any meeting and the affirmative action of a majority of the directors present at any meeting at which a quorum is present shall be required for the taking of any action by the Board of Directors.

(b) In the event one or more of the directors shall be disqualified to vote at such meeting, then the required quorum shall be reduced by one for each such director so disqualified; *provided,* however, that in no event shall the quorum as adjusted be less than one third of the total number of directors.

(c) In the absence of a quorum at any meeting of the Board such meeting need not be held; or a majority of the directors present thereat or, if no director be present, the Secretary may adjourn such meeting from time to time until a quorum shall be present. Notice of any adjourned meeting need not be given.

SECTION 3.04. Offices, Place of Meeting and Records. The Board of Directors may hold meetings, have an office or offices and keep the books and records of the Corporation at such place or places within or without the State of Delaware as the Board may from time to time

determine. The place of meeting shall be specified or fixed in the respective notices or waivers of notice thereof, except where otherwise provided by statute, by the Certificate of Incorporation or these Bylaws.

SECTION 3.05. Annual Meeting. The Board of Directors shall meet for the purpose of organization, the election of officers and the transaction of other business, as soon as practicable following each annual election of directors. Such meeting shall be called and held at the place and time specified in the notice or waiver of notice thereof as in the case of a special meeting of the Board of Directors.

SECTION 3.06. Regular Meetings. Regular meetings of the Board of Directors shall be held at such places and at such times as the Board shall from time to time by resolution determine. If any day fixed for a regular meeting shall be a legal holiday at the place where the meeting is to be held, then the meeting which would otherwise be held on that day shall be held at said place at the same hour on the next succeeding business day. Notice of regular meetings need not be given.

SECTION 3.07. Special Meetings; Notice. Special meetings of the Board of Directors shall be held whenever called by the Chairman of the Board, the President or by any two (2) of the directors. Notice of each such meeting shall be mailed to each director, addressed to him or her at his or her residence or usual place of business, at least two days before the day on which the meeting is to be held, or shall be sent to him or her by any other means permitted by statute, or shall be delivered personally or by telephone, not later than one day before the day on which the meeting is to be held. Each such notice shall state the time and place of the meeting but need not state the purposes thereof except as otherwise herein expressly provided. Notice of any such meeting need not be given to any director, however, if waived by him or her in writing or by any other means permitted by statute, whether before or after such meeting shall be held, or if he or she shall be present at such meeting.

SECTION 3.08. Organization. At each meeting of the Board of Directors, the Chairman of the Board, or in his or her absence, the President or, in his or her absence, a director chosen by a majority of the directors present, shall act as chairman. The Secretary or, in his or her absence an Assistant Secretary or, in the absence of the Secretary and all Assistant Secretaries, a person whom the chairman of such meeting shall appoint shall act as secretary of such meeting and keep the minutes thereof.

SECTION 3.9. Order of Business. At all meetings of the Board of Directors business shall be transacted in the order determined by the Board.

SECTION 3.10. Resignation. Any director of the Corporation may resign at any time by giving written notice of his or her resignation to the Board of Directors, the Chairman of the Board, the President, any Vice President or the Secretary of the Corporation. Such resignation shall take effect at the date of receipt of such notice or at any later time specified therein; and, unless otherwise specified therein, the acceptance of such resignation shall not be necessary to make it effective.

SECTION 3.11. Compensation. Each director, in consideration of serving as such, who is neither an employee of nor a compensated consultant to the Corporation, shall be entitled to receive from the Corporation such amount, if any, per annum or such fees, if any, for attendance at meetings of the Board of Directors or any committees thereof, or both, as the Board of Directors shall from time to time determine. Each director shall be entitled to reimbursement for the reasonable expenses incurred by him or her in connection with the performance of his or her duties, to the extent authorized by the Board of Directors and subject to the reasonable requirements of the Corporation; *provided* that nothing herein contained shall be construed to preclude any director from serving the Corporation or its subsidiaries in any other capacity and receiving proper compensation therefor.

ARTICLE 4.

COMMITTEES

SECTION 4.01. Executive Committee. The Board of Directors may, by resolution or resolutions passed by a majority of the whole Board, appoint an Executive Committee to consist of two or more members of the Board of Directors, and shall designate one of the members as its chairman.

Each member of the Executive Committee shall hold office, so long as he or she shall remain a director, until the first meeting of the Board of Directors held after the next annual election of directors and until his or her successor is duly appointed and qualified. The chairman of the Executive Committee or, in his or her absence, a member of the Committee chosen by a majority of the members present shall preside at meetings of the Executive Committee and the Secretary or an Assistant Secretary of the Corporation, or such other person as the Executive Committee shall from time to time determine, shall act as secretary of the Executive Committee.

The Board of Directors, by action of the majority of the whole Board, shall fill vacancies in the Executive Committee.

SECTION 4.02. Executive Committee: Powers. During the intervals between the meetings of the Board of Directors, and except as provided by statute, the Executive Committee shall have and may exercise all of the powers of the Board of Directors in all cases in which specific directions shall not have been given by the Board of Directors.

SECTION 4.03. Executive Committee: Procedure; Meetings; Quorum. The Executive Committee shall fix its own rules of procedure subject to the approval of the Board of Directors, and shall meet at such times and at such place or places as may be provided by such rules. At every meeting of the Executive Committee the presence of a majority of all the members shall be necessary to constitute a quorum and the affirmative vote of a majority of the members present shall be necessary for the adoption by it of any resolution. In the absence of a quorum at any meeting of the Executive Committee such meeting need not be held, or a majority of the

members present thereat or, if no members be present, the secretary of the meeting may adjourn such meeting from time to time until a quorum be present.

SECTION 4.04. Executive Committee: Compensation. Each member of the Executive Committee shall be entitled to receive from the Corporation reimbursement for the reasonable expenses incurred by him or her in connection with the performance of his or her duties, to the extent authorized by the Board of Directors and subject to the reasonable requirements of the Corporation, with respect to any member of the Executive Committee who is neither an employee of nor compensated consultant to the Corporation, such fee, if any, as shall be fixed from time to time by the Board of Directors.

SECTION 4.05. Nominating Committee. The Board of Directors may, by resolution or resolutions passed by a majority of the whole Board, appoint an Nominating Committee to consist of two or more members of the Board of Directors, including the President, and shall designate one of the members as its chairman. In the absence of such appointment, the Board of Directors shall act as a Nominating Committee.

Each member of the Nominating Committee shall hold office, so long as he or she shall remain a director, until the first meeting of the Board of Directors held after the next annual election of directors and until his or her successor is duly appointed and qualified. The chairman of the Nominating Committee or, in his or her absence, a member of the Committee chosen by a majority of the members present shall preside at meetings of the Nominating Committee and the Secretary or an Assistant Secretary of the Corporation, or such other person as the Nominating Committee shall from time to time determine, shall act as secretary of the Nominating Committee.

The Board of Directors, by action of the majority of the whole Board, shall fill vacancies in the Nominating Committee.

SECTION 4.06. Nominating Committee: Powers. The Nominating Committee shall have the power to nominate such persons as it may determine to stand for election to the Board of Directors, all in accordance with the Certificate of Incorporation and Bylaws.

SECTION 4.07. Nominating Committee: Procedure; Meetings; Quorum. The Nominating Committee shall fix its own rules of procedure subject to the approval of the Board of Directors, and shall meet at such times and at such place or places as may be provided by such rules. At every meeting of the Nominating Committee the presence of a majority of all the members shall be necessary to constitute a quorum and the affirmative vote of a majority of the members present shall be necessary for the adoption by it of any resolution. In the absence of a quorum at any meeting of the Nominating Committee such meeting need not be held, or a majority of the members present thereat or, if no members be present, the secretary of the meeting may adjourn such meeting from time to time until a quorum be present.

SECTION 4.08. Nominating Committee: Compensation. Each member of the Nominating Committee shall be entitled to receive from the Corporation reimbursement for the

reasonable expenses incurred by him or her in connection with the performance of his or her duties, to the extent authorized by the Board of Directors and subject to the reasonable requirements of the Corporation, with respect to any member of the Nominating Committee who is neither an employee of nor compensated consultant to the Corporation, such fee, if any, as shall be fixed from time to time by the Board of Directors.

SECTION 4.09. Other Board Committees. The Board of Directors may from time to time, by resolution passed by a majority of the whole Board, designate one or more committees in addition to the Executive Committee and Nominating Committee, each committee to consist of two or more of the directors of the Corporation. Any such committee, to the extent provided in the resolution or in the Bylaws of the Corporation, shall have and may exercise the powers of the Board of Directors in the management of the business and affairs of the Corporation, including the power or authority to authorize the issuance of stock, and may authorize the seal of the Corporation to be affixed to all papers which may require it; but no such committee shall have the power or authority in reference to (i) approving or adopting, or recommending to the stockholders, any action or matter expressly required by the Delaware General Corporation Law ("DGCL") to be submitted to the stockholders for approval or (ii) adopting, amending or repealing any Bylaws of the Corporation. Such committee or committees shall have such name or names as may be determined from time to time by resolution adopted by the Board of Directors. Each committee so formed shall keep regular minutes of its meetings and report the same to the Board of Directors when required.

A majority of all the members of any such committee may determine its action and fix the time and place of its meetings, unless the Board of Directors shall otherwise provide. The Board of Directors shall have power to change the members of any committee at any time, to fill vacancies and to discharge any such committee, either with or without cause, at any time.

SECTION 4.10. Alternates. The Chairman of the Board or the President may designate one or more directors as alternate members of any committee who may act in the place and stead of members who temporarily cannot attend any such meeting.

SECTION 4.11. Additional Committees. The Board of Directors may from time to time create such additional committees of directors, officers, employees or other persons designated by it (or any combination of such persons) for the purpose of advising the Board, the Executive Committee and the officers and employees of the Corporation in all such matters as the Board shall deem advisable and with such functions and duties as the Board shall by resolutions prescribe.

A majority of all the members of any such committee may determine its action and fix the time and place of its meetings, unless the Board of Directors shall otherwise provide. The Board of Directors shall have the power to change the members of any committee at any time, to fill vacancies and to discharge any such committee, either with or without cause, at any time.

ARTICLES 5.

ACTION BY CONSENT

SECTION 5.01. Consent by Directors. Any action required or permitted to be taken at any meeting of the Board of Directors or of any committee thereof may be taken without a meeting if prior to such action a written consent thereto is signed by all members of the Board or of such committee, as the case may be, and such written consent is filed with the minutes of the proceedings of the Board or such committee.

SECTION 5.02. Consent of Stockholders. Any action required to be taken at any annual or special meeting of stockholders of the Corporation, or any action which may be taken at any annual or special meeting of such stockholders, may be taken without a meeting, without prior notice and without a vote, if a consent or consents in writing, setting forth the action so taken, shall be signed by the holders of outstanding stock having not less than the minimum number of votes that would be necessary to authorize or take such action at a meeting at which all shares entitled to vote thereon were present and voted. Every written consent shall bear the date of signature of each stockholder who signs the consent and no written consent shall be effective to take the corporate action referred to therein unless, within sixty days of the earliest dated consent delivered in the manner required above to the Corporation, written consents signed by a sufficient number of holders to take action are delivered to the Corporation by delivery to its registered office in Delaware, its principal place of business, or an officer or agent of the Corporation having custody of the book in which proceedings of meetings of stockholders are recorded. Prompt notice of the taking of the corporate action without a meeting by less than unanimous written consent shall be given to those stockholders who have not consented in writing.

ARTICLE 6.

OFFICERS

SECTION 6.01. Number. The principal officers of the Corporation shall be a President, a Secretary and a Treasurer. The Board of Directors may also elect a Chairman of the Board and one or more Vice Presidents (the number thereof and variations in title to be determined by the Board of Directors). In addition, there may be such other or subordinate officers, agents and employees as may be appointed in accordance with the provisions of Section 6.03.

SECTION 6.02. Election, Qualifications and Term of Office. Each officer of the Corporation, except such officers as may be appointed in accordance with the provisions of Section 6.03, shall be elected annually by the Board of Directors and shall hold office until a successor shall have been duly elected and qualified, or until death, or until he or she shall have resigned or shall have been removed in the manner herein provided.

SECTION 6.03. Other Officers. The Corporation may have such other officers, agents, and employees as the Board of Directors may deem necessary, including a Chief Executive

Officer, a Controller, one or more Assistant Controllers, one or more Assistant Treasurers and one or more Assistant Secretaries, each of whom shall hold office for such period, have such authority, and perform such duties as the Board of Directors may from time to time determine. The Board of Directors may delegate to any principal officer the power to appoint or remove any such subordinate officers, agents or employees.

SECTION 6.04. Removal. Any officer may be removed, either with or without cause, by the vote of a majority of the whole Board of Directors or, except in case of any officer elected by the Board of Directors, by any committee of officers upon whom the power of removal may be conferred by the Board of Directors.

SECTION 6.05. Resignation. Any officer may resign at any time by giving written notice to the Board of Directors or the President. Any such resignation shall take effect at the date of receipt of such notice or at any later time specified therein; and, unless otherwise specified therein, the acceptance of such resignation shall not be necessary to make it effective.

SECTION 6.06. Vacancies. A vacancy in any office because of death, resignation, removal, disqualification or any other cause shall be filled for the unexpired portion of the term in the manner prescribed in these Bylaws for regular election or appointment to such office.

SECTION 6.07. Powers of Officers. The Board of Directors shall have the authority to fix or limit the powers and authority of the officers of the Corporation to conduct transactions between the Corporation and other parties, contracts proposed to be entered into by or on behalf of the Corporation, and all other areas of business operation in which the officers of the Corporation may engage.

SECTION 6.08. Chairman of the Board. The Chairman of the Board, if one is elected, shall be a director and shall preside at all meetings of the Board of Directors and shareholders. The Chairman shall have such specific powers and duties as from time to time may be conferred or assigned by the Board of Directors.

SECTION 6.09. President. Subject to determination by the Board of Directors, the President shall be the chief executive officer of the Corporation, shall have general executive powers and shall have such specific powers and duties as from time to time may be conferred upon or assigned to him or her by the Board of Directors.

SECTION 6.10. Vice President. Each Vice President shall have such powers and perform such duties as the Board of Directors or the Executive Committee may from time to time prescribe or as shall be assigned by the President.

SECTION 6.11. Treasurer. The Treasurer shall have charge and custody of, and be responsible for, all funds and securities of the Corporation, and shall deposit all such funds to the credit of the Corporation in such banks, trust companies or other depositories as shall be selected in accordance with the provisions of these Bylaws. The Treasurer shall disburse the funds of the Corporation as may be ordered by the Board of Directors or the Executive Committee, making

proper vouchers for such disbursements, and shall render to the Board of Directors or the stockholders, whenever the Board may so require, a statement of all transactions as Treasurer or the financial condition of the Corporation; and, in general, the Treasurer shall perform all the duties as from time to time may be assigned by the Board of Directors, any committee of the Board designated by it so to act or the President.

SECTION 6.12. Secretary. The Secretary shall record or cause to be recorded in books provided for the purpose the minutes of the meetings of the stockholders, the Board of Directors, and all committees of which a secretary shall not have been appointed; shall see that all notices are duly given in accordance with the provisions of these Bylaws and as required by law; shall be custodian of all corporate records (other than financial) and of the seal of the Corporation and see that the seal is affixed to all documents the execution of which on behalf of the Corporation under its seal is duly authorized in accordance with the provisions of these Bylaws; shall keep, or cause to be kept, the list of stockholders as required by Section 2.09, which include the post-office addresses of the stockholders and the number of shares held by them, respectively, and shall make or cause to be made, all proper changes therein, shall see that the books, reports, statements, certificates and all other documents and records required by law are properly kept and filed; and, in general, shall perform all duties incident to the office of Secretary and such other duties as may from time to time be assigned by the Board of Directors, the Executive Committee or the President.

SECTION 6.13. Salaries. The salaries of the principal officers of the Corporation shall be fixed from time to time by the Board of Directors or a special committee thereof, and none of such officers shall be prevented from receiving a salary by reason of the fact that he or she is a director of the Corporation.

ARTICLE 7.

INDEMNIFICATION OF DIRECTORS, OFFICERS AND OTHER AUTHORIZED REPRESENTATIVES

SECTION 7.01. Indemnification of Authorized Representatives in Third Party Proceedings. The Corporation shall indemnify any person who was or is an authorized representative of the Corporation, and who was or is a party, or is threatened to be made a party to any third party proceeding, by reason of the fact that such person was or is an authorized representative of the Corporation, against expenses, judgments, penalties, fines and amounts paid in settlement actually and reasonably incurred by such person in connection with such third party proceeding if such person acted in good faith and in a manner such person reasonably believed to be in, or not opposed to, the best interests of the Corporation and, with respect to any criminal third party proceeding, had no reasonable cause to believe such conduct was unlawful. The termination of any third party proceeding by judgment, order, settlement, indictment, conviction or upon a plea of nolo contendere or its equivalent, shall not of itself create a presumption that the authorized representative did not act in good faith and in a manner which such person reasonably believed to be in or not opposed to, the best interests of the Corporation, and, with

respect to any criminal third party proceeding, had reasonable cause to believe that such conduct was unlawful.

SECTION 7.02. Indemnification of Authorized Representatives m Corporate Proceedings. The Corporation shall indemnify any person who was or is an authorized representative of the Corporation and who was or is a party or is threatened to be made a party to any corporate proceeding, by reason of the fact that such person was or is an authorized representative of the Corporation, against expenses actually and reasonably incurred by such person in connection with the defense or settlement of such corporate action if such person acted in good faith and in a manner reasonably believed to be in, or not opposed to, the best interests of the Corporation, except that no indemnification shall be made in respect of any claim, issue or matter as to which such person shall have been adjudged to be liable to the Corporation unless and only to the extent that the Court of Chancery or the court in which such corporate proceeding was pending shall determine upon application that, despite the adjudication or liability but in view of all the circumstances of the case, such authorized representative is fairly and reasonably entitled to indemnity for such expenses which the Court of Chancery or such other court shall deem proper.

SECTION 7.03. Mandatory Indemnification of Authorized Representatives. To the extent that an authorized representative of the Corporation has been successful on the merits or otherwise in defense of any third party or corporate proceeding or in defense of any claim, issue or matter therein, such person shall be indemnified against expenses actually and reasonably incurred by such person in connection therewith.

SECTION 7.04. Determination of Entitlement to Indemnification. Any indemnification under Section 7.01, 7.02 or 7.03 of this Article (unless ordered by a court) shall be made by the Corporation only as authorized in the specific case upon a determination that indemnification of the authorized representative is proper in the circumstances because such person has either met the applicable standard of conduct set forth in Section 7.01 or 7.02 or has been successful on the merits or otherwise as set forth in Section 7.03 and that the amount requested has been actually and reasonably incurred. Such determination shall be made:

(a) By the Board of Directors by a majority of a quorum consisting of directors who were not parties to such third party or corporate proceeding, or

(b) If such a quorum is not obtainable, or, even if obtainable, a majority vote of such a quorum so directs, by independent legal counsel in a written opinion, or

(c) By the stockholders.

SECTION 7.05. Advancing Expenses. Expenses actually and reasonably incurred in defending a third party or corporate proceeding may be paid on behalf of an authorized representative by the Corporation in advance of the final disposition of such third party or corporate proceeding upon receipt of an undertaking by or on behalf of such authorized representative to repay such amount if it shall ultimately be determined that such person is not

entitled to be indemnified by the Corporation as authorized in this Article. The financial ability of such authorized representative to make such repayment shall not be a prerequisite to the making of an advance.

SECTION 7.06. Definitions. For purposes of this Article:

(a) "authorized representative" shall mean a director or officer of the Corporation, or a person serving at the request of the Corporation as a director, officer, or trustee, of another Corporation, partnership, joint venture, trust or other enterprise;

(b) "Corporation" shall include, in addition to the resulting corporation, any constituent Corporation (including any constituent of a constituent) absorbed in a consolidation or merger which, if its separate existence had continued, would have had power and authority to indemnify its directors, officers, employees or agents, so that any person who is or was a director, officer, employee or agent of such constituent Corporation, or is or was serving at the request of such constituent Corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise, shall stand in the same position under the provisions of this Article with respect to the resulting or surviving corporation as such person would have with respect to such constituent corporation if its separate existence had continued.

(c) "corporate proceeding" shall mean any threatened, pending or completed action or suit by or in the right of the Corporation to procure a judgment in its favor or investigative proceeding by the Corporation;

(d) "criminal third party proceeding" shall include any action or investigation which could or does lead to a criminal third party proceeding;

(e) "expenses" shall include attorneys' fees and disbursements;

(f) "fines" shall include any excise taxes assessed on a person with respect to an employee benefit plan;

(g) "not opposed to the best interest of the Corporation" shall include actions taken in good faith and in a manner the authorized representative reasonably believed to be in the interest of the participants and beneficiaries of an employee benefit plan;

(h) "other enterprises" shall include employee benefit plans;

(i) "party" shall include the giving of testimony or similar involvement;

G) "serving at the request of the Corporation" shall include any service as a director, officer or employee of the Corporation which imposes duties on, or involves services by, such director, officer or employee with respect to an employee benefit plan, its participants, or beneficiaries; and

(k) "third party proceeding" shall mean any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative, or investigative, other than an action by or in the right of the Corporation.

SECTION 7.07. Insurance. The Corporation may purchase and maintain insurance on behalf of any person who is or was a director, officer, employee or agent of the Corporation, or is or was serving at the request of the Corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise against any liability asserted against him and incurred by him in any such capacity, or arising out of his status as such, whether or not the Corporation would have the power or the obligation to indemnify such person against such liability under the provisions of this Article.

SECTION 7.08. Scope of Article. The indemnification of authorized representatives and advancement of expenses, as authorized by the preceding provisions of this Article, shall not be deemed exclusive of any other rights to which those seeking indemnification or advancement of expenses may be entitled under any statute, agreement, vote of stockholders or disinterested directors or otherwise, both as to action in an official capacity and as to action in another capacity. The indemnification and advancement of expenses provided by or granted pursuant to this Article shall, unless otherwise provided when authorized or ratified, continue as to a person who has ceased to be an authorized representative and shall inure to the benefit of the heirs, executors and administrators of such a person.

SECTION 7.09. Reliance on Provisions. Each person who shall act as an authorized representative of the Corporation shall be deemed to be doing so in reliance upon the rights of indemnification provided by this Article.

ARTICLE 8.

CONTRACTS, CHECKS, DRAFTS, BANK ACCOUNTS, ETC.

SECTION 8.01. Execution of Contracts. Unless the Board of Directors or the Executive Committee shall otherwise determine, (a) the Chairman of the Board, the President, any Vice President or the Treasurer, and (b) the Secretary or any Assistant Secretary, may enter into any contract or execute any contract or other instrument, the execution of which is not otherwise specifically provided for, in the name and on behalf of the Corporation. The Board of Directors, or any committee designated thereby with power so to act, except as otherwise provided in these Bylaws, may authorize any other or additional officer or officers or agent or agents of the Corporation, and such authority may be general or confined to specific instances. Unless authorized so to do by these Bylaws or by the Board of Directors or by any such committee, no officer, agent or employee shall have any power or authority to bind the Corporation by any contract or engagement or to pledge its credit or to render it liable pecuniarily for any purpose or to any amount.

SECTION 8.02. Loans. No loan shall be contracted on behalf of the Corporation, and no evidence of indebtedness shall be issued, endorsed or accepted in its name, unless authorized by

the Board of Directors or Executive Committee or other committee designated by the Board to act. Such authority may be general or confined to specific instances. When so authorized, the officer or officers thereunto authorized may effect loans and advances at any time for the Corporation from any bank, trust company or other institution, or from any firm, corporation or individual, and for such loans and advances may make, execute and deliver promissory notes or other evidences of indebtedness of the Corporation, and, when authorized as aforesaid, as security for the payment of any and all loans, advances, indebtedness and liabilities of the Corporation, may mortgage, pledge, hypothecate or transfer any real or personal property at any time owned or held by the Corporation, and to that end execute instruments of mortgage or pledge or otherwise transfer such property.

SECTION 8.03. Checks, Drafts, etc. All checks, drafts, bills or exchange or other orders for the payment of money, obligations, notes, or other evidence of indebtedness, bills of lading, warehouse receipts and insurance certificates of the Corporation, shall be signed or endorsed by such officer or officers, agent or agents, attorney or attorneys, employee or employees, of the Corporation as shall from time to time be determined by resolution of the Board of Directors or Executive Committee or other committee designated by the Board so to act.

SECTION 8.04. Deposits. All funds of the Corporation not otherwise employed shall be deposited from time to time to the credit of the Corporation in such banks, trust companies or other depositaries as the Board of Directors or Executive Committee or other committee designated by the Board so to act may from time to time designate, or as may be designated by any officer or officers or agent or agents of the Corporation to whom such power may be delegated by the Board of Directors or Executive Committee or other committee designated by the Board so to act and, for the purpose of such deposit and for the purposes of collection for the account of the Corporation may be endorsed, assigned and delivered by any officer, agent or employee of the Corporation or in such other manner as may from time to time be designated or determined by resolution of the Board of Directors or Executive Committee or other committee designated by the Board so to act.

SECTION 8.05. Proxies in Respect of Securities of Other Corporations. Unless otherwise provided by resolution adopted by the Board of Directors or the Executive Committee or other committee so designated to act by the Board, the President may from time to time appoint an attorney or attorneys or agent or agents of the Corporation, in the name and on behalf of the Corporation, to cast the votes that the Corporation may be entitled to cast as the holder of stock or other securities in any other corporation, association or trust any of whose stock or other securities may be held by the Corporation, at meetings of the holders of the stock or other securities of such other corporation, association or trust, or to consent in writing, in the name of the Corporation as such holder, to any action by such other corporation, association or trust, and may instruct the person or persons so appointed as to the manner of casting such votes or giving such consent, and may execute or cause to be executed in the name and on behalf of the Corporation and under its corporate seal, or otherwise, all such written proxies or other instruments as he or she may deem necessary or proper in the premises.

ARTICLE 9.

BOOKS AND RECORDS

SECTION 9.01. Place. The books and records of the Corporation may be kept at such places within or without the State of Delaware as the Board of Directors may from time to time determine. The stock record books and the blank stock certificate books shall be kept by the Secretary or by any other officer or agent designated by the Board of Directors.

SECTION 9.02 Addresses of Stockholders. Each stockholder shall furnish to the Secretary of the Corporation or to the transfer agent of the Corporation an address at which notices of meetings and all other corporate notices may be served upon or mailed to him, and if any stockholder shall fail to designate such address, corporate notices may be served upon him or her by mail, postage prepaid, to him or her at his or her post-office address last known to the Secretary or to the transfer agent of the Corporation or by transmitting a notice thereof to him or her at such address by telegraph, cable or other available method.

SECTION 9.03. Record Dates. The Board of Directors may fix in advance a date, not exceeding sixty days preceding the date of any meeting of stockholders, or the date for the payment of any dividend, or the date for the allotment of any rights, or the date when any change or conversion or exchange of capital stock of the Corporation shall go into effect, or a date in connection with obtaining such consent, as a record date for the determination of the stockholders entitled to notice of, and to vote at, any such meeting or any adjournment thereof, or entitled to receive payment of any such dividend, or to any such allotment of rights, or to exercise the rights in respect of any change, conversion or exchange or capital stock of the Corporation, or to give such consent, and in each such case such stockholders and only such stockholders as shall be stockholders of record on the date so fixed shall be entitled to notice of, or to vote at, such meeting and any adjournment thereof, or to receive payment of such dividend, or to receive such allotment of rights, or to exercise such rights or to give such consent, as the case may be, notwithstanding any transfer of any stock on the books of the Corporation after any such record date fixed as aforesaid.

ARTICLE 10.

SHARES AND THEIR TRANSFER

SECTION 10.01. Certificates of Stock. Every owner of stock of the Corporation shall be entitled to have a certificate certifying the number of shares owned by him or her in the Corporation and designating the class of stock to which such shares belong, which shall otherwise be in such form as the Board of Directors shall prescribe. Every such certificate shall be signed by the President or a Vice President, and by the Treasurer or any Assistant Treasurer or the Secretary or any Assistant Secretary of the Corporation; *provided,* however, that where such certificate is signed or countersigned by a transfer agent or registrar the signatures of such officers of the Corporation and the seal of the Corporation may be in facsimile form. In case any

officer or officers who shall have signed, or whose facsimile signature or signatures shall have been used on, any such certificate or certificates shall cease to be such officer or officers of the Corporation, whether because of death, resignation or otherwise, before such certificate or certificates shall have been delivered by the Corporation, such certificate or certificates may nevertheless be issued and delivered by the Corporation as though the person or persons who signed such certificate or whose facsimile signature or signatures shall have been used thereof had not ceased to be such officer or officers of the Corporation.

SECTION 10.02 Record. A record shall be kept of the name of the person, firm or corporation owning the stock represented by each certificate for stock of the Corporation issued, the number of shares represented by each such certificate, and the date thereof, and, in case of cancellation, the date of cancellation. The person in whose name shares of stock stand on the books of the Corporation shall be deemed the owner thereof for all purposes as regards the Corporation.

SECTION 10.03. Transfer of Stock. Transfers of shares of the stock of the Corporation shall be made only on the books of the Corporation by the registered holder thereof, or by his or her attorney thereunto authorized, and on the surrender of the certificate or certificates for such shares properly endorsed.

SECTION 10.04. Transfer Agent and Registrar; Regulations. The Corporation shall, if and whenever the Board of Directors or Executive Committee shall so determine, maintain one or more transfer offices or agencies, each in charge of a transfer agent designated by the Board of Directors, where the shares of the capital stock of the Corporation shall be directly transferable, and also if and whenever the Board of Directors shall so determine, maintain one or more by the Board of Directors, where such shares of stock shall be registered. The Board of Directors may make such rules and regulations as it may deem expedient, not inconsistent with these Bylaws, concerning the issue, transfer and registration of certificates for shares of the capital stock of the Corporation.

SECTION 10.05. Lost, Destroyed or Mutilated Certificates. In case of the alleged loss or destruction or the mutilation of a certificate representing capital stock of the Corporation, a new certificate may be issued in place thereof, in the manner and upon such terms as the Board of Directors may prescribe.

ARTICLE 11.

SEAL

The Board of Directors shall provide a corporate seal, which shall be in the form of a circle and shall bear the name of the Corporation and the state and year of incorporation.

ARTICLE 12.

FISCAL YEAR

The fiscal year of the Corporation shall commence on the first day of January and shall end on the last day of December in each year, except as otherwise provided from time to time by the Board of Directors.

ARTICLE 13.

WAIVER OF NOTICE

Whenever any notice whatever is required to be given by statute, these Bylaws or the Certificate of Incorporation, a waiver thereof in writing, signed or otherwise delivered in form permitted by statute by the person or persons entitled to said notice, whether before or after the time stated therein, shall be deemed equivalent thereto.

ARTICLE 14.

AMENDMENTS

These Bylaws may be altered, amended or repealed or new Bylaws may be adopted by the stockholders or by the Board of Directors, when such power is conferred upon the Board of Directors by the Certificate of Incorporation, at any regular meeting of the stockholders or of the Board of Directors or at any special meeting of the stockholders or of the Board of Directors if notice of such alteration, amendment, repeal or adoption of new Bylaws is contained in the notice of such special meeting. Any amendment of these Bylaws by the stockholders shall be effected in compliance with the applicable provisions of the Certificate of Incorporation.

Exhibit 4.2

THIS WARRANT AND THE SHARES ISSUABLE HEREUNDER HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR ANY APPLICABLE STATE SECURITIES LAWS, AND MAY NOT BE SOLD, PLEDGED OR OTHERWISE TRANSFERRED WITHOUT AN EFFECTIVE REGISTRATION THEREOF UNDER THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS, OR PURSUANT TO RULE 144 OR AN EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS.

WARRANT TO PURCHASE STOCK

Corporation:	ATYR PHARMA, INC., a Delaware corporation
Number of Shares:	72,000 as adjusted below
Class of Stock:	Series B Preferred Stock
Initial Exercise Price:	$0.8334 per share
Issue Date:	September 18, 2007
Expiration Date:	September 18, 2017 (Subject to Section 4.1)

THIS WARRANT TO PURCHASE STOCK ("WARRANT") CERTIFIES THAT, for good and valuable consideration, the receipt of which is hereby acknowledged, COMERICA BANK, a Michigan banking corporation, or its assignee ("Holder"), is entitled to purchase the number of fully paid and nonassessable shares of the class of securities (the "Shares") of ATYR PHARMA, INC. (the "Company") at the initial exercise price per Share (the "Warrant Price") all as set forth above and as adjusted pursuant to this Warrant, subject to the provisions and upon the terms and conditions set forth in this Warrant. At such time as Company requests the initial advance under the Growth Capital Line, as defined in the Loan and Security Agreement between the Holder and the Company dated as of the date hereof, and the Holder has delivered such funds to the Company (or such account as may be directed by the Company), the Number of Shares issuable hereunder shall increase by an additional 36,000 shares of Series B Preferred Stock.

ARTICLE 1
EXERCISE

1.1 Method of Exercise. Holder may exercise this Warrant by delivering this Warrant and a duly executed Notice of Exercise in substantially the form attached as Appendix 1 to the principal office of the Company. Holder shall also deliver to the Company a check or wire for the aggregate Warrant Price for the Shares being purchased.

1.2 Delivery of Certificate and New Warrant. Within 45 days after Holder exercises this Warrant and delivers to the Company the aggregate Warrant Price for the Shares being purchased, the Company shall deliver to Holder certificates for the Shares acquired and, if this Warrant has not been fully exercised and has not expired, a new warrant representing the Shares not so acquired.

1.3 Replacement of Warrants. In the case of loss, theft or destruction of this Warrant, on delivery of an indemnity agreement reasonably satisfactory in form and amount to the Company or, in the case of mutilation, on surrender and cancellation of this Warrant, the Company at its expense shall execute and deliver, in lieu of this Warrant, a new warrant of like tenor.

1.4 Acquisition of the Company.

1.4.1 "Acquisition." For the purpose of this Warrant, "Acquisition" means (a) any sale, license, or other disposition of all or substantially all of the assets (including intellectual property) of the Company, or (b) any reorganization, consolidation, merger or sale of the voting securities of the Company or any other transaction where the holders of the Company's securities before the transaction beneficially own less than 50% of the outstanding voting securities of the surviving entity after the transaction.

1.4.2 "Cash Acquisition." For the purpose of this Warrant, "Cash Acquisition" means any Acquisition in which the consideration paid by the acquirer is comprised solely of cash, promissory notes and/or the assumption of indebtedness.

1.4.3 Assumption of Warrant. Upon the closing of any Acquisition (other than a Cash Acquisition), and as a condition precedent thereto, the successor or surviving entity shall assume the obligations of this Warrant, and this Warrant shall be exercisable for the same securities, cash, and/or property as would be payable for the Shares issuable upon exercise of the unexercised portion of this Warrant as if such Shares were outstanding on the record date for the Acquisition and subsequent closing. The Warrant Price shall be adjusted accordingly, and the Warrant Price and number and class of Shares shall continue to be subject to adjustment from time to time in accordance with the provisions hereof.

ARTICLE 2
ADJUSTMENTS TO THE SHARES

2.1 Stock Dividends, Splits, Etc. If the Company declares or pays a dividend on the its common stock payable in common stock, or other securities, or subdivides the outstanding common stock into a greater amount of common stock, then upon exercise of this Warrant, for each Share acquired, Holder shall receive, without cost to Holder, the total number and kind of securities to which Holder would have been entitled had Holder owned the Shares of record as of the date the dividend or subdivision occurred.

2.2 Reclassification, Exchange or Substitution. Upon any reclassification, exchange, substitution, or other event that results in a change of the number and/or class of the securities issuable upon exercise or conversion of this Warrant, Holder shall be entitled to receive, upon exercise or conversion of this Warrant, the number and kind of securities and property that Holder would have received for the Shares if this Warrant had been exercised immediately before such reclassification, exchange, substitution, or other event. Such an event shall include any automatic conversion of the outstanding or issuable securities of the Company of the same class or series as the Shares to common stock pursuant to the terms of the Company's Amended and Restated Certificate of Incorporation, as amended from time to time (the "Certificate of Incorporation") upon the closing of a registered public offering of the Company's common stock or other circumstance as provided for in the Certificate of Incorporation. The Company or its successor shall promptly issue to Holder a new warrant for such new securities or other property. The new warrant shall provide for adjustments which shall be as nearly equivalent as may be

practicable to the adjustments provided for in this Article 2 including, without limitation, adjustments to the Warrant Price and to the number of securities or property issuable upon exercise of the new warrant. The provisions of this Section 2.2 shall similarly apply to successive reclassifications, exchanges, substitutions, or other events.

2.3 Adjustments for Combinations, Etc. If the outstanding Shares are combined or consolidated, by reclassification, reverse split or otherwise, into a lesser Number of Shares, the Warrant Price shall be proportionately increased and the Number of Shares issuable upon exercise hereof shall be proportionately decreased. If the outstanding Shares are split or multiplied, by reclassification or otherwise, into a greater Number of Shares, the Warrant Price shall be proportionately decreased and the Number of Shares issuable upon exercise hereof shall be proportionately increased.

2.4 Adjustments for Diluting Issuances. The Number of Shares issuable upon exercise of this Warrant shall be subject to adjustment, from time to time, in the manner set forth on Exhibit A in the event of Diluting Issuances (as defined on Exhibit A).

2.5 No Impairment. The Company shall not, by amendment of its Certificate of Incorporation or through a reorganization, transfer of assets, consolidation, merger, dissolution, issue, or sale of securities or any other voluntary action, avoid or seek to avoid the observance or performance of any of the terms to be observed or performed under this Warrant by the Company, but shall at all times in good faith assist in carrying out all the provisions of this Article 2 and in taking all such action as may be necessary or appropriate to protect Holder's rights under this Article 2 against impairment. Notwithstanding the foregoing, the Company shall not have been deemed to have impaired Holder's rights hereunder if it amends its Certificate of Incorporation, or the holders of shares of the Company's Preferred Stock waive rights thereunder, in a manner that does not affect Holder in a manner different form the effect that such amendments or waivers have on the rights of all holders of the Series B Preferred Stock.

2.6 Certificate as to Adjustments. Upon each adjustment of the Warrant Price, the Company at its expense shall promptly compute such adjustment, and furnish Holder with a certificate signed by its Chief Financial Officer or other authorized officer setting forth such adjustment and the facts upon which such adjustment is based. The Company shall, upon written request, furnish Holder a certificate setting forth the Warrant Price in effect upon the date thereof and the series of adjustments leading to such Warrant Price.

2.7 Fractional Shares. No fractional Shares shall be issuable upon exercise of this Warrant and the Number of Shares to be issued shall be rounded down to the nearest whole Share. If a fractional share interest arises upon any exercise of the Warrant, the Company shall eliminate such fractional share interest by paying Holder an amount computed by multiplying the fractional interest by the fair market value, as determined by the Company's Board of Directors, of a full Share.

ARTICLE 3
REPRESENTATIONS AND COVENANTS OF THE COMPANY

3.1 Representations and Warranties. The Company hereby represents and warrants to, and agrees with, the Holder as follows:

3.1.1 The initial Warrant Price referenced on the first page of this Warrant is equal to the price paid per share (on a post-split basis) in the Company's most recent preferred stock financing, rounded up to the fourth decimal point.

3.1.2 All Shares which may be issued upon the exercise of the purchase right represented by this Warrant, and all securities, if any, issuable upon conversion of the Shares, shall, upon issuance, be duly authorized, validly issued, fully paid and nonassessable, and free of any liens and encumbrances except for restrictions on transfer provided for herein or under applicable federal and state securities laws.

3.1.3 The Company's capitalization table attached to this Warrant as Exhibit C is true and complete as of the Issue Date.

3.2 Notice of Certain Events. If the Company proposes at any time (a) to declare any dividend or distribution upon its stock, whether in cash, property, stock, or other securities and whether or not a regular cash dividend; (b) to offer for subscription pro rata to the holders of any class or series of its stock any additional shares of stock of any class or series or other rights; (c) to effect any reclassification or recapitalization of stock; or (d) to merge or consolidate with or into any other corporation, or sell, lease, license, or convey all or substantially all of its assets, or to liquidate, dissolve or wind up, then, in connection with each such event, the Company shall give Holder (1) no later than the date such notice is provided to the Company's stockholders prior written notice of the date on which a record will be taken for such dividend, distribution, or subscription rights (and specifying the date on which the holders of stock will be entitled thereto) or for determining rights to vote, if any, in respect of the matters referred to in (a) and (b) above; and (2) in the case of the matters referred to in (c) and (d) above no later than the date such notice is provided to the Company's stockholders prior written notice of the date when the same will take place (and specifying the date on which the holders of stock will be entitled to exchange their stock for securities or other property deliverable upon the occurrence of such event).

3.3 Information Rights. So long as the Holder holds this Warrant and/or any of the Shares, the Company shall deliver to the Holder (a) promptly after mailing, copies of all communiques to the stockholders of the Company, (b) within one hundred fifty (150) days after the end of each fiscal year of the Company, a copy of the annual audited financial statements of the Company delivered to the Company's investors and certified by independent public accountants of recognized standing and (c) within forty-five (45) days after the end of each of the first three quarters of each fiscal year, the Company's quarterly, unaudited financial statements. The Company's obligations under this Section shall terminate upon the Company being subject to the periodic reporting requirements of the Securities Exchange Act of 1934, as amended.

3.4 Registration Under Securities Act of 1933, as amended. The Company agrees that the Shares or, if the Shares are convertible into common stock of the Company, such common stock, shall be subject to the registration rights set forth on Exhibit B.

3.5 "Market Stand-Off Agreement.

3.5.1 Market Standoff Period; Agreement. The Holder agrees, if so requested by the managing underwriter in connection with the Company's initial public offering of equity securities not to effect (except as part of such underwritten registration in accordance with the registration rights provided pursuant to Exhibit B or pursuant to a transaction exempt from registration (other than under Rule 144 or Rule 145 of the Securities Act) any sale, distribution, short sale, loan, grant of options for the purchase of, or otherwise dispose of, any shares of the capital stock or other securities of the Company for such period as such managing underwriter requests, such period in no event to commence earlier than seven (7) days prior to, or to end more than 180 days after, the effective date of such registration. In addition, the Holder agrees to execute and deliver to any managing underwriter (or, in the case of any offering that is not underwritten, an investment banker) in connection with such registration any lock-up letter requested of the Holder and in form and substance reasonably satisfactory to the managing underwriter. The Holder further agrees that the Company may instruct its transfer agent to place stop transfer notations in its records to enforce the provisions of this Section 3.5.1.

3.5.2 Transferees Bound. By accepting this warrant, the Holder agrees that it will not transfer this warrant and/or the Shares unless the transferee(s) of such Holder agrees in writing to be bound by all of the provisions of this Section 3.5.

ARTICLE 4
MISCELLANEOUS

4.1 Term; Exercise Upon Expiration. This Warrant is exercisable in whole or in part, at any time and from time to time on or before the earlier of (i) the Expiration Date set forth above and (ii) the consummation of a Cash Acquisition.

4.2 Legends. This Warrant and the Shares (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) shall be imprinted with a legend in substantially the following form:

THIS SECURITY HAS NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR ANY APPLICABLE STATE SECURITIES LAWS, AND MAY NOT BE SOLD, PLEDGED OR OTHERWISE TRANSFERRED WITHOUT AN EFFECTIVE REGISTRATION THEREOF UNDER THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS, OR PURSUANT TO RULE 144 OR AN EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS.

4.3 Compliance with Securities Laws on Transfer. This Warrant and the Shares issuable upon exercise of this Warrant (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) may not be transferred or assigned in whole or in part without compliance with applicable federal and state securities laws by the transferor and the transferee.

4.4 Transfer Procedure. Subject to the provisions of Section 4.3, Holder may transfer all or part of this Warrant or the Shares issuable upon exercise of this Warrant (or the securities issuable, directly or indirectly, upon conversion of the Shares, if any) by giving the Company notice of the portion of this Warrant being transferred setting forth the name, address and taxpayer identification number of the transferee and surrendering this Warrant to the Company for reissuance to the transferee(s) (and Holder, if applicable); *provided, however*, that Holder may transfer all or part of this Warrant to its affiliates, including, without limitation, Comerica Incorporated, at any time without notice or the delivery of any other instrument to the Company, and such affiliate shall then be entitled to all the rights of Holder under this Warrant and any related agreements, and, upon receiving notice of such transfer, the Company shall cooperate fully in ensuring that any stock issued upon exercise of this Warrant is issued in the name of the affiliate that exercises this Warrant. The terms and conditions of this Warrant shall inure to the benefit of, and be binding upon, the Company and the holders hereof and their respective permitted successors and assigns. Unless the Company is filing financial information with the SEC pursuant to the Securities Exchange Act of 1934, the Company shall have the right to refuse to transfer any portion of this Warrant to any person who directly competes with the Company.

4.5 Notices. All notices and other communications from the Company to the Holder, or vice versa, shall be deemed delivered and effective when given personally or mailed by first-class registered or certified mail, postage prepaid, at such address as may have been furnished to the Company or the Holder, as the case may be, in writing by the Company or such Holder from time to time. All notices to the Holder shall be addressed as follows:

Comerica Bank c/o Comerica Incorporated
Attn: Warrant Administrator
500 Woodward Avenue, 32nd Floor, MC 3379
Detroit, MI 48226

All notices to the Company shall be addressed as follows:

ATYR PHARMA, INC.
10885 Road to the Cure, Suite 100
San Diego, CA 92121
Attn: President

With a copy (which shall not constitute notice) to:

Randy Socol
DLA Piper US LLP
4365 Executive Drive, Ste. 1100
San Diego, CA 92121-2133

4.6 Amendments. This Warrant and any term hereof may be changed, waived, discharged or terminated only by an instrument in writing signed by the party against which enforcement of such change, waiver, discharge or termination is sought.

4.7 Attorneys' Fees. In the event of any dispute between the parties concerning the terms and provisions of this Warrant, the party prevailing in such dispute shall be entitled to collect from the other party all costs incurred in such dispute, including reasonable attorneys' fees.

4.8 Governing Law. This Warrant shall be governed by and construed in accordance with the laws of the State of California, without giving effect to its principles regarding conflicts of law.

4.9 Confidentiality. The Company hereby agrees to keep the terms and conditions of this Warrant confidential. Notwithstanding the foregoing confidentiality obligation, the Company may disclose information relating to this Warrant (a) as required by law, rule, regulation, court order or other legal authority, provided that (i) the Company has given Holder at least ten (10) days' notice of such required disclosure, and (ii) the Company only discloses information that is required, in the opinion of counsel reasonably satisfactory to Holder, to be disclosed or (b) as part of a due diligence investigation and Company shall use commercially reasonable efforts in obtaining an agreement from the party receiving such information to be bound by a confidentiality provision.

IN WITNESS HEREOF, the undersigned parties have caused this Warrant to be executed as of the date first set forth above.

ATYR PHARMA, INC.

By: /s/ Christina Waters
Name: Christina Waters, Ph.D.
Title: President and Chief Operating Officer

AGREED AND ACKNOWLEDGED:

COMERICA BANK

By: /s/ Dennis Kim
Name: Dennis Kim
Title: Corporate Banking Officer

APPENDIX 1

NOTICE OF EXERCISE

1. The undersigned hereby elects to purchase _____ shares of the _____ stock of ATYR PHARMA, INC. pursuant to the terms of the attached Warrant, and tenders herewith payment of the purchase price of such shares in full.

2. Please issue a certificate or certificates representing said shares in the name of the undersigned or in such other name as is specified below:

Comerica Bank
Attn: Warrant Administrator
500 Woodward Avenue, 32nd Floor, MC 3379
Detroit, MI 48226

3. The undersigned represents it is acquiring the shares solely for its own account and not as a nominee for any other party and not with a view toward the resale or distribution thereof except in compliance with applicable securities laws.

4. The undersigned further acknowledges that it has reviewed the "Market Stand-Off" agreement set forth in Section 3.5 of the Warrant and agrees to be bound by such provisions.

COMERICA BANK or Assignee

_____
(Signature)

_____
(Name and Title)

_____
(Date)

EXHIBIT A

Anti-Dilution Provisions
(For Preferred Stock Warrants With Existing Anti-Dilution Protection)

In the event of the issuance (a "Diluting Issuance") by the Company, after the Issue Date of this Warrant, of securities at a price per share less than the Warrant Price, then the number of shares of common stock issuable upon conversion of the Shares shall be adjusted in accordance with those provisions (the "Provisions") of the Company's Certificate of Incorporation which apply to Diluting Issuances.

EXHIBIT B

Registration Rights

The common stock issuable upon conversion of the Shares, shall be deemed "registrable securities" entitled to "Incidental Registration" rights in accordance with the terms of the following agreement (the "Agreement") between the Company and its investor(s):

Amended and Restated Registration Rights Agreement made and entered into as of November 20, 2006, as amended from time to time.

By acceptance of the Warrant to which this Exhibit B is attached, Holder shall be deemed to be a party to the Agreement solely for the purpose of the above-mentioned registration rights.

EXHIBIT C

Capitalization Table

Exhibit 4.3

THIS WARRANT AND THE SHARES ISSUABLE HEREUNDER HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "**ACT**"), OR ANY APPLICABLE STATE SECURITIES LAWS, AND EXCEPT AND PURSUANT TO THE PROVISIONS OF ARTICLE 5 BELOW, MAY NOT BE SOLD, OFFERED OR OTHERWISE TRANSFERRED WITHOUT AN EFFECTIVE REGISTRATION THEREOF UNDER THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS, OR PURSUANT TO RULE 144 OR AN EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS.

WARRANT TO PURCHASE STOCK

Corporation:	ATYR PHARMA, INC., a Delaware corporation
Number of Shares:	15,957, subject to adjustment as set forth below
Class of Stock:	Series C Preferred Stock
Initial Exercise Price:	$0.94 per share
Issue Date:	March 18, 2011
Expiration Date:	March 18, 2021 (Subject to Section 4.1)

THIS WARRANT TO PURCHASE STOCK (this "WARRANT") CERTIFIES THAT, for good and valuable consideration, the receipt of which is hereby acknowledged, COMERICA BANK, a Texas banking association, or its assignee ("Holder"), is entitled to purchase the number of fully paid and nonassessable shares of the class of securities (the "Shares") of ATYR PHARMA, INC. (the "Company") at the initial exercise price per Share (the "Warrant Price") all as set forth above and as adjusted pursuant to this Warrant, subject to the provisions and upon the terms and conditions set forth in this Warrant.

ARTICLE 1
EXERCISE

1.1 Method of Exercise. Holder may exercise this Warrant by delivering this Warrant and a duly executed Notice of Exercise in substantially the form attached as Appendix 1 to the principal office of the Company (or such other appropriate location as Holder is so instructed by the Company). Holder shall also deliver to the Company a check, wire transfer (to an account designated by the Company) or other form of payment acceptable to the Company for the aggregate Warrant Price for the Shares being purchased.

1.2 Delivery of Certificate and New Warrant. Within 45 days after Holder exercises this Warrant and delivers to the Company the aggregate Warrant Price for the Shares being purchased, the Company shall deliver to Holder certificates for the Shares acquired and, if this Warrant has not been fully exercised and has not expired, a new warrant representing the Shares not so acquired.

1.3 Replacement of Warrants. In the case of loss, theft or destruction of this Warrant, on delivery of an indemnity agreement reasonably satisfactory in form and amount to the Company or, in the case of mutilation, on surrender and cancellation of this Warrant, the Company at its expense shall execute and deliver, in lieu of this Warrant, a new warrant of like tenor.

1.4 Acquisition of the Company.

1.4.1 "Acquisition." For the purpose of this Warrant, "Acquisition" means (a) any sale, license, or other disposition of all or substantially all of the assets (including intellectual property) of the Company, or (b) any reorganization, consolidation, merger, sale of the outstanding voting securities of the Company or other transaction or series of related transactions where the holders of the Company's securities before the transaction or series of related transactions beneficially own less than 50% of the outstanding voting securities of the surviving entity after the transaction or series of related transactions.

1.4.2 "Cash Acquisition." For the purpose of this Warrant, "Cash Acquisition" means any Acquisition in which the consideration paid by the acquirer is comprised solely of cash, promissory notes and/or the assumption of indebtedness.

1.4.3 Assumption of Warrant. Upon the closing of any Acquisition (other than a Cash Acquisition), and as a condition precedent thereto, the successor or surviving entity shall assume the obligations of this Warrant, and this Warrant shall be exercisable for the same securities, cash, and/or property as would be payable for the Shares issuable upon exercise of the unexercised portion of this Warrant as if such Shares were outstanding on the record date for the Acquisition and subsequent closing. The Warrant Price shall be adjusted accordingly, and the Warrant Price and number and class of Shares shall continue to be subject to adjustment from time to time in accordance with the provisions hereof.

ARTICLE 2
ADJUSTMENTS TO THE SHARES

2.1 Stock Dividends, Splits, Etc. If the Company declares or pays a dividend on the its common stock payable in common stock, or other securities, or subdivides the outstanding common stock into a greater amount of common stock, then upon exercise of this Warrant, for each Share acquired, Holder shall receive, without cost to Holder, the total number and kind of securities to which Holder would have been entitled had Holder owned the Shares of record as of the date the dividend or subdivision occurred.

2.2 Reclassification, Exchange or Substitution. Upon any reclassification, exchange, substitution, or other event that results in a change of the number and/or class of the securities issuable upon exercise or conversion of this Warrant, Holder shall be entitled to receive, upon exercise or conversion of this Warrant, the number and kind of securities and property that Holder would have received for the Shares if this Warrant had been exercised immediately before such reclassification, exchange, substitution, or other event. Such an event shall include any automatic conversion of the outstanding or issuable securities of the Company of the same class or series as the Shares to common stock pursuant to the terms of the Company's Amended and Restated Certificate of Incorporation, as amended from time to time (the "Certificate of Incorporation") upon the closing of a registered public offering of the Company's common stock or other circumstance as provided for in the Certificate of Incorporation. The Company or its successor shall promptly issue to Holder a new warrant for such new securities or other property. The new warrant shall provide for adjustments which shall be as nearly equivalent as may be practicable to the adjustments provided for in this

Article 2 including, without limitation, adjustments to the Warrant Price and to the number of securities or property issuable upon exercise of the new warrant. The provisions of this Section 2.2 shall similarly apply to successive reclassifications, exchanges, substitutions, or other events.

2.3 Adjustments for Combinations, Etc. If the outstanding Shares are combined or consolidated, by reclassification, reverse split or otherwise, into a lesser Number of Shares, the Warrant Price shall be proportionately increased and the Number of Shares issuable upon exercise hereof shall be proportionately decreased. If the outstanding Shares are split or multiplied, by reclassification or otherwise, into a greater Number of Shares, the Warrant Price shall be proportionately decreased and the Number of Shares issuable upon exercise hereof shall be proportionately increased.

2.4 Adjustments for Diluting Issuances. The Number of Shares issuable upon exercise of this Warrant shall be subject to adjustment, from time to time, in the manner set forth on Exhibit A in the event of Diluting Issuances (as defined on Exhibit A).

2.5 No Impairment. The Company shall not, by amendment of its Certificate of Incorporation or through a reorganization, transfer of assets, consolidation, merger, dissolution, issue, or sale of securities or any other voluntary action, avoid or seek to avoid the observance or performance of any of the terms to be observed or performed under this Warrant by the Company, but shall at all times in good faith assist in carrying out all the provisions of this Article 2 and in taking all such action as may be necessary or appropriate to protect Holder's rights under this Article 2 against impairment. Notwithstanding the foregoing, the Company shall not have been deemed to have impaired Holder's rights hereunder if it amends its Certificate of Incorporation, or the holders of shares of the Company's Preferred Stock waive rights thereunder, in a manner that does not affect Holder in a manner different form the effect that such amendments or waivers have on the rights of all holders of the Series B Preferred Stock.

2.6 Certificate as to Adjustments. Upon each adjustment of the Warrant Price, the Company at its expense shall promptly compute such adjustment, and furnish Holder with a certificate signed by its Chief Financial Officer or other authorized officer setting forth such adjustment and the facts upon which such adjustment is based. The Company shall, upon written request, furnish Holder a certificate setting forth the Warrant Price in effect upon the date thereof and the series of adjustments leading to such Warrant Price.

2.7 Fractional Shares. No fractional Shares shall be issuable upon exercise of this Warrant and the Number of Shares to be issued shall be rounded down to the nearest whole Share. If a fractional share interest arises upon any exercise of the Warrant, the Company shall eliminate such fractional share interest by paying Holder an amount computed by multiplying the fractional interest by the fair market value, as determined by the Company's Board of Directors, of a full Share.

ARTICLE 3
REPRESENTATIONS AND COVENANTS OF THE COMPANY

3.1 Representations and Warranties. The Company hereby represents and warrants to, and agrees with, the Holder as follows:

3.1.1 The initial Warrant Price referenced on the first page of this Warrant is equal to the price paid per share (on a post-split basis) in the Company's most recent preferred stock financing.

3.1.2 All Shares which may be issued upon the exercise of the purchase right represented by this Warrant, and all securities, if any, issuable upon conversion of the Shares, shall, upon issuance, be duly authorized, validly issued, fully paid and nonassessable, and free of any liens and encumbrances except for restrictions on transfer provided for herein or under applicable federal and state securities laws.

3.1.3 The Company's capitalization table attached to this Warrant as Exhibit C is true and complete as of the Issue Date.

3.2 Notice of Certain Events. If the Company proposes at any time (a) to declare any dividend or distribution upon its stock, whether in cash, property, stock, or other securities and whether or not a regular cash dividend; (b) to offer for subscription pro rata to all of the holders of any class or series of its stock any additional shares of Series C Preferred Stock; (c) to effect any reclassification or recapitalization of stock; or (d) to merge or consolidate with or into any other corporation, or sell, lease, exclusively license, or convey all or substantially all of its assets, or to liquidate, dissolve or wind up, then, in connection with each such event, the Company shall give Holder (1) no later than the date such written notice is provided to the Company's stockholders, if any, written notice of the date on which a record will be taken for such dividend, distribution, or subscription rights (and specifying the date on which the holders of stock will be entitled thereto) or for determining rights to vote, if any, in respect of the matters referred to in (a) and (b) above; and (2) in the case of the matters referred to in (c) and (d) above no later than the date such written notice is provided to the Company's stockholders, written notice of the date when the same will take place (and specifying the date on which the holders of stock will be entitled to exchange their stock for securities or other property deliverable upon the occurrence of such event). Upon request, the Company shall provide Holder with such information reasonably necessary for Holder to evaluate its rights as a holder of this Warrant or Warrant Shares in the case of matters referred to (a), (b), (c) and (d) herein above.

3.3 Information Rights. So long as the Holder holds this Warrant and/or any of the Shares, the Company shall deliver to the Holder (a) promptly after mailing, copies of all communiques to the stockholders of the Company, (b) within one hundred fifty (150) days after the end of each fiscal year of the Company, a copy of the annual audited financial statements of the Company delivered to the Company's investors and certified by independent public accountants of recognized standing and (c) within forty-five (45) days after the end of each of the first three quarters of each fiscal year, the Company's quarterly, unaudited financial statements. The Company's obligations under this Section shall terminate upon the Company being subject to the periodic reporting requirements of the Securities Exchange Act of 1934, as amended. In addition, and without limiting the generality of the foregoing, so long as the Holder holds this

Warrant and/or any of the Shares, the Company shall afford to the Holder the same access to information concerning the Company and its business and financial condition as would be afforded to a holder of the class of Shares under applicable state law and/or any agreement with any holder of the class of Shares.

3.4 Registration Under Securities Act of 1933, as amended. The Company agrees that the Shares or, if the Shares are convertible into common stock of the Company, such common stock, shall be subject to the registration rights set forth on Exhibit B.

3.5 Market Stand-Off Agreement.

3.5.1 Market Standoff Period; Agreement. The Holder agrees, if so requested by the managing underwriter in connection with the Company's initial public offering of equity securities not to effect (except as part of such underwritten registration in accordance with the registration rights provided pursuant to Exhibit B or pursuant to a transaction exempt from registration (other than under Rule 144 or Rule 145 of the Securities Act)) any sale, distribution, short sale, loan, grant of options for the purchase of, or otherwise dispose of, any shares of the capital stock or other securities of the Company for such period as such managing underwriter requests, such period in no event to commence earlier than seven (7) days prior to, or to end more than 180 days after, the effective date of such registration. In addition, the Holder agrees to execute and deliver to any managing underwriter (or, in the case of any offering that is not underwritten, an investment banker) in connection with such registration any lock-up letter requested of the Holder and in form and substance reasonably satisfactory to the managing underwriter. The Holder further agrees that the Company may instruct its transfer agent to place stop transfer notations in its records to enforce the provisions of this Section 3.5.1. The foregoing restrictions shall be conditioned on each officer, director of the Company and holder of one percent or more of the Company's Common Stock or securities convertible or exchangeable for one percent or more of its Common Stock (determined in all instances on a fully diluted basis) being bound by substantially the same restrictions as are set forth above.

3.5.2 Transferees Bound. By accepting this warrant, the Holder agrees that it will not transfer this warrant and/or the Shares unless the transferee(s) of such Holder agrees in writing to be bound by all of the provisions of this Section 3.5.

ARTICLE 4
INVESTMENT REPRESENTATIONS AND COVENANTS OF HOLDER

With respect to the acquisition of this Warrant and any of the Shares, Holder hereby represents and warrants to, and agrees with, the Company as follows:

4.1 Purchase Entirely for Own Account. This Warrant is issued to Holder in reliance upon Holder's representation to the Company that this Warrant and the Shares will be acquired for investment for Holder's, or its affiliate's, own account, not as a nominee or agent, and not with a view to the resale or distribution of any part thereof other than to an affiliate, and that Holder has no present intention of selling, granting any participation in, or otherwise distributing the same other than to an affiliate. By executing this Warrant, Holder further represents that except as otherwise set forth herein, Holder does not have any contract, undertaking, agreement

or arrangement with any person, other than an affiliate, to sell, transfer or grant participations to such person or to any third person with respect to any of the Shares.

4.2 Reliance upon Holder's Representations. Holder understands that this Warrant and the Shares are not registered under the Securities Act of 1933, as amended from time to time (the "Act") on the ground that the issuance of such securities is exempt from registration under the Act, and that the Company's reliance on such exemption is predicated on Holder's representations set forth herein.

4.3 Accredited Investor Status. Holder represents to the Company that Holder is an Accredited Investor (as defined in the Act).

4.4 Restricted Securities. Holder understands that this Warrant and the Shares are "restricted securities" under the federal securities laws inasmuch as they are being acquired from the Company in a transaction not involving a public offering and that under such federal securities laws and applicable regulations such securities may be resold without registration under the Securities Act only in certain limited circumstances.

ARTICLE 5
MISCELLANEOUS

5.1 Term; Exercise Upon Expiration. This Warrant is exercisable in whole or in part, at any time and from time to time on or before the earlier of (i) the Expiration Date set forth above and (ii) the consummation of a Cash Acquisition.

5.2 Legends. This Warrant and the Shares (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) shall be imprinted with a legend in substantially the following form:

> THIS WARRANT AND THE SHARES ISSUABLE HEREUNDER HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR ANY APPLICABLE STATE SECURITIES LAWS, AND, EXCEPT AND PURSUANT TO THE PROVISIONS OF ARTICLE 5 BELOW, MAY NOT BE OFFERED, SOLD OR OTHERWISE TRANSFERRED WITHOUT AN EFFECTIVE REGISTRATION THEREOF UNDER THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS, OR PURSUANT TO RULE 144 OR AN EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS.

5.3 Compliance with Securities Laws on Transfer. This Warrant and the Shares issuable upon exercise of this Warrant (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) may not be transferred or assigned in whole or in part without compliance with applicable federal and state securities laws by the transferor and the transferee. The Company shall not require Comerica Bank ("Bank") or a Bank Affiliate (as defined herein) to provide an opinion of counsel or investment representation letter if the transfer is to Bank's parent company, Comerica Incorporated ("Comerica"), or any other affiliate of Bank ("Bank Affiliate").

5.4 Transfer Procedure. After receipt of the executed Warrant, Bank will transfer all of this Warrant to Comerica Ventures Incorporated, a non-banking subsidiary of Comerica and a Bank Affiliate ("Ventures"). Subject to the provisions of Section 4.3, Holder may transfer all or part of this Warrant or the Shares issuable upon exercise of this Warrant (or the securities issuable, directly or indirectly, upon conversion of the Shares, if any) by giving the Company notice of the portion of this Warrant being transferred setting forth the name, address and taxpayer identification number of the transferee and surrendering this Warrant to the Company for reissuance to the transferee(s) (and Holder, if applicable); *provided, however*, that Holder may transfer all or part of this Warrant to its affiliates, including, without limitation, Ventures, at any time without notice or the delivery of any other instrument to the Company, and such affiliate shall then be entitled to all the rights of Holder under this Warrant and any related agreements, and, upon receiving notice of such transfer, the Company shall cooperate fully in ensuring that any stock issued upon exercise of this Warrant is issued in the name of the affiliate that exercises this Warrant. The terms and conditions of this Warrant shall inure to the benefit of, and be binding upon, the Company and the holders hereof and their respective permitted successors and assigns. Unless the Company is filing financial information with the SEC pursuant to the Securities Exchange Act of 1934, the Company shall have the right to refuse to transfer any portion of this Warrant to any person who directly competes with the Company.

5.5 Notices. All notices and other communications from the Company to the Holder, or vice versa, shall be deemed delivered and effective when given personally or mailed by first-class registered or certified mail, postage prepaid, or sent via a nationally recognized overnight courier service, fee prepaid, or on the first business day after transmission by facsimile, at such address or facsimile number as may have been furnished to the Company or the Holder, as the case may be, in writing by the Company or such Holder from time to time. Effective upon the receipt of executed Warrant and initial transfer described in Section 5.4 above, all notices to the Holder shall be addressed as follows until the Company receives notice of a change of address in connection with a transfer or otherwise:

Comerica Bank c/o Comerica Incorporated
Attn: Warrant Administrator
1717 Main Street, 5th Floor, MC 6406
Dallas, Texas 75201
Facsimile No. (214) 462-4459

All notices to the Company shall be addressed as follows:

ATYR PHARMA, INC.
3565 General Atomics Court, Suite 103
San Diego, CA 92121
Attn: President

With a copy (which shall not constitute notice) to:

DLA Piper LLP (US)
4365 Executive Drive, Suite 1100
San Diego, CA 92121
Attn: Randy Socol, Esq.
FAX: (858) 638-5057

5.6 Amendments. This Warrant and any term hereof may be changed, waived, discharged or terminated only by an instrument in writing signed by the party against which enforcement of such change, waiver, discharge or termination is sought.

5.7 Attorneys' Fees. In the event of any dispute between the parties concerning the terms and provisions of this Warrant, the party prevailing in such dispute shall be entitled to collect from the other party all costs incurred in such dispute, including reasonable attorneys' fees.

5.8 Governing Law. This Warrant shall be governed by and construed in accordance with the laws of the State of California, without giving effect to its principles regarding conflicts of law.

5.9 Confidentiality. The Company hereby agrees to keep the terms and conditions of this Warrant confidential. Notwithstanding the foregoing confidentiality obligation, the Company may disclose information relating to this Warrant (a) as required by law, rule, regulation, court order or other legal authority, provided that (i) the Company has given Holder at least ten (10) days' notice of such required disclosure, and (ii) the Company only discloses information that is required, in the opinion of counsel reasonably satisfactory to Holder, to be disclosed or (b) as part of a due diligence investigation and Company shall use commercially reasonable efforts in obtaining an agreement from the party receiving such information to be bound by a confidentiality provision.

5.10 No Stockholder Rights. This warrant in and of itself shall not entitle the Holder to any voting rights or other rights as a stockholder of the Company.

5.11 California Corporate Securities Law. THIS WARRANT AND THE SALE OF THE SECURITIES THAT ARE THE SUBJECT OF THIS WARRANT HAVE NOT BEEN QUALIFIED WITH THE COMMISSIONER OF CORPORATIONS OF THE STATE OF CALIFORNIA AND THE ISSUANCE OF THE WARRANT AND SUCH SECURITIES OR THE PAYMENT OR RECEIPT OF ANY PART OF THE CONSIDERATION THEREFORE PRIOR TO THE QUALIFICATION IS UNLAWFUL, UNLESS THE SALE OF SECURITIES IS EXEMPT FROM THE QUALIFICATION BY SECTIONS 25100, 25102, OR 25105 OF THE CALIFORNIA CORPORATIONS CODE, THE RIGHTS OF ALL PARTIES TO THIS WARRANT ARE EXPRESSLY CONDITIONED UPON THE QUALIFICATION BEING OBTAINED, UNLESS THE SALE IS SO EXEMPT.

IN WITNESS HEREOF, the undersigned parties have caused this Warrant to be executed as of the date first set forth above.

ATYR PHARMA, INC.

By: /s/ Jeffrey D. Watkins
Name: Jeffrey D. Watkins, Ph.D.
Title: President and Chief Executive Officer

AGREED AND ACKNOWLEDGED:

COMERICA BANK

By: /s/ Steven J. Stuckey
Name: Steven J. Stuckey
Title: SVP

APPENDIX 1

NOTICE OF EXERCISE

1. The undersigned hereby elects to purchase _____ shares of the _____ stock of ATYR PHARMA, INC. pursuant to the terms of the attached Warrant, and tenders herewith payment of the purchase price of such shares in full.

2. Please issue a certificate or certificates representing said shares in the name of the undersigned or in such other name as is specified below:

Comerica Ventures Incorporated
Attn: Warrant Administrator
1717 Main Street, 5th Floor, MC 6406
Dallas, Texas 75201
Facsimile No. (214) 462-4459

3. The undersigned further acknowledges that it has reviewed the "Market Stand-Off" agreement set forth in Section 3.5 of the Warrant and agrees to be bound by such provisions.

4. The undersigned hereby represents and warrants that the representations and warranties set forth in Article 4 of the Warrant are true and correct in all respects as of the date hereof with respect to the undersigned's acquisition of the Shares.

COMERICA VENTURES INCORPORATED or Assignee

_____
(Signature)

_____
(Name and Title)

_____
(Date)

EXHIBIT A

Anti-Dilution Provisions
(For Preferred Stock Warrants With Existing Anti-Dilution Protection)

In the event of the issuance (a "Diluting Issuance") by the Company, after the Issue Date of this Warrant, of securities at a price per share less than the Warrant Price, then the number of shares of common stock issuable upon conversion of the Shares shall be adjusted in accordance with those provisions (including any exceptions or exclusions to any adjustment) of the Company's Certificate of Incorporation which apply to Diluting Issuances (the "Provisions").

EXHIBIT B

Registration Rights

The common stock issuable upon conversion of the Shares, shall be deemed "registrable securities" entitled to "Incidental Registration" rights in accordance with the terms of the following agreement (the "Agreement") between the Company and its investor(s):

Third Amended and Restated Registration Rights Agreement made and entered into as of October 6, 2010, as amended from time to time.

By acceptance of the Warrant to which this Exhibit B is attached, Holder shall be deemed to be a party to the Agreement solely for the purpose of the above-mentioned registration rights.

EXHIBIT C

Capitalization Table

THIS WARRANT AND THE SHARES ISSUABLE HEREUNDER HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "**ACT**"), OR THE SECURITIES LAWS OF ANY STATE AND, EXCEPT AS SET FORTH IN SECTIONS 5.3 AND 5.4 BELOW, MAY NOT BE OFFERED, SOLD, PLEDGED OR OTHERWISE TRANSFERRED UNLESS AND UNTIL REGISTERED UNDER SAID ACT AND LAWS OR IN FORM AND SUBSTANCE SATISFACTORY TO THE COMPANY, SUCH OFFER, SALE, PLEDGE OR OTHER TRANSFER IS EXEMPT FROM SUCH REGISTRATION.

WARRANT TO PURCHASE STOCK

Company:	ATYR PHARMA, INC.
Number of Shares:	59,312, plus all Additional Shares which Holder is entitled to purchase pursuant to Section 1.7
Type/Series of Stock:	Series D Preferred
Warrant Price:	$2.529 per share
Issue Date:	July 24, 2013
Expiration Date:	July 24, 2023 See also Section 5.1(b).
Credit Facility:	This Warrant to Purchase Stock (**"Warrant"**) is issued in connection with that certain First Amendment to Loan and Security Agreement of even date herewith between Silicon Valley Bank and the Company (the Loan and Security Agreement by and between Silicon Valley Bank and the Company dated as of April 25, 2012, as amended, the **"Loan Agreement"**).

THIS WARRANT CERTIFIES THAT, for good and valuable consideration, SILICON VALLEY BANK (together with any successor or permitted assignee or transferee of this Warrant or of any shares issued upon exercise hereof, "**Holder**") is entitled to purchase the number of fully paid and non-assessable shares (the "**Shares**") of the above-stated Type/Series of Stock (the "**Class**") of the above-named company (the "**Company**") at the above-stated Warrant Price, all as set forth above and as adjusted pursuant to Section 2 of this Warrant, subject to the provisions and upon the terms and conditions set forth in this Warrant. Reference is made to Section 5.4 of this Warrant whereby Silicon Valley Bank shall transfer this Warrant to its parent company, SVB Financial Group.

SECTION 1. EXERCISE.

1.1 Method of Exercise. Holder may at any time and from time to time exercise this Warrant, in whole or in part, by delivering to the Company the original of this Warrant together with a duly executed Notice of Exercise in substantially the form attached hereto as Appendix 1 and, unless Holder is exercising this Warrant pursuant to a cashless exercise set forth in Section 1.2, a check, wire transfer of same-day funds (to an account designated by the Company), or other form of payment acceptable to the Company for the aggregate Warrant Price for the Shares being purchased.

1.2 Cashless Exercise. On any exercise of this Warrant, in lieu of payment of the aggregate Warrant Price in the manner as specified in Section 1.1 above, but otherwise in accordance with the requirements of Section 1.1, Holder may elect to receive Shares equal to the value of this Warrant, or portion hereof as to which this Warrant is being exercised. Thereupon, the Company shall issue to the Holder such number of fully paid and non-assessable Shares as are computed using the following formula:

$$X = Y(A-B)/A$$

where:

X = the number of Shares to be issued to the Holder;

Y = the number of Shares with respect to which this Warrant is being exercised (inclusive of the Shares surrendered to the Company in payment of the aggregate Warrant Price);

A = the Fair Market Value (as determined pursuant to Section 1.3 below) of one Share; and

B = the Warrant Price.

1.3 Fair Market Value. If the Company's common stock is then traded or quoted on a nationally recognized securities exchange, inter-dealer quotation system or over-the-counter market (a "**Trading Market**") and the Class is common stock, the fair market value of a Share shall be the closing price or last sale price of a share of common stock reported for the Business Day immediately before the date on which Holder delivers this Warrant together with its Notice of Exercise to the Company. If the Company's common stock is then traded in a Trading Market and the Class is a series of the Company's convertible preferred stock, the fair market value of a Share shall be the closing price or last sale price of a share of the Company's common stock reported for the Business Day immediately before the date on which Holder delivers this Warrant together with its Notice of Exercise to the Company multiplied by the number of shares of the Company's common stock into which a Share is then convertible. If the Company's common stock is not traded in a Trading Market, the Board of Directors of the Company shall determine the fair market value of a Share in its reasonable good faith judgment.

1.4 Delivery of Certificate and New Warrant. Within a reasonable time after Holder exercises this Warrant in the manner set forth in Section 1.1 or 1.2 above, the Company shall deliver to Holder a certificate representing the Shares issued to Holder upon such exercise and, if this Warrant has not been fully exercised and has not expired, a new warrant of like tenor representing the Shares not so acquired.

1.5 Replacement of Warrant. On receipt of evidence reasonably satisfactory to the Company of the loss, theft, destruction or mutilation of this Warrant and, in the case of loss, theft or destruction, on delivery of an indemnity agreement reasonably satisfactory in form, substance and amount to the Company or, in the case of mutilation, on surrender of this Warrant to the Company for cancellation, the Company shall, within a reasonable time, execute and deliver to Holder, in lieu of this Warrant, a new warrant of like tenor and amount.

1.6 Treatment of Warrant Upon Acquisition of Company.

(a) Acquisition. For the purpose of this Warrant, "**Acquisition**" means any transaction or series of related transactions involving: (i) the sale, lease, exclusive license, or other disposition of all or substantially all of the assets of the Company (ii) any merger or consolidation of the Company into or with another person or entity (other than a merger or consolidation effected exclusively to change the Company's domicile), or any other corporate reorganization, in which the stockholders of the Company in their capacity as such immediately prior to such merger, consolidation or reorganization, own less than a majority of the Company's (or the surviving or successor entity's) outstanding voting power immediately after such merger, consolidation or reorganization; or (iii) any sale or other transfer by the stockholders of the Company of shares representing at least a majority of the Company's then-total outstanding combined voting power.

(b) Treatment of Warrant at Acquisition. In the event of an Acquisition in which the consideration to be received by the Company's stockholders consists solely of cash, solely of Marketable Securities or a combination of cash and Marketable Securities (a "**Cash/Public Acquisition**"), either (i) Holder shall exercise this Warrant pursuant to Section 1.1 and/or 1.2 and such exercise will be deemed effective immediately prior to and contingent upon the consummation of such Acquisition or (ii) if Holder elects not to exercise the Warrant, this Warrant will expire immediately prior to the consummation of such Acquisition.

(c) The Company shall provide Holder with written notice of its request relating to the Cash/Public Acquisition (together with such reasonable information as Holder may reasonably require regarding the treatment of this Warrant in connection with such contemplated Cash/Public Acquisition giving rise to such notice), which is to be delivered to Holder not less than seven (7) Business Days prior to the closing of the proposed Cash/Public Acquisition. In the event the Company does not provide such notice, then if, immediately prior to the Cash/Public Acquisition, the fair market value of one Share (or other security issuable upon the exercise hereof) as determined in accordance with Section 1.3 above would be greater than the Warrant Price in effect on such date, then this Warrant shall automatically be deemed on and as of such date to be exercised pursuant to Section 1.2 above as to all Shares (or such other securities) for which it shall not previously have been exercised, and the Company shall promptly notify the Holder of the number of Shares (or such other securities) issued upon such exercise to the Holder and Holder shall be deemed to have restated each of the representations and warranties in Section 4 of the Warrant as of the date thereof.

(d) Upon the closing of any Acquisition other than a Cash/Public Acquisition defined above, the acquiring, surviving or successor entity shall assume the obligations of this Warrant, and this Warrant shall thereafter be exercisable for the same securities and/or other property as would have been paid for the Shares issuable upon exercise of the unexercised portion of this Warrant as if such Shares were outstanding on and as of the closing of such Acquisition, subject to further adjustment from time to time in accordance with the provisions of this Warrant.

(e) As used in this Warrant, "**Marketable Securities**" means securities meeting all of the following requirements: (i) the issuer thereof is then subject to the reporting requirements of Section 13 or Section 15(d) of the Securities Exchange Act of 1934, as amended (the "**Exchange Act**"), and is then current in its filing of all required reports and other information under the Act and the Exchange Act; (ii) the class and series of shares or other security of the issuer that would be received by Holder in connection with the Acquisition were Holder to exercise this Warrant on or prior to the closing thereof is then traded in Trading Market, and (iii) following the closing of such Acquisition, Holder would not be restricted from publicly re-selling all of the issuer's shares and/or other securities that would be received by Holder in such Acquisition were Holder to exercise or convert this Warrant in full on or prior to the closing of such Acquisition, except to the extent that any such restriction (x) arises solely under federal or state securities laws, rules or regulations, and (y) does not extend beyond six (6) months from the closing of such Acquisition.

1.7 Additional Shares. Upon the funding of the Supplemental Growth Capital Advance (as defined in the Loan Agreement) under the Supplemental Second Tranche (as defined in the Loan Agreement), the Company shall be deemed to have automatically granted to Holder, in addition to the number of Shares which this Warrant can otherwise be exercised for by Holder, the right to purchase that number of additional Shares, rounded upward to the nearest whole number, equal to One Hundred Fifty Thousand Dollars ($150,000) divided by the Warrant Price (such additional shares being called the "**Additional Shares**").

SECTION 2. ADJUSTMENTS TO THE SHARES AND WARRANT PRICE.

2.1 Stock Dividends, Splits, Etc. If the Company declares or pays a dividend or distribution on the outstanding shares of the Class payable in common stock or other securities or property (other than cash), then upon exercise of this Warrant, for each Share acquired, Holder shall receive, without additional cost to Holder, the total number and kind of securities and property which Holder would have received had Holder owned the Shares of record as of the date the dividend or distribution occurred. If the Company subdivides the outstanding shares of the Class by reclassification or otherwise into a greater number of shares, the number of Shares purchasable hereunder shall be proportionately increased and the Warrant Price shall be proportionately decreased. If the outstanding shares of the Class are combined or consolidated, by reclassification or otherwise, into a lesser number of shares, the Warrant Price shall be proportionately increased and the number of Shares shall be proportionately decreased.

2.2 Reclassification, Exchange, Combinations or Substitution. Upon any event whereby all of the outstanding shares of the Class are reclassified, exchanged, combined, substituted, or replaced for, into, with or by Company securities of a different class and/or series, then from and after the consummation of such event, this Warrant will be exercisable for the number, class and series of Company securities that Holder would have received had the Shares been outstanding on and as of the consummation of such event, and subject to further adjustment thereafter from time to time in accordance with the provisions of this Warrant. The provisions of this Section 2.2 shall similarly apply to successive reclassifications, exchanges, combinations substitutions, replacements or other similar events.

2.3 Conversion of Preferred Stock. If the Class is a class and series of the Company's convertible preferred stock, in the event that all outstanding shares of the Class are converted, automatically or by action of the holders thereof, into common stock pursuant to the provisions of the Company's Amended and Restated Certificate of Incorporation (as amended from time to time, the "**Certificate of Incorporation**"), including, without limitation, in connection with the Company's initial, underwritten public offering and sale of its common stock pursuant to an effective registration statement under the Act (the "**IPO**"), then from and after the date on which all outstanding shares of the Class have been so converted, this Warrant shall be exercisable for such number of shares of common stock into which the Shares would have been converted had the Shares been outstanding on the date of such conversion, and the Warrant Price shall equal the Warrant Price in effect as of immediately prior to such conversion divided by the number of shares of common stock into which one Share would have been converted, all subject to further adjustment thereafter from time to time in accordance with the provisions of this Warrant.

2.4 Adjustments for Diluting Issuances. Without duplication of any adjustment otherwise provided for in this Section 2, the number of shares of common stock issuable upon conversion of the Shares shall be subject to anti-dilution adjustment from time to time in the manner set forth in the Certificate of Incorporation as if the Shares were issued and outstanding on and as of the date of any such required adjustment.

2.5 No Fractional Share. No fractional Share shall be issuable upon exercise of this Warrant and the number of Shares to be issued shall be rounded down to the nearest whole Share. If a fractional Share interest arises upon any exercise of the Warrant, the Company shall eliminate such fractional Share interest by paying Holder in cash the amount computed by multiplying the fractional

interest by (i) the fair market value (as determined in accordance with Section 1.3 above) of a full Share, less (ii) the then-effective Warrant Price.

2.6 Notice/Certificate as to Adjustments. Upon each adjustment of the Warrant Price, Class and/or number of Shares, the Company, at the Company's expense, shall notify Holder in writing within a reasonable time setting forth the adjustments to the Warrant Price, Class and/or number of Shares and facts upon which such adjustment is based. The Company shall, upon written request from Holder, furnish Holder with a certificate of its Chief Financial Officer, including computations of such adjustment and the Warrant Price, Class and number of Shares in effect upon the date of such adjustment.

SECTION 3. REPRESENTATIONS AND COVENANTS OF THE COMPANY.

3.1 Representations and Warranties. The Company represents and warrants to, and agrees with, the Holder as follows:

(a) The initial Warrant Price referenced on the first page of this Warrant is not greater than the price per share at which shares of the Class were last sold and issued prior to the Issue Date hereof in an arms-length transaction in which at least $500,000 of such shares were sold.

(b) All Shares which may be issued upon the exercise of this Warrant, and all securities, if any, issuable upon conversion of the Shares, shall, upon issuance, be duly authorized, validly issued, fully paid and non-assessable, and free of any liens and encumbrances except for restrictions on transfer provided for herein or under applicable federal and state securities laws. The Company covenants that it shall at all times cause to be reserved and kept available out of its authorized and unissued capital stock such number of shares of the Class, common stock and other securities as will be sufficient to permit the exercise in full of this Warrant and the conversion of the Shares into common stock or such other securities.

(c) The Company's capitalization table attached hereto as Schedule 1 is true and complete, in all material respects, as of the Issue Date.

3.2 Notice of Certain Events. If the Company proposes at any time to:

(a) declare any dividend or distribution upon the outstanding shares of the Class or common stock, whether in cash, property, stock, or other securities and whether or not a regular cash dividend;

(b) offer for subscription or sale pro rata to the holders of the outstanding shares of the Class any additional shares of any class or series of the Company's stock (other than pursuant to contractual pre-emptive rights);

(c) effect any reclassification, exchange, combination, substitution, reorganization or recapitalization of the outstanding shares of the Class;

(d) effect an Acquisition or to liquidate, dissolve or wind up; or

(e) effect an IPO;

then, in connection with each such event, the Company shall give Holder:

(1) at least seven (7) Business Days prior written notice of the date on which a record will be taken for such dividend, distribution, or subscription rights (and specifying the date on which the holders of outstanding shares of the Class will be entitled thereto) or for determining rights to vote, if any, in respect of the matters referred to in (a) and (b) above;

(2) in the case of the matters referred to in (c) and (d) above at least seven (7) Business Days prior written notice of the date when the same will take place (and specifying the date on which the holders of outstanding shares of the Class will be entitled to exchange their shares for the securities or other property deliverable upon the occurrence of such event); and

(3) with respect to the IPO, at least seven (7) Business Days prior written notice of the date on which the Company proposes to file its registration statement in connection therewith.

Reference is made to Section 1.6(c) whereby this Warrant will be deemed to be exercised pursuant to Section 1.2 hereof if the Company does not give written notice to Holder of a Cash/Public Acquisition as required by the terms hereof. Company will also provide information requested by Holder that is reasonably necessary to enable Holder to comply with Holder's accounting or reporting requirements.

SECTION 4. REPRESENTATIONS AND WARRANTIES OF THE HOLDER.

The Holder represents and warrants to the Company as follows:

4.1 Purchase for Own Account. This Warrant and the securities to be acquired upon exercise of this Warrant by Holder are being acquired for investment for Holder's account, not as a nominee or agent, and not with a view to the public resale or distribution within the meaning of the Act. Holder also represents that it has not been formed for the specific purpose of acquiring this Warrant or the Shares.

4.2 Disclosure of Information. Holder is aware of the Company's business affairs and financial condition and has received or has had full access to all the information it considers necessary or appropriate to make an informed investment decision with respect to the acquisition of this Warrant and its underlying securities. Holder further has had an opportunity to ask questions and receive answers from the Company regarding the terms and conditions of the offering of this Warrant and its underlying securities and to obtain additional information (to the extent the Company possessed such information or could acquire it without unreasonable effort or expense) necessary to verify any information furnished to Holder or to which Holder has access.

4.3 Investment Experience. Holder understands that the purchase of this Warrant and its underlying securities involves substantial risk. Holder has experience as an investor in securities of companies in the development stage and acknowledges that Holder can bear the economic risk of such Holder's investment in this Warrant and its underlying securities and has such knowledge and experience in financial or business matters that Holder is capable of evaluating the merits and risks of its investment in this Warrant and its underlying securities and/or has a preexisting personal or business relationship with the Company and certain of its officers, directors or controlling persons of a nature and duration that enables Holder to be aware of the character, business acumen and financial circumstances of such persons.

4.4 Accredited Investor Status. Holder is an "accredited investor" within the meaning of Regulation D promulgated under the Act.

4.5 The Act. Holder understands that this Warrant and the Shares issuable upon exercise hereof (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) have not been registered under the Act in reliance upon a specific exemption therefrom, which exemption depends upon, among other things, the bona fide nature of the Holder's investment intent as expressed herein. Holder understands that this Warrant and the Shares issued upon any exercise hereof (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) must be held indefinitely unless subsequently registered under the Act and qualified under applicable state securities laws, or unless exemption from such registration and qualification are otherwise available. Holder is aware of the provisions of Rule 144 promulgated under the Act.

4.6 Market Stand-off Agreement. The Holder agrees that the Shares (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) shall be subject to the holdback agreement in Section 4.2 of the Fourth Amended and Restated Registration Rights Agreement dated April 8, 2013, as amended from time to time, by and among the Company and the investors party therein.

4.7 No Voting Rights. Holder, as a Holder of this Warrant, will not have any voting rights until the exercise of this Warrant.

SECTION 5. MISCELLANEOUS.

5.1 Term and Automatic Conversion Upon Expiration.

(a) Term. Subject to the provisions of Section 1.6 above, this Warrant is exercisable in whole or in part at any time and from time to time on or before 6:00 PM, Pacific time, on the Expiration Date and shall be void thereafter.

(b) Automatic Cashless Exercise upon Expiration. In the event that, upon the Expiration Date, the fair market value of one Share (or other security issuable upon the exercise hereof) as determined in accordance with Section 1.3 above is greater than the Warrant Price in effect on such date, then this Warrant shall automatically be deemed on and as of such date to be exercised pursuant to Section 1.2 above as to all Shares (or such other securities) for which it shall not previously have been exercised, and the Company shall, within a reasonable time, deliver a certificate representing the Shares (or such other securities) issued upon such exercise to Holder.

5.2 Legends. The Shares (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) shall be imprinted with a legend in substantially the following form:

> THE SHARES EVIDENCED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "**ACT**"), OR THE SECURITIES LAWS OF ANY STATE AND, EXCEPT AS SET FORTH IN THAT CERTAIN WARRANT TO PURCHASE STOCK ISSUED BY THE ISSUER TO SILICON VALLEY BANK DATED JULY 24, 2013, MAY NOT BE OFFERED, SOLD, PLEDGED OR OTHERWISE TRANSFERRED UNLESS AND UNTIL REGISTERED UNDER SAID ACT AND LAWS OR IN FORM AND SUBSTANCE SATISFACTORY TO THE

ISSUER, SUCH OFFER, SALE, PLEDGE OR OTHER TRANSFER IS EXEMPT FROM SUCH REGISTRATION.

5.3 Compliance with Securities Laws on Transfer. This Warrant and the Shares issuable upon exercise of this Warrant (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) may not be transferred or assigned in whole or in part except in compliance with applicable federal and state securities laws by the transferor and the transferee (including, without limitation, the delivery of investment representation letters and legal opinions reasonably satisfactory to the Company, as reasonably requested by the Company). The Company shall not require Holder to provide an opinion of counsel if the transfer is to SVB Financial Group (Silicon Valley Bank's parent company) or any other affiliate of Holder, provided that any such transferee is an "accredited investor" as defined in Regulation D promulgated under the Act. Additionally, the Company shall also not require an opinion of counsel if there is no material question as to the availability of Rule 144 promulgated under the Act.

5.4 Transfer Procedure. After receipt by Silicon Valley Bank of the executed Warrant, Silicon Valley Bank will transfer all of this Warrant to its parent company, SVB Financial Group. By its acceptance of this Warrant, SVB Financial Group hereby makes to the Company each of the representations and warranties set forth in Section 4 hereof and agrees to be bound by all of the terms and conditions of this Warrant as if the original Holder hereof. Subject to the provisions of Section 5.3 and upon providing the Company with written notice, SVB Financial Group and any subsequent Holder may transfer all or part of this Warrant or the Shares issuable upon exercise of this Warrant (or the securities issuable directly or indirectly, upon conversion of the Shares, if any) to any transferee, provided, however, in connection with any such transfer, SVB Financial Group or any subsequent Holder will give the Company notice of the portion of the Warrant being transferred with the name, address and taxpayer identification number of the transferee and Holder will surrender this Warrant to the Company for reissuance to the transferee(s) (and Holder if applicable); and provided further, that any subsequent transferee other than SVB Financial Group shall agree in writing with the Company to be bound by all of the terms and conditions of this Warrant. Notwithstanding any contrary provision herein, at all times prior to the IPO, Holder may not, without the Company's prior written consent, transfer this Warrant or any portion hereof, or any Shares issued upon any exercise hereof, or any shares or other securities issued upon any conversion of any Shares issued upon any exercise hereof, to any person or entity who directly competes with the Company, except in connection with an Acquisition of the Company by such a direct competitor.

5.5 Notices. All notices and other communications hereunder from the Company to the Holder, or vice versa, shall be deemed delivered and effective (i) when given personally, (ii) on the third (3rd) Business Day after being mailed by first-class registered or certified mail, postage prepaid, (iii) upon actual receipt if given by facsimile or electronic mail and such receipt is confirmed in writing by the recipient, or (iv) on the first Business Day following delivery to a reliable overnight courier service, courier fee prepaid, in any case at such address as may have been furnished to the Company or Holder, as the case may be, in writing by the Company or such Holder from time to time in accordance with the provisions of this Section 5.5. All notices to Holder shall be addressed as follows until the Company receives notice of a change of address in connection with a transfer or otherwise:

SVB Financial Group
Attn: Treasury Department
3003 Tasman Drive, HC 215
Santa Clara, CA 95054

Telephone: (408) 654-7400
Facsimile: (408) 988-8317
Email address: derivatives@svb.com

Notice to the Company shall be addressed as follows until Holder receives notice of a change in address:

aTyr Pharma, Inc.
Attn: Chief Financial Officer
3545 John Hopkins Court, #250
San Diego, CA 92121
Telephone: (858) 731-8392
Facsimile: (858) 731-8394
Email: sblackburn@atyrpharma.com

5.6 Waiver. This Warrant and any term hereof may be changed, waived, discharged or terminated (either generally or in a particular instance and either retroactively or prospectively) only by an instrument in writing signed by the party against which enforcement of such change, waiver, discharge or termination is sought.

5.7 Attorney's Fees. In the event of any dispute between the parties concerning the terms and provisions of this Warrant, the party prevailing in such dispute shall be entitled to collect from the other party all costs incurred in such dispute, including reasonable attorneys' fees.

5.8 Counterparts; Facsimile/Electronic Signatures. This Warrant may be executed in counterparts, all of which together shall constitute one and the same agreement. Any signature page delivered electronically or by facsimile shall be binding to the same extent as an original signature page with regards to any agreement subject to the terms hereof or any amendment thereto.

5.9 Governing Law. This Warrant shall be governed by and construed in accordance with the laws of the State of California, without giving effect to its principles regarding conflicts of law.

5.10 Headings. The headings in this Warrant are for purposes of reference only and shall not limit or otherwise affect the meaning of any provision of this Warrant.

5.11 Business Days. "**Business Day**" is any day that is not a Saturday, Sunday or a day on which Silicon Valley Bank is closed.

[Remainder of page left blank intentionally]
[Signature page follows]

IN WITNESS WHEREOF, the parties have caused this Warrant to Purchase Stock to be executed by their duly authorized representatives effective as of the Issue Date written above.

"COMPANY"

ATYR PHARMA, INC.

By: /s/ JOHN MENDLEIN

Name: JOHN MENDLEIN
(Print)

Title: CEO

"HOLDER"

SILICON VALLEY BANK

By:. /s/ KEVIN WALLACE

Name:. KEVIN WALLACE
(Print)

Title: VICE PRESIDENT

APPENDIX 1

NOTICE OF EXERCISE

1. The undersigned Holder hereby exercises its right purchase _____ shares of the Common/Series _____ Preferred [circle one] Stock of ATYR PHARMA, INC. (the "**Company**") in accordance with the attached Warrant To Purchase Stock, and tenders payment of the aggregate Warrant Price for such shares as follows:

☐ check in the amount of $_____ payable to order of the Company enclosed herewith

☐ Wire transfer of immediately available funds to the Company's account

☐ Cashless Exercise pursuant to Section 1.2 of the Warrant

☐ Other [Describe] _____

2. Please issue a certificate or certificates representing the Shares in the name specified below:

_____
Holder's Name

_____

_____
(Address)

3. By its execution below and for the benefit of the Company, Holder hereby restates each of the representations and warranties in Section 4 of the Warrant to Purchase Stock as of the date hereof.

HOLDER:

_____

By: _____

Name: _____

Title: _____

(Date): _____

SCHEDULE 1

Company Capitalization Table

See attached

Exhibit 4.5

THE SECURITIES REPRESENTED HEREBY HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR ANY STATE SECURITIES LAWS. THESE SECURITIES ARE SUBJECT TO RESTRICTIONS ON TRANSFERABILITY AND RESALE AND MAY NOT BE TRANSFERRED OR RESOLD EXCEPT AS PERMITTED UNDER THE ACT AND THE APPLICABLE STATE SECURITIES LAWS, PURSUANT TO REGISTRATION OR EXEMPTION THEREFROM. HOLDERS SHOULD BE AWARE THAT THEY MAY BE REQUIRED TO BEAR THE FINANCIAL RISKS OF THIS INVESTMENT FOR AN INDEFINITE PERIOD OF TIME.

SUBORDINATED CONVERTIBLE UNSECURED PROMISSORY NOTE

December 22, 2011
San Diego, California

For value received, aTyr Pharma, Inc., a Delaware corporation (the "Company"), promises to pay to BMV Direct RE LP, a Delaware limited partnership ("Holder"), the principal amount of Two Million Dollars ($2,000,000.00) (the "Principal Amount"). Reference is made to that certain Lease, dated as of December 22, 2011, as amended from time to time (the "Lease"), by and between the Company and BMR-John Hopkins Court LLC, an affiliate of Holder ("Landlord"). Capitalized terms used herein but not defined herein shall have the meanings ascribed to them in the Lease. Interest on the Principal Amount shall accrue, compounded annually, at a rate equal to eight percent (8%) per annum (the "Interest Rate"), commencing on the date hereof. The Interest Rate shall be computed on the basis of the actual number of days elapsed and a year of 365 days. This Subordinated Convertible Unsecured Promissory Note (this "Note") is subject to the following terms and conditions.

1 **Maturity**. Unless earlier converted pursuant to Section 3 hereof, the principal and any accrued but unpaid interest under this Note shall be due and payable on the earliest of (i) the three-year anniversary of the Phase I Term Commencement Date under the Lease, (ii) a Liquidation Event (as defined in the Company's Amended and Restated Certificate of Incorporation as amended from time to time (the "COI")) or (iii) the closing of an initial firm commitment underwritten public offering of common stock of the Company pursuant to a registration statement under the Act (such date, the "Maturity Date").

2 **Payment**.

2.1 Unless this Note is converted pursuant to Section 3 hereof, or interest hereunder is forgiven pursuant to Section 9 hereof, any Principal Amount and any accrued but unpaid interest under this Note then outstanding shall be due and payable on the Maturity Date. Payment shall be credited first to costs of collection or enforcement, if any, then to accrued interest due and payable through such payment date, and the remainder applied to the Principal Amount.

2.2 With the prior written consent of the Holder, the Company may prepay this Note in full, but not in part. The Company shall deliver to the Holder written notice of its

intended prepayment at least twenty (20) days in advance of the intended prepayment date.

3 **Conversion of the Note.**

3.1 Elective Conversion into New Preferred Stock. If the Company completes a Threshold New Preferred Financing, then at any time prior to the Maturity Date, at Holder's election and exercisable by written notice to the Company, Holder may elect to convert, in whole but not in part, the Principal Amount into that number of fully paid and nonassessable shares of the Company's New Preferred Stock equal to the quotient obtained by dividing the Principal Amount by the New Series Price (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the New Preferred Stock after the date of issuance of the New Preferred Stock, but excluding any Stock Distribution (as defined below) received by Holder). Upon conversion into New Preferred Stock, Holder agrees to execute and shall become a party to and have substantially the same rights as the other holders of New Preferred Stock, including, but not limited to, those rights as set forth in the COI, any stock purchase agreement, registration rights agreement, investor rights agreement, voting agreement or similar agreement governing the New Preferred Stock and/or the holders thereof in effect as of the date of conversion. For the avoidance of doubt, if the Company completes a Threshold New Preferred Financing, Holder shall have the rights of conversion set forth in this Section 3.1, and shall not have rights of conversion as set forth in Section 3.2 below.

3.2 Elective Conversion into Series C Preferred Stock. If the Company does not complete a Threshold New Preferred Financing, or effects a Liquidation Event prior to a Threshold New Preferred Financing, then at any time and from time to time following the earlier of (i) Holder's receipt of notice of the Liquidation Event under Section 14 below and (ii) June 30, 2013, at Holder's election and exercisable by written notice to the Company, Holder may elect to convert, in whole but not in part, the Principal Amount into 1,934,236 fully paid and nonassessable shares of Series C Preferred Stock of the Company (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series C Preferred Stock after the Effective Time (as defined in the COI), but excluding any Stock Distribution received by Holder). Upon conversion into Series C Preferred Stock, Holder agrees to execute and shall become a party to and have substantially the same rights as the other holders of Series C Preferred Stock, including, but not limited to, those rights as set forth in the COI, any stock purchase agreement, registration rights agreement, investor rights agreement, voting agreement or similar agreement governing the Series C Preferred Stock and/or the holders thereof in effect as of the date of conversion. The Company shall take all actions reasonably necessary to give effect to the conversion rights set forth in this Section 3.

For purposes of this Note:

"Threshold New Preferred Financing" means the sale (or series of related sales) by the Company of New Preferred Stock on or before June 30, 2013 to one or more investors in an aggregate amount of not less than Fifteen Million Dollars ($15,000,000.00) (excluding the exchange, conversion or cancellation of this Note or any notes or warrants issued prior to the date hereof), which includes at least one investor (who is not a current investor in the Company as of the date hereof) that commits Two Million Dollars ($2,000,000.00) or more in such financing.

"New Series Price" means the lowest price paid per share for the New Preferred Stock by investors in the Threshold New Preferred Financing.

"New Preferred Stock" means the Company's series of preferred stock issued in connection with the Threshold New Preferred Financing.

3.3 Mechanics and Effect of Conversion. Upon conversion of this Note, any interest payable in respect of the Principal Amount shall be immediately forgiven and shall not converted into New Preferred Stock, Series C Preferred Stock or any other shares of the capital stock of the Company. No fractional shares of the Company's capital stock will be issued upon conversion of the Note. In lieu of any fractional share to which Holder would otherwise be entitled, the Company will pay to Holder in cash the amount of the unconverted principal balance of the Note that would otherwise be converted into such fractional share. Upon conversion of the Note pursuant to this Section 3, Holder shall surrender the Note, duly endorsed, at the principal offices of the Company or any transfer agent of the Company (or a notice to the effect that the original Note has been lost, stolen or destroyed and an agreement reasonably acceptable to the Company whereby the Holder agrees to indemnify the Company from any loss incurred by it in connection with this Note); provided, that upon conversion pursuant hereto, this Note shall be deemed cancelled and of no further force and effect, whether or not it is delivered for cancellation as set forth in this sentence. At its expense, the Company will, as soon as practicable and in any event within ten (10) days thereafter, issue and deliver to Holder, at Holder's principal office, a certificate or certificates for the number of shares to which Holder is entitled upon such conversion, and a check payable to Holder for any cash amounts payable as described herein. Upon conversion of this Note, the Company will be forever released from all of its obligations and liabilities under this Note with regard to the Principal Amount being converted and any interest which has accrued thereon, including without limitation the obligation to pay such portion of the Principal Amount and any accrued interest.

3.4 No Rights as Stockholder. This Note does not by itself entitle the Holder to any voting rights or other rights as a stockholder of the Company, other than as set forth in Section 9 below. In the absence of conversion of this Note, no provision of this Note, and no enumeration herein of the rights or privileges of the Holder shall cause the Holder to be a stockholder of the Company for any purpose, other than as set forth in Section 9 below.

4 **Representations and Warranties of the Company.** The Company represents and warrants to Holder as of the date hereof, and with respect to Sections 4.6 and 4.7 for so

long as Holder, or an affiliate of Holder, holds the Note or any equity securities issued to Holder pursuant to the terms hereof, as follows:

4.1 Organization, Good Standing and Qualification. The Company is a corporation duly organized, validly existing and in good standing under the laws of the State of Delaware and has all requisite corporate power and authority to own and operate its properties and assets and to carry on its business as presently conducted. The Company is duly qualified to transact business and is in good standing in each jurisdiction in which the failure so to qualify would have a material adverse effect on its business or properties. ·

4.2 Authorization. All corporate action on the part of the Company, its officers, directors and stockholders necessary for the authorization, sale, issuance and delivery of the Note and the performance of all obligations of the Company under the Note has been taken prior to the date hereof. The Note constitutes a valid and legally binding obligation of the Company, enforceable against the Company in accordance with its terms, except (i) as limited by applicable bankruptcy, insolvency, reorganization, moratorium, fraudulent conveyance and other laws of general application affecting enforcement of creditors' rights generally, and (ii) as limited by laws relating to the availability of specific performance, injunctive relief or other equitable remedies. Any equity securities of the Company or of any Related Entity (as defined below) issuable to Holder hereunder have been or will be duly reserved for issuance, and upon issuance in accordance with the terms of the Note, will be validly issued, fully paid and non-assessable and free of restrictions on transfer other than restrictions contained in this Note and applicable federal and state securities laws. The issuance of the Note and the issuance of any such equity securities issuable hereunder are not and will not be subject to preemptive rights of any present or future debt or equity holders of the Company or any Related Entity.

4.3 Governmental Consent. No consent, approval, order or authorization of, or registration, qualification, designation, declaration or filing with, any federal, state or local governmental authority on the part of the Company is required in connection with the valid execution, delivery and performance by the Company of the Note and the transactions contemplated thereby, except for filings pursuant to Section 25102(f) of the California Corporate Securities Law of 1968, as amended, and the rules thereunder, other applicable state securities laws and Regulation D of the Act, all of which filings will be timely effected after the date hereof.

4.4 Compliance with Other Instruments. The Company is not in violation or default of any provision of its COI or bylaws currently in effect. The Company is not in violation of, or default under any provision of any instrument, mortgage, deed of trust, loan, contract, commitment or obligation to which it is a party or by which it or any of its properties are bound, which violations or defaults, individually or in the aggregate, would materially adversely affect the business, properties or condition (financial or otherwise) of the Company. The Company is not in violation of any provision of any federal, state or local statute, rule or governmental regulation which would materially adversely affect the business, properties or condition (financial or otherwise) of' the Company or any judgment, decree or order to which it is a party. The Company has all franchises,

permits, licenses and any similar authority necessary for the conduct of its business, the lack of which could materially adversely affect the business, properties or condition (financial or otherwise) of the Company. The Company is not in default in any material respect under any of such franchises, permits, licenses or other similar authority.

4.5 Percentage of Outstanding Securities. This Note, together with the aggregate securities actually issued and/or potentially issuable under this Note (assuming for this purpose conversion of the Note into shares of Series C Preferred Stock pursuant to Section 3.2 above), represent less than ten percent (10.0%) of the voting interest and less than ten percent (10.0%) of the value of the outstanding debt and equity securities of the Company or any Related Entity, as applicable.

4.6 Health Care / Lodging Facilities. Neither the Company nor any Related Entity currently operates or manages, or in the future will operate or manage, any health care facilities (including a congregate care facility or assisted living facility) or lodging facilities or provide any person, under a franchise, license or otherwise, rights to any brand name under which any lodging facility or health care facility is operated.

4.7 Financial Information. The Company shall furnish to Holder, as soon as practicable and in any event within ten (10) days after the date of such request, a statement showing the capitalization of the Company and any Related Entity, including but not limited to the total number of outstanding securities of each class and series of capital stock of the Company and such Related Entity, in sufficient detail as to permit Holder to calculate its percentage ownership in securities of the Company and such Related Entity and voting power to elect directors to their respective Board of Directors.

5 **Representations and Warranties of Holder.** Holder hereby represents and warrants to the Company as of the date hereof that:

5.1 Experience. Holder is experienced in investing in the securities of development stage companies such as the Company and acknowledges that investment in the Securities (as defined below) involves a number of significant risks, it is able to fend for itself, it can bear the economic risk of its investment, including the full loss of its investment, and it has such knowledge and experience in financial or business matters that it is capable of evaluating the merits and risks of the investment in the Securities. Holder also represents it was not organized solely for the purpose of acquiring the Securities. As used herein, "Securities" shall mean this Note and the equity securities issuable hereunder (and the securities issuable upon conversion of such equity securities).

5.2 Accredited Investor. Holder represents that it is an "accredited investor" within the meaning of Rule 501(a) of the Act.

5.3 Purchase Entirely for Own Account. This Note is issued to Holder in reliance upon Holder's representation to the Company, which by Holder's purchase of this Note, Holder hereby confirms, that the Securities to be received by Holder will be acquired for investment for Holder's own account, not as a nominee or agent, and not with a view to the resale or distribution of any part thereof, and that Holder has no present intention of

selling, granting any participation in, or otherwise distributing the same. Holder further represents that it does not have any contract, undertaking, agreement or arrangement with any person to sell, transfer or grant participations to such person or to any third person, with respect to the Securities.

5.4 Restricted Securities. Holder understands that the Securities are characterized as "restricted securities" under the federal securities laws inasmuch as they are being acquired from the Company in a transaction not involving a public offering and that under such laws and applicable regulations such Securities may be resold without registration under the Act only in certain limited circumstances. In this connection, Holder represents that it is familiar with Rule 144, as presently in effect, and understands the resale limitations imposed thereby and by the Act. Holder must bear the economic risk of this investment indefinitely unless the Securities are registered pursuant to the Act, or an exemption from registration is available. . Holder understands that the Company has no present intention of registering the Securities. Holder also understands that there is no assurance that any exemption from registration under the Act will be available and that, even if available, such exemption may not allow Holder to transfer all or any portion of the Securities under the circumstances, in the amounts or at the times Holder might propose.

5.5 No Public Market. Holder understands that no public market now exists for any of the securities issued by the Company and that the Company has made no assurances that a public market will ever exist for the Securities.

6 **Restrictions on Transfer.** Holder hereby acknowledges that the Securities shall not be transferred except upon the conditions specified in this Section 6, which conditions are intended to insure compliance with the provisions of the Act. Holder may not assign, pledge, or otherwise transfer this Note without the prior written consent of the Company, except for transfers to any of the Holder's affiliates, partners, members, affiliated funds or entities under common control, or to the estate of any of its partners or members. Holder will cause any proposed transferee of Securities held by Holder to agree to take and hold such Securities subject to the provisions and upon the conditions specified in the Note.

6.1 Legends. Each certificate representing the Securities or any securities of the Company issued to Holder upon any stock split, stock dividend, recapitalization, merger, consolidation or similar event, shall (unless otherwise permitted or unless the securities evidenced by such certificate shall have been registered under the Act) be stamped or otherwise imprinted with a legend substantially in the following form (in addition to any legend required under applicable state securities laws):

"THE SECURITIES REPRESENTED HEREBY HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR ANY STATE SECURITIES LAWS. THESE SECURITIES ARE SUBJECT TO RESTRICTIONS ON TRANSFERABILITY AND RESALE AND MAY NOT BE TRANSFERRED OR RESOLD EXCEPT AS PERMITTED UNDER

THE ACT AND THE APPLICABLE STATE SECURITIES LAWS, PURSUANT TO REGISTRATION OR EXEMPTION THEREFROM. HOLDERS SHOULD BE AWARE THAT THEY MAY BE REQUIRED TO BEAR THE FINANCIAL RISKS OF THIS INVESTMENT FOR AN INDEFINITE PERIOD OF TIME."

6.2 Notice of Proposed Transfers. The holder of each certificate representing the Securities required to bear the legend set forth in Section 6.1 by acceptance thereof agrees to comply in all respects with the provisions of this Section 6. Prior to any proposed transfer of any Securities, the holder thereof shall give written notice to the Company of such holder's intention to effect such transfer. Each such notice shall describe the manner and circumstances of the proposed transfer in sufficient detail, and shall be accompanied (except in transactions involving the distribution without consideration of such Securities by a holder to any of its affiliates, partners, members, affiliated funds or entities under common control, or to the estate of any of its partners or members) by either:

6.2.1 a written opinion of legal counsel who shall be reasonably satisfactory to the Company, addressed to the Company and reasonably satisfactory in form and substance to the Company's counsel, to the effect that the proposed transfer of the Securities may be effected without registration under the Act; or

6.2.2 a "no-action" letter from the Securities and Exchange Commission to the effect that the distribution of such Securities without registration will not result in a recommendation by the staff of the Securities and Exchange Commission that action be taken with respect thereto, whereupon the holder of such Securities shall be entitled to transfer such Securities in accordance with the terms of the notice delivered by such holder to the Company.

Each certificate evidencing the Securities transferred as above provided shall bear the restrictive legend set forth in Section 6.1 above, except that such certificate shall not bear such restrictive legend if the opinion of counsel or "no-action" letter referred to above expressly indicates that such legend is not required in order to establish compliance with the Act or if such legend is no longer required pursuant to Rule 144. Notwithstanding the foregoing, Holder may transfer the Securities at any time to an affiliate of Holder as deemed necessary or advisable, in Holder's discretion, to ensure BioMed Realty Trust, Inc.'s compliance with requirements relating to BioMed Realty Trust, Inc.'s status as a real estate investment trust for federal income tax purposes, without having to provide to the Company the documentation contained in Section 6.2.1 or 6.2.2.

7 **Assignment.** Subject to the restrictions on transfer set forth in Section 6 and this Section 7 of the Note, the rights and obligations of the Company and Holder will be binding upon and inure to the benefit of the successors, assigns, heirs, administrators and transferees of the parties.

8 **Events of Default.** Upon the occurrence or existence of any Event of Default (as defined below) and at any time thereafter during the continuance of an Event of Default,

the entire Principal Amount of this Note, together with all unpaid accrued interest thereon, and all unpaid fees, charges, costs and expenses, if any, owed by the Company to the Holder hereunder, may become or may be declared by the Holder to be immediately due and payable. In addition to the foregoing remedies, upon the occurrence or existence of any Event of Default, the Holder may exercise any other right, power or remedy permitted to it by applicable law, either by suit in equity or by action at law, or both.

8.1 Events of Default. The occurrence of any one or more of the following events with respect to the Company constitutes an "Event of Default" hereunder:

(a) The Company breaches any covenant or obligation in this Note, and fails to cure such breach within thirty (30) days of such breach;

(b) The Company fails to pay timely any of the Principal Amount due under this Note on the date the same becomes due and payable or any accrued interest or other amounts due under this Note on the date the same becomes due and payable;

(c) The dissolution, termination of existence of the Company or inability of the Company to pay its debts as they become due, or appointment of a receiver, trustee or custodian, for all or any part of the property of the Company under any reorganization, bankruptcy, insolvency, arrangement, readjustment of debt, dissolution or liquidation law or statute of any jurisdiction, now or in the future in effect; or

(d) The commencement of any proceeding against the Company under any reorganization, bankruptcy, insolvency, arrangement, readjustment of debt, dissolution or liquidation law or statute of any jurisdiction, now or in the future, if within sixty (60) days after the commencement of such proceeding (i) such action has not been dismissed or all orders or proceedings thereunder affecting the operations or the business of the Company stayed, or (ii) the stay of any such order or proceedings has been set aside.

8.2 Default Rate. As long as any payment due under this Note remains past due (whether at the stated maturity, by acceleration or otherwise) for five (5) days or more, interest under this Note shall accrue on such overdue payment at a rate (the "Default Rate") (which is in lieu of and not in addition to the Interest Rate) equal to the lesser of twelve percent (12%) per annum or the maximum rate permitted by applicable law from the date of such non-payment until such amount is paid in full (whether after or before judgment).

8.3 Payment of Expenses. Following the occurrence of an Event of Default, the Company shall pay, on demand, all reasonable costs and expenses of collection of this Note (including reasonable attorneys' fees, costs and disbursements) in respect of such Event of Default, whether or not any suit or other legal proceedings shall be instituted.

8.4 No Usury. Payments of interest shall not be required, for any period for which interest is computed hereunder, to the extent that contracting for or receipt thereof would

be contrary to provisions of any applicable law to the Holder limiting the highest rate of interest that may be lawfully contracted for, charged or received by the Holder, as determined by a final judgment of a court of competent jurisdiction. Any interest paid in excess of such highest rate shall be applied to the unpaid principal balance of this Note. In the event that any such excess exceeds the principal amount, the amount of such excess over the principal amount shall be refunded to the Company.

9 **Certain Stock Distributions.** In the case of any stock dividend, stock distribution or similar transaction (any such transaction, a "Stock Distribution") by the Company of shares of the capital stock or other securities of any Related Entity ("Distribution Securities") after the date of issuance of this Note and prior to the conversion of this Note by Holder, Holder shall be entitled to receive, and the Company shall promptly deliver to Holder, such number of the Distribution Securities as shall be issued or distributed pursuant to such Stock Distribution as if Holder is a holder of 1,934,236 shares of Series C Preferred Stock of the Company (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series C Preferred Stock after the Effective Time) (such shares of Series C Preferred Stock, the "Deemed Held Stock") as of the record date determined by the Company's Board of Directors for such Stock Distribution. Holder shall be deemed to be a holder of such Deemed Held Stock solely for purposes of this Section 9 and shall otherwise have no other rights in, to or by reason of this Section 9 in the Deemed Held Stock, including, but not limited to, any rights of a stockholder or rights otherwise associated with ownership of shares of capital stock. The right of the Holder to receive any Distribution Securities pursuant to this Section 9 is subject to and conditioned upon Holder agreeing to enter into such agreements with the Company and/or any Related Entity as the holders of a majority of the shares of Series C Preferred Stock of the Company have entered into and/or are subject to with respect to such holders' ownership of any Distribution Securities; provided that if Holder receives any Distribution Securities from the Company and thereafter elects not to convert the Note prior to the Maturity Date, upon payment in full by the Company of any and all principal and interest then due and payable hereunder, Holder shall promptly surrender all such Distribution Securities to the Company (or such Related Entity as may be designated by the Company) and waive any and all rights in and to such securities. As used herein, "Related Entity" shall mean any entity initially formed, organized or otherwise established as a subsidiary or other affiliate of the Company, either prior to, at or after the date of this Note, regardless of whether or not the Company thereafter continues to hold any equity or other ownership interest therein. In the event that Holder receives aggregate cash proceeds derived from Holder's Distribution Securities exceeding Three Million Five Hundred Thousand Dollars ($3,500,000.00) prior to the Maturity Date, then any accrued but unpaid interest under this Note shall be forgiven and no interest under this Note shall thereafter accrue or otherwise be payable by the Company with respect hereto.

10 **Subordination.** Holder agrees that payment of amounts due under this Note is expressly subordinated to the prior payment of, and shall rank junior in priority to, all amounts due by the Company under that certain Loan and Security Agreement dated as of March 18, 2011 by and between the Company and Comerica Bank ("Comerica"), as

the same may be amended from time to time. To the extent requested by Comerica, the Holder and the Company shall enter into a reasonable and customary subordination agreement providing for such subordination and other related terms as described in the preceding sentence.

11 **Early Termination of Lease.** If at any time prior to the Maturity Date the Lease terminates, other than as a result of a Default by the Company, a portion of the Principal Amount equal to the amount to be deemed as a credit against the Base Rent (as defined in the Lease) for months under the Lease which have not, as of such termination date, elapsed, shall immediately be forgiven and no longer deemed to be outstanding, due or otherwise payable hereunder.

12 **Governing Law.** This Note and all acts and transactions pursuant hereto and the rights and obligations of the parties hereto shall be governed, construed and interpreted in accordance with the laws of the State of California, without giving effect to principles of conflicts of law.

13 **Notices.** All notices and other communications required or permitted hereunder shall be in writing and shall be deemed effectively given upon personal delivery, upon three (3) business days after deposit with the United States Post Office, by registered or certified mail, return receipt requested, postage prepaid, one (1) business day after deposit with a nationally recognized air courier, or upon receipt of confirmation with regard to delivery by facsimile and addressed: (a) if to Holder, at Holder's address as set forth on Holder's signature page hereto, or at such other address as Holder shall have furnished to the Company in writing, or (b) if to the Company, at its current address or at such other address as the Company shall have furnished to Holder in writing.

14 **Notification of Certain Events.** The Company shall provide Holder with at least ten (10) days prior written notice of any Liquidation Event.

15 **Amendments and Waivers.** Any term of this Note may be amended and the observance of any term of this Note may be waived (either generally or in a particular instance and either retroactively or prospectively), only with the written consent of the Company and the Holder. Any amendment or waiver effected in accordance with this Section 15 shall be binding upon Holder and the Company.

16 **Lost Documents.** Upon receipt by the Company of evidence and indemnity reasonably satisfactory to it of the loss, theft, destruction or mutilation of, and upon surrender and cancellation of this Note, if mutilated, the Company will make and deliver in lieu of this Note a new note of the same series and of like tenor and unpaid Principal Amount and dated as of the date to which interest, if any, has been paid on the unpaid Principal Amount of this Note.

17 **Waivers and Rights of Holder.** The Company hereby waives demand, presentment for payment, protest, notice of nonpayment, notice of protest, notice of dishonor, and any other notices of any kind, and any and all exemption rights that it holds at law or in equity with respect to the indebtedness evidenced by this Note.

18 **Attorneys' Fees**. If any action at law or in equity is necessary to enforce or interpret the terms of this Note, the prevailing party shall be entitled to reasonable attorneys' fees, costs and disbursements in addition to any other relief to which such party may be entitled.

19 **Severability**. If one or more provisions of this Note are held to be unenforceable under applicable law, such provision shall be excluded from this Note and the balance of this Note shall be interpreted as if such provision were so excluded and shall be enforceable in accordance with its terms.

20 **California Corporate Securities Law**. THE SALE OF THE SECURITIES WHICH ARE THE SUBJECT OF THIS NOTE HAS NOT BEEN QUALIFIED WITH THE COMMISSIONER OF CORPORATIONS OF THE STATE OF CALIFORNIA AND THE ISSUANCE OF SUCH SECURITIES OR THE PAYMENT OR RECEIPT OF ANY PART OF THE CONSIDERATION THEREFOR PRIOR TO THE QUALIFICATION IS UNLAWFUL UNLESS THE SALE OF SECURITIES IS EXEMPT FROM THE QUALIFICATION BY SECTION 25100, 25102, OR 25105 OF THE CALIFORNIA CORPORATIONS CODE. THE RIGHTS OF ALL PARTIES TO THIS NOTE ARE EXPRESSLY CONDITIONED UPON SUCH QUALIFICATION BEING OBTAINED, UNLESS THE SALE IS SO EXEMPT.

21 **Counterparts**. This Note may be executed in two or more counterparts (including by facsimile or PDF copy), each of which shall be deemed an original and all of which together shall constitute one instrument.

(Signature Page Follows)

The parties have executed this Subordinated Convertible Unsecured Promissory Note as of the date first written above.

COMPANY:

ATYR PHARMA, INC.

By: /s/ Randy Socol
Name: Randy Socol
Title: Secretary

HOLDER:

BMV DIRECT RE LP, a Delaware limited partnership
By: BioMed Realty, L.P., its general partner

By: /s/ Brian J. Wolfe
Name: Brian J. Wolfe
Title: Assistant Secretary

Address: 17190 Bernardo Center Drive
San Diego, CA 92128
Attn: Corporate Legal
Fax: 858-485-9843

Exhibit 10.1

ATYR PHARMA, INC.
2014 STOCK PLAN

1. ESTABLISHMENT, PURPOSE, AND TERM OF PLAN.

1.1 **Establishment**. The aTyr Pharma, Inc. 2007 Stock Plan was initially adopted April 12, 2007, and approved by the Company's stockholders on April 25, 2007. This Plan was subsequently amended on several occasions and is hereby completely amended and restated, and renamed the aTyr Pharma, Inc. 2014 Stock Plan (the "**Plan**") effective as of the date this amendment and restatement is approved by the Company's stockholders (the "**Effective Date**").

1.2 **Purpose**. The purpose of the Plan is to advance the interests of the Participating Company Group and its stockholders by providing an incentive to attract, retain and reward persons performing services for the Participating Company Group and by motivating such persons to contribute to the growth and profitability of the Participating Company Group. The Plan seeks to achieve this purpose by providing for Awards in the form of Options, Restricted Stock Awards and Restricted Stock Unit Awards. The Company intends that the Plan, and Awards granted pursuant to the Plan, be exempt from, or comply with, Section 409A, and the Plan shall be so construed.

1.3 **Term of Plan**. The Plan shall continue in effect until its termination by the Board; provided, however, that all Awards shall be granted, if at all, within ten (10) years from the Plan's Effective Date.

2. DEFINITIONS AND CONSTRUCTION.

2.1 **Definitions**. Whenever used herein, the following terms shall have their respective meanings set forth below:

(a) "***Award***" means an Option, Restricted Stock Purchase Right, Restricted Stock Bonus, or Restricted Stock Unit Award granted under the Plan.

(b) "***Award Agreement***" means a written or electronic agreement between the Company and a Participant setting forth the terms, conditions and restrictions applicable to an Award.

(c) "***Board***" means the Board of Directors of the Company. If one or more Committees have been appointed by the Board to administer the Plan, "***Board***" also means such Committee(s).

(d) "***Cause***" means, unless such term or an equivalent term is otherwise defined by the applicable Award Agreement or other written agreement between a Participant and a Participating Company applicable to an Award, any of the following: (i) the Participant's theft, dishonesty, willful misconduct, breach of fiduciary duty for personal profit, or falsification of any Participating Company documents or records; (ii) the Participant's material failure to abide by a Participating Company's code of conduct or other policies (including, without limitation, policies relating to confidentiality and reasonable workplace conduct);

(iii) the Participant's unauthorized use, misappropriation, destruction or diversion of any tangible or intangible asset or corporate opportunity of a Participating Company (including, without limitation, the Participant's improper use or disclosure of a Participating Company's confidential or proprietary information); (iv) any intentional act by the Participant which has a material detrimental effect on a Participating Company's reputation or business; (v) the Participant's repeated failure or inability to perform any reasonable assigned duties after written notice from a Participating Company of, and a reasonable opportunity to cure, such failure or inability; (vi) any material breach by the Participant of any employment or service agreement between the Participant and a Participating Company, which breach is not cured pursuant to the terms of such agreement; or (vii) the Participant's conviction (including any plea of guilty or nolo contendere) of any criminal act involving fraud, dishonesty, misappropriation or moral turpitude, or which impairs the Participant's ability to perform his or her duties with a Participating Company.

(e) "***Change in Control***" means, unless such term or an equivalent term is otherwise defined with respect to an Award by the Participant's Award Agreement or written contract of employment or service, the occurrence of any of the following:

(i) an Ownership Change Event or a series of related Ownership Change Events (collectively, a "***Transaction***") in which the stockholders of the Company immediately before the Transaction do not retain immediately after the Transaction, in substantially the same proportions as their ownership of shares of the Company's voting stock immediately before the Transaction, direct or indirect beneficial ownership of more than fifty percent (50%) of the total combined voting power of the outstanding voting securities of the Company or, in the case of an Ownership Change Event described in Section 2.1(v)(iii), the entity to which the assets of the Company were transferred (the "***Transferee***"), as the case may be; or

(ii) the liquidation or dissolution of the Company.

For purposes of the preceding sentence, indirect beneficial ownership shall include, without limitation, an interest resulting from ownership of the voting securities of one or more corporations or other business entities which own the Company or the Transferee, as the case may be, either directly or through one or more subsidiary corporations or other business entities. The Board shall have the right to determine whether multiple sales or exchanges of the voting securities of the Company or multiple Ownership Change Events are related, and its determination shall be final, binding and conclusive,

(f) "***Code***" means the Internal Revenue Code of 1986, as amended, and any applicable regulations and administrative guidelines promulgated thereunder.

(g) "***Committee***" means the compensation committee or other committee or subcommittee of the Board duly appointed to administer the Plan and having such powers as specified by the Board. Unless the powers of the Committee have been specifically limited, the Committee shall have all of the powers of the Board granted herein, including, without limitation, the power to amend or terminate the Plan at any time, subject to the terms of the Plan and any applicable limitations imposed by law.

(h) "***Company***" means aTyr Pharma, Inc., a Delaware corporation, and any successor thereto.

(i) "***Consultant***" means a person or entity engaged to provide consulting or advisory services (other than as an Employee or a Director) to a Participating Company; provided that (i) if the Consultant is a person, the identity of such person, the nature of such services or the entity to which such services are provided would not preclude the Company from offering or selling securities to such person pursuant to the Plan in reliance on either the exemption from registration provided by Rule 701 under the Securities Act or, if the Company is required to file reports pursuant to Section 13 or 15(d) of the Exchange Act, registration on a Form S-8 Registration Statement under the Securities Act, and (ii) if the Consultant is an entity would not preclude the Company from offering or selling securities to such an entity pursuant to the Plan in reliance on Section 4(2) of the Securities Act.

(j) "***Director***" means a member of the Board or of the board of directors of any other Participating Company.

(k) "***Disability***" means the inability of the Participant, in the opinion of a qualified physician acceptable to the Company, to perform the major duties of the Participant's position with the Participating Company Group because of the sickness or injury of the Participant.

(l) "***Dividend Equivalent Right***" means the right of a Participant, granted at the discretion of the Board or as otherwise provided by the Plan, to receive a credit for the account of such Participant in an amount equal to the cash dividends paid on one share of Stock for each share of Stock represented by an Award held by such Participant.

(m) "***Employee***" means any person treated as an employee (including an Officer or a Director who is also treated as an employee) in the records of a Participating Company and, with respect to any Incentive Stock Option granted to such person, who is an employee for purposes of Section 422 of the Code; provided, however, that neither service as a Director nor payment of a director's fee shall be sufficient to constitute employment for purposes of the Plan. The Company shall determine in good faith and in the exercise of its discretion whether an individual has become or has ceased to be an Employee and the effective date of such individual's employment or termination of employment, as the case may be. For purposes of an individual's rights, if any, under the terms of the Plan as of the time of the Company's determination of whether or not the individual is an Employee, all such determinations by the Company shall be final, binding and conclusive as to such rights, if any, notwithstanding that the Company or any court of law or governmental agency subsequently makes a contrary determination as to such individual's status as an Employee.

(n) "***Exchange Act***" means the Securities Exchange Act of 1934, as amended.

(o) "***Fair Market Value***" means, as of any date, the value of a share of Stock or other property as determined by the Board, in its discretion, or by the Company, in its

discretion, if such determination is expressly allocated to the Company herein, subject to the following:

(i) If, on such date, the Stock is listed or quoted on a national or regional securities exchange or quotation system, the Fair Market Value of a share of Stock shall be the closing price of a share of Stock as quoted on the national or regional securities exchange or quotation system constituting the primary market for the Stock, as reported in *The Wall Street Journal* or such other source as the Company deems reliable. If the relevant date does not fall on a day on which the Stock has traded on such securities exchange or quotation system, the date on which the Fair Market Value shall be established shall be the last day on which the Stock was so traded or quoted prior to the relevant date, or such other appropriate day as shall be determined by the Board, in its discretion.

(ii) If, on such date, the Stock is not listed or quoted on a national or regional securities exchange or quotation system, the Fair Market Value of a share of Stock shall be as determined by the Board in good faith without regard to any restriction other than a restriction which, by its terms, will never lapse, and in a manner consistent with the requirements of Section 409A.

(p) "***Good Reason***" means, unless such term or an equivalent term is otherwise defined by the applicable Award Agreement or other written agreement between a Participant and a Participating Company applicable to an Award, the Participant's voluntary resignation of Service with the applicable Participating Company (or any successor) within sixty (60) days after the occurrence of one or more of the following circumstances; provided that the Participant has notified the Company (or its successor) in writing of the Participant's assertion that one of the following circumstances has occurred, which notice has been delivered within thirty (30) days following the Participant becoming aware of such circumstance: (i) a material reduction in the Participant's base salary as then in-effect, unless the reduction is made as part of, and is generally consistent with, a general reduction of similarly situated the Participants; (ii) a material reduction in the kind or level of non-monetary benefits that the Participant is entitled to receive, unless the reduction is made as part of, and is generally consistent with, a general reduction of senior executive benefits; or (iii) relocation of the Participant's principal place of work to a location resulting in an increase in the Participant's daily commute to such principal place of work by more than thirty-five (35) miles, without the Participant's prior written approval; provided, however, that the Company (or its successor) has been provided with written notice of the circumstance and thirty (30) days from receipt of written notice in which to cure such circumstance and the Company (or its successor) fails to cure such circumstance during such thirty-day period.

(q) "***Incentive Stock Option***" means an Option intended to be (as set forth in the Award Agreement) and which qualifies as an incentive stock option within the meaning of Section 422(b) of the Code.

(r) "***Insider***" means an Officer, a Director or other person whose transactions in Stock are subject to Section 16 of the Exchange Act.

(s) "***Nonstatutory Stock Option***" means an Option not intended to be (as set forth in the Award Agreement) or which does not qualify as an incentive stock option within the meaning of Section 422(b) of the Code.

(t) "***Officer***" means any person designated by the Board as an officer of the Company.

(u) "***Option***" means an Incentive Stock Option or a Nonstatutory Stock Option granted pursuant to the Plan.

(v) "***Ownership Change Event***" means the occurrence of any of the following with respect to the Company: (i) the direct or indirect sale or exchange in a single or series of related transactions by the stockholders of the Company of more than fifty percent (50%) of the voting stock of the Company; (ii) a merger or consolidation in which the Company is a party; or (iii) the sale, exchange, or transfer of all or substantially all of the assets of the Company.

(w) "***Parent Corporation***" means any present or future "parent corporation" of the Company, as defined in Section 424(e) of the Code.

(x) "***Participant***" means any eligible person who has been granted one or more Awards.

(y) "***Participating Company***" means the Company or any Parent Corporation or Subsidiary Corporation.

(z) "***Participating Company Group****"* means, at any point in time, all entities collectively which are then Participating Companies.

(aa) "***Restricted Stock Award***" means an Award in the form of a Restricted Stock Bonus or a Restricted Stock Purchase Right.

(bb) "***Restricted Stock Bonus*** " means Stock granted to a Participant pursuant to Section 7.

(cc) "***Restricted Stock Purchase Right***" means a right to purchase Stock granted to a Participant pursuant to Section 7.

(dd) "***Restricted Stock Unit***" means a right granted to a Participant pursuant to Section 8 to receive on a future date or event a share of Stock or cash in lieu thereof, as determined by the Board.

(ee) "***Rule 16b-3***" means Rule 16b-3 under the Exchange Act, as amended from time to time, or any successor rule or regulation.

(ff) "***Section 409A***" means Section 409A of the Code.

(gg) "***Securities Act***" means the Securities Act of 1933, as amended.

(hh) "***Service***" means a Participant's employment or service with the Participating Company Group, whether as an Employee, a Director or a Consultant. Unless otherwise provided by the Board, a Participant's Service shall not be deemed to have terminated merely because of a change in the capacity in which the Participant renders Service or a change in the Participating Company for which the Participant renders Service; provided that there is no interruption or termination of the Participant's Service. Furthermore, a Participant's Service shall not be deemed to have been interrupted or terminated if the Participant takes any military leave, sick leave, or other bona fide leave of absence approved by the Company. However, unless otherwise provided by the Board, if any such leave taken by a Participant exceeds ninety (90) days, then on the ninety-first (91st) day following the commencement of such leave the Participant's Service shall be deemed to have terminated, unless the Participant's right to return to Service is guaranteed by statute or contract. Notwithstanding the foregoing, unless otherwise designated by the Company or required by law, an unpaid leave of absence shall not be treated as Service for purposes of determining vesting under the Participant's Award Agreement. A Participant's Service shall be deemed to have terminated either upon an actual termination of Service or upon the business entity for which the Participant performs Service ceasing to be a Participating Company. Subject to the foregoing, the Company, in its discretion, shall determine whether the Participant's Service has terminated and the effective date of and reason for such termination.

(ii) "***Stock***" means the common stock of the Company, as adjusted from time to time in accordance with Section 4.3.

(jj) "***Subsidiary Corporation***" means any present or future "subsidiary corporation" of the Company, as defined in Section 424(f) of the Code.

(kk) "***Ten Percent Stockholder***" means a person who, at the time an Award is granted to such person, owns stock possessing more than ten percent (10%) of the total combined voting power of all classes of stock of a Participating Company within the meaning of Section 422(b)(6) of the Code.

(ll) "***Termination After Change in Control***" shall mean either of the following events occurring within twelve (12) months after the consummation of a Change in Control:

(i) termination of the Participant's Service by the Participating Company Group (or the entity assuming such service relationship and/or duties under the Plan) for any reason other than for Cause; or

(ii) the Participant's resignation for Good Reason.

Notwithstanding any provision herein to the contrary, Termination After Change in Control shall not include any termination of the Participant's Service which (1) is for Cause; (2) is a result of the Participant's death or Disability; (3) is a result of the Participant's voluntary termination of Service other than for Good Reason; or (4) occurs prior to the effectiveness of a Change in Control.

(mm) "***Trading Compliance Policy***" means the written policy of the Company pertaining to the purchase, sale, transfer or other disposition of the Company's equity securities by Directors, Officers, Employees or other service providers who may possess material, nonpublic information regarding the Company or its securities.

(nn) "***Vesting Conditions***" mean those conditions established in accordance with the Plan prior to the satisfaction of which an Award or shares subject to an Award remain subject to forfeiture or a repurchase option in favor of the Company exercisable for the Participant's monetary purchase price, if any, for such shares upon the Participant's termination of Service or failure of a performance condition to be satisfied.

2.2 **Construction**. Captions and titles contained herein are for convenience only and shall not affect the meaning or interpretation of any provision of the Plan. Except when otherwise indicated by the context, the singular shall include the plural and the plural shall include the singular. Use of the term "or" is not intended to be exclusive, unless the context clearly requires otherwise.

3. **ADMINISTRATION**.

3.1 **Administration by the Board**. The Plan shall be administered by the Board. All questions of interpretation of the Plan, of any Award Agreement or of any other form of agreement or other document employed by the Company in the administration of the Plan or of any Award shall be determined by the Board, and such determinations shall be final, binding and conclusive upon all persons having an interest in the Plan or such Award, unless fraudulent or made in bad faith. Any and all actions, decisions and determinations taken or made by the Board in the exercise of its discretion pursuant to the Plan or Award Agreement or other agreement thereunder (other than determining questions of interpretation pursuant to the preceding sentence) shall be final, binding and conclusive upon all persons having an interest therein. All expenses incurred in connection with the administration of the Plan shall be paid by the Company.

3.2 **Authority of Officers**. Any Officer shall have the authority to act on behalf of the Company with respect to any matter, right, obligation, determination or election that is the responsibility of or that is allocated to the Company herein; *provided* that the Officer has apparent authority with respect to such matter, right, obligation, determination or election.

3.3 **Powers of the Board**. In addition to any other powers set forth in the Plan and subject to the provisions of the Plan, the Board shall have the full and final power and authority, in its discretion:

(a) to determine the persons to whom, and the time or times at which, Awards shall be granted and the number of shares of Stock or units to be subject to each Award;

(b) to determine the type of Award granted;

(c) to determine the Fair Market Value of shares of Stock or other property;

(d) to determine the terms, conditions and restrictions applicable to each Award (which need not be identical) and any shares acquired pursuant thereto, including, without limitation, (i) the exercise or purchase price of shares pursuant to any Award, (ii) the method of payment for shares purchased pursuant to any Award, (iii) the method for satisfaction of any tax withholding obligation arising in connection with any Award, including by the withholding or delivery of shares of Stock, (iv) the timing, terms and conditions of the exercisability or vesting of any Award or any shares acquired pursuant thereto, (v) the time of expiration of any Award, (vi) the effect of any Participant's termination of Service on any of the foregoing, and (vii) all other terms, conditions and restrictions applicable to any Award or shares acquired pursuant thereto not inconsistent with the terms of the Plan;

(e) to determine whether an Award will be settled in shares of Stock, cash, other property or in any combination thereof;

(f) to approve one or more forms of Award Agreement;

(g) to amend, modify, extend, cancel or renew any Award or to waive any restrictions or conditions applicable to any Award or any shares acquired pursuant thereto;

(h) to reprice or otherwise adjust the exercise price of any Option, or to grant in substitution for any Option a new Award covering the same or different number of shares of Stock;

(i) to accelerate, continue, extend or defer the exercisability or vesting of any Award or any shares acquired pursuant thereto, including with respect to the period following a Participant's termination of Service;

(j) to prescribe, amend or rescind rules, guidelines and policies relating to the Plan, or to adopt sub-plans or supplements to, or alternative versions of, the Plan, including, without limitation, as the Board deems necessary or desirable to comply with the laws of, or to accommodate the tax policy, accounting principles or custom of, foreign jurisdictions whose residents may be granted Awards; and

(k) to correct any defect, supply any omission or reconcile any inconsistency in the Plan or any Award Agreement and to make all other determinations and take such other actions with respect to the Plan or any Award as the Board may deem advisable to the extent not inconsistent with the provisions of the Plan or applicable law.

3.4 **Administration with Respect to Insiders**. With respect to participation by Insiders in the Plan, at any time that any class of equity security of the Company is registered pursuant to Section 12 of the Exchange Act, the Plan shall be administered in compliance with the requirements, if any, of Rule 16b-3.

3.5 **Indemnification**. In addition to such other rights of indemnification as they may have as members of the Board or as officers or employees of the Participating Company Group, to the extent permitted by applicable law, members of the Board and any officers or employees of the Participating Company Group to whom authority to act for the Board or the Company is delegated shall be indemnified by the Company against all reasonable expenses,

including attorneys' fees, actually and necessarily incurred in connection with the defense of any action, suit or proceeding, or in connection with any appeal therein, to which they or any of them may be a party by reason of any action taken or failure to act under or in connection with the Plan, or any right granted hereunder, and against all amounts paid by them in settlement thereof (*provided* such settlement is approved by independent legal counsel selected by the Company) or paid by them in satisfaction of a judgment in any such action, suit or proceeding, except in relation to matters as to which it shall be adjudged in such action, suit or proceeding that such person is liable for gross negligence, bad faith or intentional misconduct in duties; *provided, however,* that within sixty (60) days after the institution of such action, suit or proceeding, such person shall offer to the Company, in writing, the opportunity at its own expense to handle and defend the same.

4. **SHARES SUBJECT TO PLAN**.

4.1 **Maximum Number of Shares Issuable**.

(a) Subject to adjustment as provided in Sections 4.1(b) and 4.2, the maximum aggregate number of shares of Stock that may be issued since its inception under the Plan shall be 16,219,000 which shall consist of authorized but unissued or reacquired shares of Stock or any combination thereof. If an outstanding Award for any reason expires or is terminated or canceled or if shares of Stock are acquired upon the exercise of an Award subject to a Company repurchase option and are repurchased by the Company at the Participant's exercise or purchase price, the shares of Stock allocable to the unexercised portion of such Award or such repurchased shares of Stock shall again be available for issuance under the Plan.

(b) Subject to adjustment as provided in Section 4.2, the maximum aggregate number of shares of Stock that may be issued under the Plan as set forth in Section 4.1 (a) shall be cumulatively increased on January 1, 2015 and on each subsequent January 1 through the end of the Plan's term under Section 1.3, by a number of shares of Stock (the "***Annual Increase***") equal to the smaller of (i) four percent (4%) of the number of shares of all classes of stock issued and outstanding on an as converted fully diluted basis on the immediately preceding December 31, and (ii) an amount determined by the Board.

4.2 **Share Counting**. If an outstanding Award for any reason expires or is terminated or canceled without having been exercised or settled in full, or if shares of Stock acquired pursuant to an Award subject to forfeiture or repurchase are forfeited or repurchased by the Company, the shares of Stock allocable to the terminated portion of such Award or such forfeited or repurchased shares of Stock shall again be available for issuance under the Plan. Shares of Stock shall not be deemed to have been issued pursuant to the Plan (a) with respect to any portion of an Award that is settled in cash or (b) to the extent such shares are withheld or reacquired by the Company in satisfaction of tax withholding obligations pursuant to Section 11.2. If the exercise price of an Option is paid by tender to the Company, or attestation to the ownership, of shares of Stock owned by the Participant, or by means of a Net Exercise, the number of shares available for issuance under the Plan shall be reduced by the net number of shares issued upon the exercise of the Option.

4.3 **Adjustments for Changes in Capital Structure**. Subject to any required action by the stockholders of the Company and the requirements of Sections 409A and 424 of the Code to the extent applicable, in the event of any change in the Stock effected without receipt of consideration by the Company, whether through merger, consolidation, reorganization, reincorporation, recapitalization, reclassification, stock dividend, stock split, reverse stock split, split-up, split-off, spin-off, combination of shares, exchange of shares, or similar change in the capital structure of the Company, or in the event of payment of a dividend or distribution to the stockholders of the Company in a form other than Stock (excepting normal cash dividends) that has a material effect on the Fair Market Value of shares of Stock, appropriate and proportionate adjustments shall be made in the number and class of shares subject to the Plan and to any outstanding Awards, in the ISO Share Limit set forth in Section 5.3(a), and in the exercise or purchase price per share under any outstanding Awards in order to prevent dilution or enlargement of Participants' rights under the Plan. For purposes of the foregoing, conversion of any convertible securities of the Company shall not be treated as "effected without receipt of consideration by the Company." If a majority of the shares which are of the same class as the shares that are subject to outstanding Awards are exchanged for, converted into, or otherwise become (whether or not pursuant to an Ownership Change Event) shares of another corporation (the "***New Shares***"), the Board may unilaterally amend the outstanding Awards to provide that such Awards are for New Shares. In the event of any such amendment, the number of shares subject to, and the exercise or purchase price per share of, the outstanding Awards shall be adjusted in a fair and equitable manner as determined by the Board, in its discretion. Any fractional share resulting from an adjustment pursuant to this Section shall be rounded down to the nearest whole number, and the exercise or purchase price per share shall be rounded up to the nearest whole cent. In no event may the exercise or purchase price, if any, under any Award be decreased to an amount less than the par value, if any, of the stock subject to the Award. Such adjustments shall be determined by the Board, and its determination shall be final, binding and conclusive.

4.4 **Assumption or Substitution of Awards**. The Board may, without affecting the number of shares of Stock available pursuant to Section 4.1, authorize the issuance or assumption of benefits under this Plan in connection with any merger, consolidation, acquisition of property or stock, or reorganization upon such terms and conditions as it may deem appropriate, subject to compliance with Section 409A and any other applicable provisions of the Code.

5. **ELIGIBILITY, PARTICIPATION AND OPTION LIMITATIONS.**

5.1 **Persons Eligible for Awards**. Awards may be granted only to Employees, Consultants and Directors.

5.2 **Participation in the Plan**. Awards are granted solely at the discretion of the Board. Eligible persons may be granted more than one Award. However, eligibility in accordance with this Section shall not entitle any person to be granted an Award, or, having been granted an Award, to be granted an additional Award.

5.3 **Incentive Stock Option Limitations.**

(a) ***Maximum Number of Shares Issuable Pursuant to Incentive Stock Options***. The maximum aggregate number of shares of Stock that may be issued under the Plan pursuant to the exercise of Incentive Stock Options shall not exceed 50,000,000 subject to adjustment as provided in Sections 4.1(b) and 4.2. Likewise, the maximum aggregate number of shares of Stock that may be issued under the Plan pursuant to all Awards other than Incentive Stock Options shall be the number of shares determined in accordance with Section 4.1, subject to adjustment as provided in Section 4.2.

(b) ***Persons Eligible***. An Incentive Stock Option may be granted only to a person who, on the effective date of grant, is an Employee. Any person who is not an Employee on the effective date of the grant of an Option to such person may be granted only a Nonstatutory Stock Option. An Incentive Stock Option granted to a prospective Employee upon the condition that such person become an Employee shall be deemed granted effective on the date such person commences Service as an Employee, with an exercise price determined as of such date in accordance with Section 6.1.

(c) ***Fair Market Value Limitation***. To the extent that options designated as Incentive Stock Options (granted under all stock plans of the Participating Company Group, including the Plan) become exercisable by a Participant for the first time during any calendar year for stock having a Fair Market Value greater than One Hundred Thousand Dollars ($100,000), the portion of such options which exceeds such amount shall be treated as Nonstatutory Stock Options. For purposes of this Section, options designated as Incentive Stock Options shall be taken into account in the order in which they were granted, and the Fair Market Value of stock shall be determined as of the time the option with respect to such stock is granted. If the Code is amended to provide for a limitation different from that set forth in this Section, such different limitation shall be deemed incorporated herein effective as of the date and with respect to such Options as required or permitted by such amendment to the Code. If an Option is treated as an Incentive Stock Option in part and as a Nonstatutory Stock Option in part by reason of the limitation set forth in this Section, the Participant may designate which portion of such Option the Participant is exercising. In the absence of such designation, the Participant shall be deemed to have exercised the Incentive Stock Option portion of the Option first. Upon exercise of the Option, shares issued pursuant to each such portion shall be separately identified.

6. **STOCK OPTIONS.**

Options shall be evidenced by Award Agreements specifying the number of shares of Stock covered thereby, in such form as the Board shall establish. Such Award Agreements may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

6.1 **Exercise Price**. The exercise price for each Option shall be established in the discretion of the Board; *provided, however*, that (a) the exercise price per share for an Option shall be not less than the Fair Market Value of a share of Stock on the effective date of grant of the Option and (b) no Incentive Stock Option granted to a Ten Percent Stockholder shall have an exercise price per share less than one hundred ten percent (110%) of the Fair Market Value of a

share of Stock on the effective date of grant of the Option. Notwithstanding the foregoing, an Option (whether an Incentive Stock Option or a Nonstatutory Stock Option) may be granted with an exercise price less than the minimum exercise price set forth above if such Option is granted pursuant to an assumption or substitution for another option in a manner that would qualify under the provisions of Section 409A or Section 424(a) of the Code, as applicable.

6.2 **Exercisability and Term of Options**. Options shall be exercisable at such time or times, or upon such event or events, and subject to such terms, conditions, performance criteria and restrictions as shall be determined by the Board and set forth in the Award Agreement evidencing such Option; *provided, however,* that (a) no Option shall be exercisable after the expiration of ten (10) years after the effective date of grant of such Option, (b) no Incentive Stock Option granted to a Ten Percent Stockholder shall be exercisable after the expiration of five (5) years after the effective date of grant of such Option, and (c) no Option granted to an Employee who is a non-exempt employee for purposes of the Fair Labor Standards Act of 1938, as amended, shall be first exercisable until at least six (6) months following the date of grant of such Option (except in the event of such Employee's death, disability or retirement, upon a Change in Control, or as otherwise permitted by the Worker Economic Opportunity Act). Subject to the foregoing, unless otherwise specified by the Board in the grant of an Option, each Option shall terminate ten (10) years after the effective date of grant of the Option, unless earlier terminated in accordance with its provisions.

6.3 **Payment of Exercise Price.**

(a) ***Forms of Consideration Authorized***. Except as otherwise provided below, payment of the exercise price for the number of shares of Stock being purchased pursuant to any Option shall be made (i) in cash, by check or in cash equivalent, (ii) if permitted by the Company and subject to the limitations contained in Section 6.3(b), by means of (1) a Stock Tender Exercise, (2) a Cashless Exercise or (3) a Net Exercise; (iii) by such other consideration as may be approved by the Board from time to time to the extent permitted by applicable law, or (iv) by any combination thereof. The Board may at any time or from time to time grant Options which do not permit all of the foregoing forms of consideration to be used in payment of the exercise price or which otherwise restrict one or more forms of consideration.

(b) ***Limitations on Forms of Consideration***.

(i) **Stock Tender Exercise**. A "***Stock Tender Exercise***" means the delivery of a properly executed exercise notice accompanied by a Participant's tender to the Company, or attestation to the ownership, in a form acceptable to the Company of whole shares of Stock owned by the Participant having a Fair Market Value that does not exceed the aggregate exercise price for the shares with respect to which the Option is exercised. A Stock Tender Exercise shall not be permitted if it would constitute a violation of the provisions of any law, regulation or agreement restricting the redemption of the Company's stock. If required by the Company, an Option may not be exercised by tender to the Company, or attestation to the ownership, of shares of Stock unless such shares either have been owned by the Participant for a period of time required by the Company (and not used for another option exercise by attestation during such period) or were not acquired, directly or indirectly, from the Company.

(ii) **Cashless Exercise**. A Cashless Exercise shall be permitted only upon the class of shares subject to the Option becoming publicly traded in an established securities market. A "***Cashless Exercise***" means the delivery of a properly executed exercise notice together with irrevocable instructions to a broker providing for the assignment to the Company of the proceeds of a sale or loan with respect to some or all of the shares being acquired upon the exercise of the Option (including, without limitation, through an exercise complying with the provisions of Regulation T as promulgated from time to time by the Board of Governors of the Federal Reserve System). The Company reserves, at any and all times, the right, in the Company's sole and absolute discretion, to establish, decline to approve or terminate any program or procedures for the exercise of Options by means of a Cashless Exercise, including with respect to one or more Participants specified by the Company notwithstanding that such program or procedures may be available to other Participants.

(iii) **Net Exercise**. A "***Net Exercise***" means the delivery of a properly executed exercise notice followed by a procedure pursuant to which (1) the Company will reduce the number of shares otherwise issuable to a Participant upon the exercise of an Option by the largest whole number of shares having a Fair Market Value that does not exceed the aggregate exercise price for the shares with respect to which the Option is exercised, and (2) the Participant shall pay to the Company in cash the remaining balance of such aggregate exercise price not satisfied by such reduction in the number of whole shares to be issued.

6.4 **Effect of Termination of Service.**

(a) ***Option Exercisability***. Subject to earlier termination of the Option as otherwise provided by this Plan and unless a different exercise period is provided by the Board in the grant of an Option and set forth in the Award Agreement, an Option shall terminate immediately upon the Participant's termination of Service to the extent that it is then unvested and shall be exercisable after the Participant's termination of Service to the extent it is then vested only during the applicable time period determined in accordance with this Section and thereafter shall terminate:

(i) **Disability.** If the Participant's Service terminates because of the Disability of the Participant, the Option, to the extent unexercised and exercisable on the date on which the Participant's Service terminated, may be exercised by the Participant (or the Participant's guardian or legal representative) at any time prior to the expiration of twelve (12) months after the date on which the Participant's Service terminated (to the extent required by applicable law (or such other legal period of time as determined by the Board in its discretion)), but in any event no later than the date of expiration of the Option's term as set forth in the Award Agreement evidencing such Option (the "***Option Expiration Date***").

(ii) **Death**. If the Participant's Service terminates because of the death of the Participant, the Option, to the extent unexercised and exercisable on the date on which the Participant's Service terminated, may be exercised by the Participant's legal representative or other person who acquired the right to exercise the Option by reason of the Participant's death at any time prior to the expiration of twelve (12) months after the date on which the Participant's Service terminated (to the extent required by applicable law (or such other legal period of time as determined by the Board in its discretion)), but in any event no later

than the Option Expiration Date. The Participant's Service shall be deemed to have terminated on account of death if the Participant dies within three (3) months (or such longer period of time as determined by the Board, in its discretion) after the Participant's termination of Service.

(iii) **Termination for Cause**. Notwithstanding any other provision of the Plan to the contrary, if Participant's Service is terminated for Cause, the Option shall terminate and cease to be exercisable immediately upon such termination of Service.

(iv) **Other Termination of Service**. If the Participant's Service terminates for any reason, except Disability, death or for Cause, the Option, to the extent unexercised and exercisable by the Participant on the date on which the Participant's Service terminated, may be exercised by the Participant at any time prior to the expiration of three (3) months after the date on which the Participant's Service terminated (to the extent required by applicable law (or such other legal period of time as determined by the Board in its discretion)), but in any event no later than the Option Expiration Date.

(b) ***Extension if Exercise Prevented by Law***. Notwithstanding the foregoing, other than termination for Cause, if the exercise of an Option within the applicable time periods set forth in Section 6.4(a) is prevented by the provisions of Section 11 below, the Option shall remain exercisable until thirty (30) days after the date such exercise first would no longer be prevented by such provisions (to the extent required by applicable law (or such other legal period of time as determined by the Board in its discretion)), but in any event no later than the Option Expiration Date.

6.5 **Transferability of Options**. During the lifetime of the Participant, an Option shall be exercisable only by the Participant or the Participant's guardian or legal representative. An Option shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution; provided, however, that to the extent permitted by the Board, in its discretion, and set forth in the Award Agreement evidencing such Option, a Nonstatutory Stock Option shall be assignable or transferable subject to the applicable limitations, if any, described in Rule 701 under the Securities Act and the General Instructions to Form S-8 Registration Statement under the Securities Act. Notwithstanding the foregoing, for so long as the Company is relying on the exemption provided by Rule 12h-1(f) under the Exchange Act, no Option or, prior to its exercise, the shares to be issued upon the exercise of the Option, shall be transferred except in compliance with the restrictions on transfer under Rule 12h-1(f) (including the requirement under such rule that any permitted transferee may not further transfer the Option) or be made subject to any short position, "put equivalent position" or "call equivalent position" by the Participant, as such terms are defined in Rule 16a-1 of the Exchange Act.

7. **RESTRICTED STOCK AWARDS.**

Restricted Stock Awards shall be evidenced by Award Agreements specifying whether the Award is a Restricted Stock Bonus or a Restricted Stock Purchase Right and the number of shares of Stock subject to the Award, in such form as the Board shall establish. Such

Award Agreements may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

7.1 **Types of Restricted Stock Awards Authorized**. Restricted Stock Awards may be granted in the form of either a Restricted Stock Bonus or a Restricted Stock Purchase Right. Restricted Stock Awards may be granted upon such conditions as the Board shall determine, including, without limitation, upon the attainment of one or more performance goals.

7.2 **Purchase Price**. The purchase price for shares of Stock issuable under each Restricted Stock Purchase Right shall be established by the Board in its discretion. No monetary payment (other than applicable tax withholding) shall be required as a condition of receiving shares of Stock pursuant to a Restricted Stock Bonus, the consideration for which shall be services actually rendered to a Participating Company or for its benefit. Notwithstanding the foregoing, if required by applicable state corporate law, the Participant shall furnish consideration in the form of cash or past services rendered to a Participating Company or for its benefit having a value not less than the par value of the shares of Stock subject to a Restricted Stock Award.

7.3 **Purchase Period**. A Restricted Stock Purchase Right shall be exercisable within a period established by the Board, which shall in no event exceed thirty (30) days from the effective date of the grant of the Restricted Stock Purchase Right.

7.4 **Payment of Purchase Price**. Except as otherwise provided below, payment of the purchase price for the number of shares of Stock being purchased pursuant to any Restricted Stock Purchase Right shall be made (a) in cash, by check or in cash equivalent, (b) by such other consideration as may be approved by the Board from time to time to the extent permitted by applicable law, or (c) by any combination thereof.

7.5 **Vesting and Restrictions on Transfer**. Shares issued pursuant to any Restricted Stock Award may (but need not) be made subject to Vesting Conditions based upon the satisfaction of such Service requirements, conditions, restrictions or performance criteria, as shall be established by the Board and set forth in the Award Agreement evidencing such Award. During any period in which shares acquired pursuant to a Restricted Stock Award remain subject to Vesting Conditions, such shares may not be sold, exchanged, transferred, pledged, assigned or otherwise disposed of other than pursuant to an Ownership Change Event or as provided in Section 7.8. The Board, in its discretion, may provide in any Award Agreement evidencing a Restricted Stock Award that, if the satisfaction of Vesting Conditions with respect to any shares subject to such Restricted Stock Award would otherwise occur on a day on which the sale of such shares would violate the provisions of the Trading Compliance Policy, then satisfaction of the Vesting Conditions automatically shall be determined on the next trading day on which the sale of such shares would not violate the Trading Compliance Policy. Upon request by the Company, each Participant shall execute any agreement evidencing such transfer restrictions prior to the receipt of shares of Stock hereunder and shall promptly present to the Company any and all certificates representing shares of Stock acquired hereunder for the placement on such certificates of appropriate legends evidencing any such transfer restrictions.

7.6 **Voting Rights; Dividends and Distributions**. Except as provided in this Section, Section 7.5 and any Award Agreement, during any period in which shares acquired pursuant to a Restricted Stock Award remain subject to Vesting Conditions, the Participant shall have all of the rights of a stockholder of the Company holding shares of Stock, including the right to vote such shares and to receive all dividends and other distributions paid with respect to such shares; provided, however, that if so determined by the Board and provided by the Award Agreement, such dividends and distributions shall be subject to the same Vesting Conditions as the shares subject to the Restricted Stock Award with respect to which such dividends or distributions were paid, and otherwise shall be paid no later than the end of the calendar year in which such dividends or distributions are paid to stockholders (or, if later, the 15th day of the third month following the date such dividends or distributions are paid to stockholders). In the event of a dividend or distribution paid in shares of Stock or other property or any other adjustment made upon a change in the capital structure of the Company as described in Section 4.3, any and all new, substituted or additional securities or other property (other than regular, periodic cash dividends) to which the Participant is entitled by reason of the Participant's Restricted Stock Award shall be immediately subject to the same Vesting Conditions as the shares subject to the Restricted Stock Award with respect to which such dividends or distributions were paid or adjustments were made.

7.7 **Effect of Termination of Service**. Unless otherwise provided by the Board in the Award Agreement evidencing a Restricted Stock Award, if a Participant's Service terminates for any reason, whether voluntary or involuntary (including the Participant's death or disability), then (a) the Company shall have the option to repurchase for the purchase price paid by the Participant any shares acquired by the Participant pursuant to a Restricted Stock Purchase Right which remain subject to Vesting Conditions as of the date of the Participant's termination of Service and (b) the Participant shall forfeit to the Company any shares acquired by the Participant pursuant to a Restricted Stock Bonus which remain subject to Vesting Conditions as of the date of the Participant's termination of Service. The Company shall have the right to assign at any time any repurchase right it may have, whether or not such right is then exercisable, to one or more persons as may be selected by the Company.

7.8 **Nontransferability of Restricted Stock Award Rights**. Rights to acquire shares of Stock pursuant to a Restricted Stock Award shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or the laws of descent and distribution. All rights with respect to a Restricted Stock Award granted to a Participant hereunder shall be exercisable during his or her lifetime only by such Participant or the Participant's guardian or legal representative.

8. **RESTRICTED STOCK UNITS.**

Restricted Stock Unit Awards shall be evidenced by Award Agreements specifying the number of Restricted Stock Units subject to the Award, in such form as the Board shall establish. Award Agreements evidencing Restricted Stock Units may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

8.1 **Grant of Restricted Stock Unit Awards**.Restricted Stock Unit Awards may be granted upon such conditions as the Board shall determine, including, without limitation, upon the attainment of one or more performance goals established by the Board.

8.2 **Purchase Price**. No monetary payment (other than applicable tax withholding, if any) shall be required as a condition of receiving a Restricted Stock Unit Award, the consideration for which shall be services actually rendered to a Participating Company or for its benefit. Notwithstanding the foregoing, if required by applicable state corporate law, the Participant shall furnish consideration in the form of cash or past services rendered to a Participating Company or for its benefit having a value not less than the par value of the shares of Stock issued upon settlement of the Restricted Stock Unit Award.

8.3 **Vesting**. Restricted Stock Unit Awards may (but need not) be made subject to Vesting Conditions based upon the satisfaction of such Service requirements, conditions, restrictions or performance criteria as shall be established by the Board and set forth in the Award Agreement evidencing such Award. The Board, in its discretion, may provide in any Award Agreement evidencing a Restricted Stock Unit Award that, if the satisfaction of Vesting Conditions with respect to any shares subject to the Award would otherwise occur on a day on which the sale of such shares would violate the provisions of the Trading Compliance Policy, then the satisfaction of the Vesting Conditions automatically shall be determined on the first to occur of (a) the next trading day on which the sale of such shares would not violate the Trading Compliance Policy or (b) the last day of the calendar year in which the original vesting date occurred.

8.4 **Voting Rights, Dividend Equivalent Rights and Distributions**. Participants shall have no voting rights with respect to shares of Stock represented by Restricted Stock Units until the date of the issuance of such shares (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company). However, the Board, in its discretion, may provide in the Award Agreement evidencing any Restricted Stock Unit Award that the Participant shall be entitled to Dividend Equivalent Rights with respect to the payment of cash dividends on Stock during the period beginning on the date such Award is granted and ending, with respect to each share subject to the Award, on the earlier of the date the Award is settled or the date on which it is terminated. Dividend Equivalent Rights, if any, shall be paid by crediting the Participant with a cash amount or with additional whole Restricted Stock Units as of the date of payment of such cash dividends on Stock, as determined by the Board. The number of additional Restricted Stock Units (rounded to the nearest whole number), if any, to be credited shall be determined by dividing (a) the amount of cash dividends paid on the dividend payment date with respect to the number of shares of Stock represented by the Restricted Stock Units previously credited to the Participant by (b) the Fair Market Value per share of Stock on such date. Such cash amount or additional Restricted Stock Units shall be subject to the same terms and conditions and shall be settled in the same manner and at the same time as the Restricted Stock Units originally subject to the Restricted Stock Unit Award. In the event of a dividend or distribution paid in shares of Stock or other property or any other adjustment made upon a change in the capital structure of the Company as described in Section 4.3, appropriate adjustments shall be made in the Participant's Restricted Stock Unit Award so that it represents the right to receive upon settlement any and all new, substituted or additional securities or other property (other than regular, periodic cash dividends) to which the Participant would be entitled

by reason of the shares of Stock issuable upon settlement of the Award, and all such new, substituted or additional securities or other property shall be immediately subject to the same Vesting Conditions as are applicable to the Award.

8.5 **Effect of Termination of Service**. Unless otherwise provided by the Board and set forth in the Award Agreement evidencing a Restricted Stock Unit Award, if a Participant's Service terminates for any reason, whether voluntary or involuntary (including the Participant's death or disability), then the Participant shall forfeit to the Company any Restricted Stock Units pursuant to the Award which remain subject to Vesting Conditions as of the date of the Participant's termination of Service.

8.6 **Settlement of Restricted Stock Unit Awards**. The Company shall issue to a Participant on the date on which Restricted Stock Units subject to the Participant's Restricted Stock Unit Award vest or on such other date determined by the Board in compliance with Section 409A, if applicable, and set forth in the Award Agreement one (1) share of Stock (and/or any other new, substituted or additional securities or other property pursuant to an adjustment described in Section 8.4) for each Restricted Stock Unit then becoming vested or otherwise to be settled on such date, subject to the withholding of applicable taxes, if any. If permitted by the Board, the Participant may elect, consistent with the requirements of Section 409A, to defer receipt of all or any portion of the shares of Stock or other property otherwise issuable to the Participant pursuant to this Section, and such deferred issuance date(s) and amount(s) elected by the Participant shall be set forth in the Award Agreement. Notwithstanding the foregoing, the Board, in its discretion, may provide for settlement of any Restricted Stock Unit Award by payment to the Participant in cash of an amount equal to the Fair Market Value on the payment date of the shares of Stock or other property otherwise issuable to the Participant pursuant to this Section.

8.7 **Nontransferability of Restricted Stock Unit Awards**. The right to receive shares pursuant to a Restricted Stock Unit Award shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution. For so long as the Company is relying on an order of the Securities and Exchange Commission (the "***SEC***") under Section 12(h) of the Exchange Act or a no-action position of the Staff of the SEC relieving the Company from registration under Section 12(g) of the Exchange Act of the Units and the shares of Stock subject thereto, no Restricted Stock Unit Award, or prior to its settlement, shares of Stock underlying such Award, shall be transferred except in compliance with the restrictions on transfer under Rule 12h-1(f) under the Exchange Act that would apply were the Restricted Stock Units subject to such rule (including the requirement under such rule that any permitted transferee may not further transfer the securities) or be made subject to any short position, "put equivalent position" or "call equivalent position" by the Participant, as such terms are defined in Rule 16a-1 under the Exchange Act. All rights with respect to a Restricted Stock Unit Award granted to a Participant hereunder shall be exercisable during his or her lifetime only by such Participant or the Participant's guardian or legal representative.

9. **STANDARD FORMS OF AWARD AGREEMENTS.**

9.1 **Award Agreements**. Each Award shall comply with and be subject to the terms and conditions set forth in the appropriate form of Award Agreement approved by the Board and as amended from time to time. No Award or purported Award shall be a valid and binding obligation of the Company unless evidenced by a fully executed Award Agreement, which execution may be evidenced by electronic means.

9.2 **Authority to Vary Terms**. The Board shall have the authority from time to time to vary the terms of any standard form of Award Agreement either in connection with the grant or amendment of an individual Award or in connection with the authorization of a new standard form or forms; *provided, however*, that the terms and conditions of any such new, revised or amended standard form or forms of Award Agreement are not inconsistent with the terms of the Plan.

10. **CHANGE IN CONTROL.**

10.1 **Effect of Change in Control on Awards**. Subject to the requirements and limitations of Section 409A, if applicable, the Board may provide for any one or more of the following:

(a) **Accelerated Vesting**. In its discretion, the Board may provide in the grant of any Award or at any other time may take action it deems appropriate to provide for acceleration of the exercisability, vesting and/or settlement in connection with a Change in Control of each or any outstanding Award or portion thereof and shares acquired pursuant thereto upon such conditions, including termination of the Participant's Service prior to, upon, or following the Change in Control, and to such extent as the Board determines. Further, unless otherwise provided by the applicable Award Agreement or determined by the Board and subject to Section 12.2(c), in the event that the Acquiror (as defined below) elects not to assume, continue or substitute for, in accordance with Section 10.1(b), any portion of an Award outstanding immediately prior to the Change in Control, the exercisability and/or vesting of such portion of the Award held by a Participant whose Service has not terminated prior to the Change in Control shall be accelerated in full effective as of a date prior to, but conditioned upon, the consummation of the Change in Control, such effective date to be as determined by the Board.

(b) **Assumption, Continuation or Substitution of Awards**. In the event of a Change in Control, the surviving, continuing, successor, or purchasing corporation or other business entity or parent thereof, as the case may be (the "***Acquiror***"), may, without the consent of any Participant, assume or continue the Company's rights and obligations under each or any Award or portion thereof outstanding immediately prior to the Change in Control or substitute for each or any such outstanding Award or portion thereof a substantially equivalent award with respect to the Acquiror's stock. For purposes of this Section, if so determined by the Board, in its discretion, an Award or any portion thereof shall be deemed assumed if, following the Change in Control, the Award confers the right to receive, subject to the terms and conditions of the Plan and the applicable Award Agreement, for each share of Stock subject to such portion of the Award immediately prior to the Change in Control, the consideration (whether stock, cash, other securities or property or a combination thereof) to which a holder of a share of Stock on the

effective date of the Change in Control was entitled (and if holders were offered a choice of consideration, the type of consideration chosen by the holders of a majority of the outstanding shares of Stock); *provided, however*, that if such consideration is not solely common stock of the Acquiror, the Board may, with the consent of the Acquiror, provide for the consideration to be received upon the exercise or settlement of the Award, for each share of Stock subject to the Award, solely common stock of the Acquiror equal in Fair Market Value to the per share consideration received by holders of Stock pursuant to the Change in Control. If any portion of such consideration may be received by holders of Stock pursuant to the Change in Control on a contingent or delayed basis, the Board may, in its discretion, determine such Fair Market Value per share as of the time of the Change in Control on the basis of the Board's good faith estimate of the present value of the probable future payment of such consideration. Any Award or portion thereof which is neither assumed or continued by the Acquiror in connection with the Change in Control nor exercised as of the time of consummation of the Change in Control shall terminate and cease to be outstanding effective as of the time of consummation of the Change in Control. Notwithstanding the foregoing, shares acquired upon exercise of an Award prior to the Change in Control and any consideration received pursuant to the Change in Control with respect to such shares shall continue to be subject to all applicable provisions of the Award Agreement evidencing such Award except as otherwise provided in such Award Agreement.

(c) **Cash-Out of Outstanding Awards**. The Board may, in its sole discretion and without the consent of any Participant, determine that, upon the occurrence of a Change in Control, each or any Award outstanding immediately prior to the Change in Control shall be canceled in exchange for a payment with respect to each vested share (and each unvested share, if so determined by the Board) of Stock subject to such canceled Award in (i) cash, (ii) stock of the Company or of a corporation or other business entity a party to the Change in Control, or (iii) other property which, in any such case, shall be in an amount having a Fair Market Value equal to the Fair Market Value of the consideration to be paid per share of Stock in the Change in Control over the exercise price per share under such Award (the "***Spread***"). In the event such determination is made by the Board, the Spread (reduced by applicable withholding taxes, if any) shall be paid to Participants in respect of their canceled Awards as soon as practicable following the date of the Change in Control and in respect of the unvested portion of their canceled Awards in accordance with the vesting schedule applicable to such Awards as in effect prior to the Change in Control.

10.2 **Federal Excise Tax Under Section 4999 of the Code.**

(a) **Excess Parachute Payment**. If any acceleration of vesting pursuant to an Award and any other payment or benefit received or to be received by a Participant would subject the Participant to any excise tax pursuant to Section 4999 of the Code due to the characterization of such acceleration of vesting, payment or benefit as an "excess parachute payment" under Section 280G of the Code, then, provided such election would not subject the Participant to taxation under Section 409A, the Participant may elect to reduce the amount of any acceleration of vesting called for under the Award in order to avoid such characterization.

(b) **Determination by Tax Firm**. To aid the Participant in making any election called for under Section 10.2(a), no later than the date of the occurrence of any event that might reasonably be anticipated to result in an "excess parachute payment" to the Participant

as described in Section 10.2(a), the Company shall request a determination in writing by the professional firm engaged by the Company for general tax purposes, or, if the tax firm so engaged by the Company is serving as accountant or auditor for the Acquiror, the Company will appoint a nationally recognized tax firm to make the determinations required by this Section (the "***Tax Firm***"). As soon as practicable thereafter, the Tax Firm shall determine and report to the Company and the Participant the amount of such acceleration of vesting, payments and benefits which would produce the greatest after-tax benefit to the Participant. For the purposes of such determination, the Tax Firm may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code. The Company and the Participant shall furnish to the Tax Firm such information and documents as the Tax Firm may reasonably request in order to make its required determination. The Company shall bear all fees and expenses the Tax Firm may charge in connection with its services contemplated by this Section.

11. **TAX WITHHOLDING**.

11.1 **Tax Withholding in General**. The Company shall have the right to deduct from any and all payments made under the Plan, or to require the Participant, through payroll withholding, cash payment or otherwise, to make adequate provision for, the federal, state, local and foreign taxes (including social insurance), if any, required by law to be withheld by any Participating Company with respect to an Award or the shares acquired pursuant thereto. The Company shall have no obligation to deliver shares of Stock, to release shares of Stock from an escrow established pursuant to an Award Agreement, or to make any payment in cash under the Plan until the Participating Company Group's tax withholding obligations have been satisfied by the Participant.

11.2 **Withholding in or Directed Sale of Shares**. The Company shall have the right, but not the obligation, to deduct from the shares of Stock issuable to a Participant upon the exercise, vesting or settlement of an Award, or to accept from the Participant the tender of, a number of whole shares of Stock having a Fair Market Value, as determined by the Company, equal to all or any part of the tax withholding obligations of any Participating Company. The Fair Market Value of any shares of Stock withheld or tendered to satisfy any such tax withholding obligations shall not exceed the amount determined by the applicable minimum statutory withholding rates. The Company may require a Participant to direct a broker, upon the vesting, exercise or settlement of an Award, to sell a portion of the shares subject to the Award determined by the Company in its discretion to be sufficient to cover the tax withholding obligations of any Participating Company and to remit an amount equal to such tax withholding obligations to the Participating Company in cash.

12. **COMPLIANCE WITH SECTION 409A**.

12.1 **In General**. The Plan and all Awards granted hereunder are intended to comply with, or otherwise be exempt from, Section 409A. The Plan and all Awards granted under the Plan shall be administered, interpreted, and construed in a manner consistent with Section 409A, as determined by the Company in good faith, to the extent necessary to avoid the imposition of additional taxes under Section 409A(a)(1)(B) of the Code. It is intended that any election, payment or benefit which is made or provided pursuant to or in connection with any

Award that may result in deferred compensation within the meaning of Section 409A shall comply in all respects with the applicable requirements of Section 409A.

12.2 **Certain Limitations**. With respect to any Award that is subject to Section 409A, the following shall apply, as applicable:

(a) Notwithstanding anything to the contrary in the Plan or any Award Agreement, to the extent required to avoid tax penalties under Section 409A, amounts that would otherwise be payable and benefits that would otherwise be provided pursuant to the Plan on account of, and during the six (6) month period immediately following, the Participant's termination of Service shall instead be paid on the first payroll date after the six-month anniversary of the Participant's separation from service (or the Participant's death, if earlier).

(b) Neither any Participant nor the Company shall take any action to accelerate or delay the payment of any amount or benefits under an Award in any manner which would not be in compliance with Section 409A.

(c) Notwithstanding anything to the contrary in the Plan or any Award Agreement, to the extent that any amount constituting deferred compensation subject to Section 409A would become payable under the Plan by reason of a Change in Control, such amount shall become payable only if the event constituting the Change in Control would also constitute a change in ownership or effective control of the Company or a change in the ownership of a substantial portion of the assets of the Company within the meaning of Section 409A. Any Award which constitutes deferred compensation subject to Section 409A and which would vest and otherwise become payable upon a Change in Control as a result of the failure of the Acquiror to assume, continue or substitute for such Award in accordance with Section 10.1(b) shall vest to the extent provided by such Award but shall be converted automatically at the effective time of such Change in Control into a right to receive, in cash on the date or dates such award would have been settled in accordance with its then existing settlement schedule, an amount or amounts equal in the aggregate to the intrinsic value of the Award at the time of the Change in Control.

(d) Should any provision of the Plan, any Award Agreement, or any other agreement or arrangement contemplated by the Plan be found not to comply with, or otherwise be exempt from, the provisions of Section 409A, such provision shall be modified and given effect (retroactively if necessary), in the sole discretion of the Board, and without the consent of the holder of the Award, in such manner as the Board determines to be necessary or appropriate to comply with, or to effectuate an exemption from, Section 409A.

(e) Notwithstanding the foregoing, neither the Company nor the Board shall have any obligation to take any action to prevent the assessment of any tax or penalty on any Participant under Section 409A, and neither the Company nor the Board will have any liability to any Participant for such tax or penalty.

13. **COMPLIANCE WITH SECURITIES LAW**.

The grant of Awards and the issuance of shares of Stock pursuant to any Award shall be subject to compliance with all applicable requirements of federal, state and foreign law

with respect to such securities and the requirements of any stock exchange or market system upon which the Stock may then be listed. In addition, no Award may be exercised or shares issued pursuant to an Award unless (a) a registration statement under the Securities Act shall at the time of such exercise or issuance be in effect with respect to the shares issuable pursuant to the Award or (b) in the opinion of legal counsel to the Company, the shares issuable pursuant to the Award may be issued in accordance with the terms of an applicable exemption from the registration requirements of the Securities Act. Except as otherwise determined by the Board, the Company intends that securities issued pursuant to the Plan be exempt from requirements of registration and qualification of such securities pursuant to the exemptions afforded by Rule 701 promulgated under the Securities Act and Section 25102(o) of the California Corporations Code or any other applicable exemptions, and the Plan shall be so construed. The inability of the Company to obtain from any regulatory body having jurisdiction the authority, if any, deemed by the Company's legal counsel to be necessary to the lawful issuance and sale of any shares hereunder shall relieve the Company of any liability in respect of the failure to issue or sell such shares as to which such requisite authority shall not have been obtained. As a condition to issuance of any Stock, the Company may require the Participant to satisfy any qualifications that may be necessary or appropriate, to evidence compliance with any applicable law or regulation and to make any representation or warranty with respect thereto as may be requested by the Company.

14. **AMENDMENT OR TERMINATION OF PLAN**.

The Board may amend, suspend or terminate the Plan at any time. However, without the approval of the Company's stockholders, there shall be (a) no increase in the maximum aggregate number of shares of Stock that may be issued under the Plan (except by operation of the provisions of Sections 4.1(b), 4.2, and 4.3), (b) no change in the class of persons eligible to receive Incentive Stock Options, and (c) no other amendment of the Plan that would require approval of the Company's stockholders under any applicable law, regulation or rule, including the rules of any stock exchange or quotation system upon which the Stock may then be listed or quoted. No amendment, suspension or termination of the Plan shall affect any then outstanding Award unless expressly provided by the Board. Except as provided by the next sentence, no amendment, suspension or termination of the Plan may have a materially adverse effect on any then outstanding Award without the consent of the Participant. Notwithstanding any other provision of the Plan or any Award Agreement to the contrary, the Board may, in its sole and absolute discretion and without the consent of any Participant, amend the Plan or any Award Agreement, to take effect retroactively or otherwise, as it deems necessary or advisable for the purpose of conforming the Plan or such Award Agreement to any present or future law, regulation or rule applicable to the Plan, including, but not limited to, Section 409A.

15. **MISCELLANEOUS PROVISIONS**.

15.1 **Restrictions on Transfer of Shares.**

(a) Shares issued under the Plan may be subject to a right of first refusal, one or more repurchase options, or other conditions and restrictions as determined by the Board in its discretion at the time the Award is granted. The Company shall have the right to assign at any time any repurchase right it may have, whether or not such right is then exercisable, to one

or more persons as may be selected by the Company. Upon request by the Company, each Participant shall execute any agreement evidencing such transfer restrictions prior to the receipt of shares of Stock hereunder and shall promptly present to the Company any and all certificates representing shares of Stock acquired hereunder for the placement on such certificates of appropriate legends evidencing any such transfer restrictions.

(b) Notwithstanding the provisions of any Award Agreement to the contrary, at any time prior to the date on which the Stock is listed on a national securities exchange (as such term is used in the Exchange Act) or is traded on the over-the-counter market and prices therefore are published daily on business days in a recognized financial journal, the Board may prohibit any Participant who acquires shares of Stock pursuant to the Plan or any transferee of such Participant from selling, transferring, assigning, pledging, or otherwise disposing of or encumbering any such shares (each, a "***Transfer***") without the prior written consent of the Board. The Board may withhold consent to any Transfer for any reason, including without limitation any Transfer (i) to any individual or entity identified by the Company as a potential competitor or considered by the Company to be unfriendly, or (ii) if such Transfer increases the risk of the Company having a class of security held of record by such number of persons as would require the Company to register any class of securities under the Exchange Act; or (iii) if such Transfer would result in the loss of any federal or state securities law exemption relied upon by the Company in connection with the initial issuance of such shares or the issuance of any other securities; or (iv) if such Transfer is facilitated in any manner by any public posting, message board, trading portal, Internet site, or similar method of communication, including without limitation any trading portal or Internet site intended to facilitate secondary transfers of securities; or (v) if such Transfer is to be effected in a brokered transaction; or (vi) if such Transfer would be of less than all of the shares of Stock then held by the stockholder and its affiliates or is to be made to more than a single transferee.

15.2 **Forfeiture Events**. The Board may determine that the Participant's rights, payments, and benefits with respect to an Award shall be subject to reduction, cancellation, forfeiture, or recoupment upon the occurrence of specified events, in addition to any otherwise applicable vesting or performance conditions of an Award. Such events may include, but shall not be limited to, termination of Service for Cause, any act by a Participant, whether before or after termination of Service, that would constitute Cause for termination of Service, or any accounting restatement due to material noncompliance of the Company with any financial reporting requirements of securities laws as a result of which, and to the extent that, such reduction, cancellation, forfeiture, or recoupment is required by applicable securities laws.

15.3 **Provision of information**. To the extent required by applicable law, copies of the Company's balance sheet and income statement for the just completed fiscal year shall be made available to each Participant and purchaser of shares of Stock upon the exercise of an Award. In addition, the Company shall deliver to each Participant such additional disclosures as are required in accordance with Rule 701 under the Securities Act. Notwithstanding the foregoing, at any time the Company is relying on the exemption provided by Rule 12h-1(f) under the Exchange Act, the Company shall provide to the applicable Participants the information described in Securities Act Rules 701(e)(3), (4) and (5) by a method allowed under Rule 12h- 1(f)(1)(vi) and in accordance with the requirements of Rule 12h-1(f)(1)(vi); *provided* that the

Participant agrees to keep the information confidential until the Company becomes subject to the reporting requirements of Section 13 or Section 15(d) of the Exchange Act.

15.4 **Rights as Employee, Consultant or Director**. No person, even though eligible pursuant to Section 5, shall have a right to be selected as a Participant, or, having been so selected, to be selected again as a Participant. Nothing in the Plan or any Award granted under the Plan shall confer on any Participant a right to remain an Employee, Consultant or Director or interfere with or limit in any way any right of a Participating Company to terminate the Participant's Service at any time. To the extent that an Employee of a Participating Company other than the Company receives an Award under the Plan, that Award shall in no event be understood or interpreted to mean that the Company is the Employee's employer or that the Employee has an employment relationship with the Company.

15.5 **Rights as a Stockholder**. A Participant shall have no rights as a stockholder with respect to any shares covered by an Award until the date of the issuance of such shares (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company). No adjustment shall be made for dividends, distributions or other rights for which the record date is prior to the date such shares are issued, except as provided in Section 4.3 or another provision of the Plan.

15.6 **Delivery of Title to Shares**. Subject to any governing rules or regulations, the Company shall issue or cause to be issued the shares of Stock acquired pursuant to an Award and shall deliver such shares to or for the benefit of the Participant by means of one or more of the following: (a) by delivering to the Participant evidence of book entry shares of Stock credited to the account of the Participant, (b) by depositing such shares of Stock for the benefit of the Participant with any broker with which the Participant has an account relationship, or (c) by delivering such shares of Stock to the Participant in certificate form.

15.7 **Fractional Shares**. The Company shall not be required to issue fractional shares upon the exercise or settlement of any Award.

15.8 **Retirement and Welfare Plans**. Neither Awards made under this Plan nor shares of Stock or cash paid pursuant to such Awards may be included as "compensation" for purposes of computing the benefits payable to any Participant under any Participating Company's retirement plans (both qualified and non-qualified) or welfare benefit plans unless such other plan expressly provides that such compensation shall be taken into account in computing a Participant's benefits.

15.9 **Severability**. If any one or more of the provisions (or any part thereof) of this Plan shall be held invalid, illegal or unenforceable in any respect, such provision shall be modified so as to make it valid, legal and enforceable, and the validity, legality and enforceability of the remaining provisions (or any part thereof) of the Plan shall not in any way be affected or impaired thereby.

15.10 **No Constraint on Corporate Action**. Nothing in this Plan shall be construed to: (a) limit, impair, or otherwise affect the Company's or another Participating Company's right or power to make adjustments, reclassifications, reorganizations, or changes of

its capital or business structure, or to merge or consolidate, or dissolve, liquidate, sell, or transfer all or any part of its business or assets; or (b) limit the right or power of the Company or another Participating Company to take any action which such entity deems to be necessary or appropriate.

15.11 **Unfunded Obligation**. Participants shall have the status of general unsecured creditors of the Company. Any amounts payable to Participants pursuant to the Plan shall be considered unfunded and unsecured obligations for all purposes, including, without limitation, Title I of the Employee Retirement Income Security Act of 1974. No Participating Company shall be required to segregate any monies from its general funds, or to create any trusts, or establish any special accounts with respect to such obligations. The Company shall retain at all times beneficial ownership of any investments, including trust investments, which the Company may make to fulfill its payment obligations hereunder. Any investments or the creation or maintenance of any trust or any Participant account shall not create or constitute a trust or fiduciary relationship between the Board or any Participating Company and a Participant, or otherwise create any vested or beneficial interest in any Participant or the Participant's creditors in any assets of any Participating Company. The Participants shall have no claim against any Participating Company for any changes in the value of any assets which may be invested or reinvested by the Company with respect to the Plan.

15.12 **Choice of Law**. Except to the extent governed by applicable federal law, the validity, interpretation, construction and performance of the Plan and each Award Agreement shall be governed by the laws of the State of Delaware, without regard to its conflict of law rules.

15.13 **Grants Prior to Amendment and Restatement of Plan**. Notwithstanding anything in the Plan to the contrary, Awards granted prior to the Effective Date shall continue to be governed by the terms of the Plan as in effect when such Awards were granted.

15.14 **Stockholder Approval**. Any increase in the maximum aggregate number of shares of Stock issuable thereunder as provided in Section 4 (the "***Authorized Shares***") shall be approved by a majority of the outstanding securities of the Company entitled to vote within the period beginning twelve (12) months before and ending twelve (12) months after the date of adoption thereof by the Board. Awards granted prior to security holder approval of the Authorized Shares previously approved by the security holders shall become exercisable no earlier than the date of security holder approval of such increase in the Authorized Shares, and such Awards shall be rescinded if such security holder approval is not received in the manner described in the preceding sentence.

PLAN HISTORY

April 12, 2007	Board adopts Plan, with an initial reserve of 500,000 shares.
April 25, 2007	Stockholders of the Company approve Plan.
December 5, 2007	Board approves an amendment to increase the reserve to 2,250,000 shares.
December 5, 2007	Stockholders of the Company approve an amendment to increase to the reserve to 2,250,000 shares.
July 13, 2010	Board approves an amendment to increase the reserve to 3,792,000 shares.
July 13, 2010	Stockholders of the Company approve an amendment to increase to the reserve to 3,792,000 shares.
March 16, 2011	Board approves an amendment to increase the reserve to 7,822,000 shares.
March 9, 2012	Stockholders of the Company approve an amendment to increase to the reserve to 7,822,000 shares.
March 9, 2012	Board amends and restates the Plan to take into account changes under California Corporations Code Section 25102(o).
May 15, 2013	Board approves an amendment to increase the reserve to 13,470,812 shares.
May 15, 2013	Stockholders of the Company approve an amendment to increase to the reserve to 13,470,812 shares.
March 5, 2014	Board approves an amendment to increase the reserve to 16,219,000 shares.
March 5, 2014	Stockholders of the Company approve an amendment to increase to the reserve to 16,219,000 shares.
July 10, 2014	Board amends and restates the Plan, which includes adopting an “evergreen” provision, renaming the Plan the “2014 Stock Plan” and extending the term of the Plan until ten (10) years from date of stockholder approval.
August 14, 2014	Stockholders approve amended and restated Plan.
January 1, 2015	Reserve automatically increases to 19,447,999 shares pursuant to the Plan’s “evergreen” provision.
March 30, 2015	Board approves an amendment to increase the reserve to 27,681,002 shares.
March 30, 2015	Stockholders of the Company approve an amendment to increase the reserve to 27,681,002 shares.

ATYR PHARMA, INC.
NOTICE OF GRANT OF STOCK OPTION

The Participant has been granted an option (the "***Option***") to purchase shares of Stock of aTyr Pharma, Inc. pursuant to the aTyr Pharma, Inc. 2014 Stock Plan (the "***Plan***"), as follows:

Participant: _____

Date of Grant: _____

Number of Option Shares: _____, subject to adjustment as provided by the Option Agreement.

Exercise Price: $_____

Initial Vesting Date: _____, 201__

Option Expiration Date: The date ten (10) years after the Date of Grant.

Tax Status of Option: _____ Stock Option. (Enter "Incentive" or "Nonstatutory." If blank, this Option will be a Nonstatutory Stock Option.)

Vested Shares: Except as provided in the Stock Option Agreement, the number of Vested Shares (disregarding any resulting fractional share) as of any date is determined by multiplying the Number of Option Shares by the "***Vested Ratio***" determined as of such date as follows:

	Vested Ratio
Prior to Initial Vesting Date	0
On Initial Vesting Date, provided the Participant's Service has not terminated prior to such date	1/6
Plus	
For each additional full month of the Participant's continuous Service from Initial Vesting Date until the Vested Ratio equals 1/1, an additional	1/72

The Exercise Price represents an amount the Company believes to be no less than the fair market value of a share of Stock as of the Date of Grant, determined in good faith in compliance with the requirements of Section 409A of the Code (***Section 409A***"). However, there is no guarantee that the Internal Revenue Service will agree with the Company's determination. A subsequent IRS determination that the Exercise Price is less than such fair market value could result in adverse tax consequences to the Participant. By signing below, the Participant agrees that the Company, its directors, officers and shareholders shall not be held liable for any tax, penalty, interest or cost incurred by the Participant as a result of such determination by the IRS. The Participant is urged to consult with his or her own tax advisor regarding the tax consequences of the Option, including the application of Section 409A.

By their signatures below, the Company and the Participant agree that the Option is governed by this Grant Notice and by the provisions of the Plan and the Stock Option Agreement, both of which are attached to and made a part of this document. The Participant acknowledges receipt of copies of the Plan and the Stock Option Agreement, represents that the Participant has read and is familiar with their provisions, and hereby accepts the Option subject to all of their terms and conditions.

ATYR PHARMA, INC.

By: _____

Its: _____

Address: 3545 John Hopkins Court
Suite 250
San Diego, CA 92121

PARTICIPANT

_____
Signature

_____
Date

_____
Address

ATTACHMENTS: 2014 Stock Plan, as amended to the Date of Grant; Stock Option Agreement and Exercise Notice

ATYR PHARMA, INC.
NOTICE OF GRANT OF STOCK OPTION
(Double-Trigger)

The Participant has been granted an option (the "***Option***") to purchase shares of Stock of aTyr Pharma, Inc. pursuant to the aTyr Pharma, Inc. 2014 Stock Plan (the "***Plan***"), as follows:

Participant: _____

Date of Grant: _____

Number of Option Shares: _____, subject to adjustment as provided by the Option Agreement.

Exercise Price: $_____

Initial Vesting Date: _____, 201__

Option Expiration Date: The date ten (10) years after the Date of Grant.

Tax Status of Option: _____ Stock Option. (Enter "Incentive" or "Nonstatutory." If blank, this Option will be a Nonstatutory Stock Option.)

Vested Shares: Except as provided in the Stock Option Agreement, the number of Vested Shares (disregarding any resulting fractional share) as of any date is determined by multiplying the Number of Option Shares by the "***Vested Ratio***" determined as of such date as follows:

	Vested Ratio
Prior to Initial Vesting Date	0
On Initial Vesting Date, provided the Participant's Service has not terminated prior to such date	1/6
Plus	
For each additional full month of the Participant's continuous Service from Initial Vesting Date until the Vested Ratio equals 1/1, an additional	1/72
Notwithstanding the foregoing, if a Change in Control occurs and the Participant experiences a Termination After Change in Control, the Vested Ration shall be	1/1

The Exercise Price represents an amount the Company believes to be no less than the fair market value of a share of Stock as of the Date of Grant, determined in good faith in compliance with the requirements of Section 409A of the Code (***Section 409A***"). However, there is no guarantee that the Internal Revenue Service will agree with the Company's determination. A subsequent IRS determination that the Exercise Price is less than such fair market value could result in adverse tax consequences to the Participant. By signing below, the Participant agrees that the Company, its directors, officers and shareholders shall not be held liable for any tax, penalty, interest or cost incurred by the Participant as a result of such determination by the IRS. The Participant is urged to consult with his or her own tax advisor regarding the tax consequences of the Option, including the application of Section 409A.

By their signatures below, the Company and the Participant agree that the Option is governed by this Grant Notice and by the provisions of the Plan and the Stock Option Agreement, both of which are attached to and made a part of this document. The Participant acknowledges receipt of copies of the Plan and the Stock Option Agreement, represents that the Participant has read and is familiar with their provisions, and hereby accepts the Option subject to all of their terms and conditions.

ATYR PHARMA, INC.

By: _____

Its: _____

Address: 3545 John Hopkins Court
Suite 250
San Diego, CA 92121

PARTICIPANT

_____
Signature

_____
Date

_____
Address

ATTACHMENTS: 2014 Stock Plan, as amended to the Date of Grant; Stock Option Agreement and Exercise Notice

ATYR PHARMA, INC.
NOTICE OF GRANT OF STOCK OPTION
(Double-Trigger)

The Participant has been granted an option (the "***Option***") to purchase shares of Stock of aTyr Pharma, Inc. pursuant to the aTyr Pharma, Inc. 2014 Stock Plan (the "***Plan***"), as follows:

Participant: _____

Date of Grant: _____

Number of Option Shares: _____, subject to adjustment as provided by the Option Agreement.

Exercise Price: $_____

Initial Vesting Date: _____, 201__

Option Expiration Date: The date ten (10) years after the Date of Grant.

Tax Status of Option: _____ Stock Option. (Enter "Incentive" or "Nonstatutory." If blank, this Option will be a Nonstatutory Stock Option.)

Vested Shares: Except as provided in the Stock Option Agreement, the number of Vested Shares (disregarding any resulting fractional share) as of any date is determined by multiplying the Number of Option Shares by the "***Vested Ratio***" determined as of such date as follows:

	Vested Ratio
Prior to Initial Vesting Date	0
For each additional full month of the Participant's continuous Service from Initial Vesting Date until the Vested Ratio equals 1/1, an additional	1/72
Notwithstanding the foregoing, if a Change in Control occurs and the Participant experiences a Termination After Change in Control, the Vested Ration shall be	1/1

The Exercise Price represents an amount the Company believes to be no less than the fair market value of a share of Stock as of the Date of Grant, determined in good faith in compliance with the requirements of Section 409A of the Code (***Section 409A***"). However, there is no guarantee that the Internal Revenue Service will agree with the Company's determination. A subsequent IRS determination that the Exercise Price is less than such fair market value could result in adverse tax consequences to the Participant. By signing below, the Participant agrees that the Company, its directors, officers and shareholders shall not be held liable for any tax, penalty, interest or cost incurred by the Participant as a result of such determination by the IRS. The Participant is urged to consult with his or her own tax advisor regarding the tax consequences of the Option, including the application of Section 409A.

By their signatures below, the Company and the Participant agree that the Option is governed by this Grant Notice and by the provisions of the Plan and the Stock Option Agreement, both of which are attached to and made a part of this document. The Participant acknowledges receipt of copies of the Plan and the Stock Option Agreement, represents that the Participant has read and is familiar with their provisions, and hereby accepts the Option subject to all of their terms and conditions.

ATYR PHARMA, INC.

By: _____

Its: _____

Address: 3545 John Hopkins Court
Suite 250
San Diego, CA 92121

PARTICIPANT

_____
Signature

_____
Date

_____
Address

ATTACHMENTS: 2014 Stock Plan, as amended to the Date of Grant; Stock Option Agreement and Exercise Notice

ATYR PHARMA, INC.
NOTICE OF GRANT OF STOCK OPTION

The Participant has been granted an option (the *"**Option**"*) to purchase shares of Stock of aTyr Pharma, Inc. pursuant to the aTyr Pharma, Inc. 2014 Stock Plan (the *"**Plan**"*), as follows:

Participant:	_____
Date of Grant:	_____
Number of Option Shares:	_____, subject to adjustment as provided by the Option Agreement.
Exercise Price:	$_____
Initial Vesting Date:	_____, 201__
Option Expiration Date:	The date ten (10) years after the Date of Grant.
Tax Status of Option:	_____ Stock Option. (Enter "Incentive" or "Nonstatutory." If blank, this Option will be a Nonstatutory Stock Option.)
Vested Shares:	Except as provided in the Stock Option Agreement, the number of Vested Shares (disregarding any resulting fractional share) as of any date is determined by multiplying the Number of Option Shares by the *"**Vested Ratio**"* determined as of such date as follows:

	Vested Ratio
Prior to and on Initial Vesting Date	0
For each additional full month of the Participant's continuous Service from Initial Vesting Date until the Vested Ratio equals 1/1, an additional	1/72

The Exercise Price represents an amount the Company believes to be no less than the fair market value of a share of Stock as of the Date of Grant, determined in good faith in compliance with the requirements of Section 409A of the Code (***Section 409A***"). However, there is no guarantee that the Internal Revenue Service will agree with the Company's determination. A subsequent IRS determination that the Exercise Price is less than such fair market value could result in adverse tax consequences to the Participant. By signing below, the Participant agrees that the Company, its directors, officers and shareholders shall not be held liable for any tax, penalty, interest or cost incurred by the Participant as a result of such determination by the IRS. The Participant is urged to consult with his or her own tax advisor regarding the tax consequences of the Option, including the application of Section 409A.

By their signatures below, the Company and the Participant agree that the Option is governed by this Grant Notice and by the provisions of the Plan and the Stock Option Agreement, both of which are attached to and made a part of this document. The Participant acknowledges receipt of copies of the Plan and the Stock Option Agreement, represents that the Participant has read and is familiar with their provisions, and hereby accepts the Option subject to all of their terms and conditions.

ATYR PHARMA, INC.	PARTICIPANT
By: _____	_____
	Signature
Its: _____	_____
	Date
Address: 3545 John Hopkins Court Suite 250 San Diego, CA 92121	_____
	Address
	_____

ATTACHMENTS: 2014 Stock Plan, as amended to the Date of Grant; Stock Option Agreement and Exercise Notice

THE SECURITIES WHICH ARE THE SUBJECT OF THIS AGREEMENT HAVE NOT BEEN QUALIFIED WITH THE COMMISSIONER OF CORPORATIONS OF THE STATE OF CALIFORNIA AND THE ISSUANCE OF SUCH SECURITIES OR THE PAYMENT OR RECEIPT OF ANY PART OF THE CONSIDERATION THEREFOR PRIOR TO SUCH QUALIFICATION IS UNLAWFUL, UNLESS THE SALE OF SECURITIES IS EXEMPT FROM QUALIFICATION BY SECTION 25100, 25102, OR 25105 OF THE CALIFORNIA CORPORATIONS CODE. THE RIGHTS OF ALL PARTIES TO THIS AGREEMENT ARE EXPRESSLY CONDITIONED UPON SUCH QUALIFICATION BEING OBTAINED, UNLESS THE SALE IS SO EXEMPT.

THE SECURITIES WHICH ARE THE SUBJECT OF THIS AGREEMENT HAVE BEEN ACQUIRED FOR INVESTMENT AND NOT WITH A VIEW TO, OR IN CONNECTION WITH, THE SALE OR DISTRIBUTION THEREOF. NO SUCH SALE OR DISPOSITION MAY BE EFFECTED WITHOUT AN EFFECTIVE REGISTRATION STATEMENT RELATED THERETO OR AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH REGISTRATION IS NOT REQUIRED UNDER THE SECURITIES ACT OF 1933.

ATYR PHARMA, INC.
STOCK OPTION AGREEMENT

aTyr Pharma, Inc. has granted to the Participant named in the *Notice of Grant of Stock Option* (the *"**Grant Notice**"*) to which this Stock Option Agreement (the *"**Option Agreement**"*) is attached an option (the *"**Option**"*) to purchase shares of Stock upon the terms and conditions set forth in the Grant Notice and this Option Agreement. The Option has been granted pursuant to and shall in all respects be subject to the terms and conditions of the aTyr Pharma, Inc. 2014 Stock Plan (the *"**Plan**"*), as amended to the Date of Grant, the provisions of which are incorporated herein by reference. By signing the Grant Notice, the Participant: (a) acknowledges receipt of, and represents that the Participant has read and is familiar with the terms and conditions of, the Grant Notice, this Option Agreement and the Plan, (b) accepts the Option subject to all of the terms and conditions of the Grant Notice, this Option Agreement and the Plan, and (c) agrees to accept as binding, conclusive and final all decisions or interpretations of the Board upon any questions arising under the Grant Notice, this Option Agreement or the Plan.

1. **DEFINITIONS AND CONSTRUCTION.**

1.1 **Definitions.** Unless otherwise defined herein, capitalized terms shall have the meanings assigned to such terms in the Grant Notice or the Plan.

1.2 **Construction.** Captions and titles contained herein are for convenience only and shall not affect the meaning or interpretation of any provision of this Option Agreement. Except when otherwise indicated by the context, the singular shall include the plural and the plural shall include the singular. Use of the term "or" is not intended to be exclusive, unless the context clearly requires otherwise.

2. **Tax Consequences.**

2.1 **Tax Status of Option.** This Option is intended to have the tax status designated in the Grant Notice.

(a) ***Incentive Stock Option.*** If the Grant Notice so designates, this Option is intended to be an Incentive Stock Option within the meaning of Section 422(b) of the Code, but the Company does not represent or warrant that this Option qualifies as such. The Participant should consult with the Participant's own tax advisor regarding the tax effects of this Option and the requirements necessary to obtain favorable income tax treatment under Section 422 of the Code, including, but not limited to, holding period requirements. (NOTE TO PARTICIPANT: If the Option is exercised more than three (3) months after the date on which you cease to be an Employee (other than by reason of your death or permanent and total disability as defined in Section 22(e)(3) of the Code), the Option will be treated as a Nonstatutory Stock Option and not as an Incentive Stock Option to the extent required by Section 422 of the Code.)

(b) ***Nonstatutory Stock Option.*** If the Grant Notice so designates, this Option is intended to be a Nonstatutory Stock Option and shall not be treated as an Incentive Stock Option within the meaning of Section 422(b) of the Code.

2.2 **ISO Fair Market Value Limitation.** *If the Grant Notice designates this Option as an Incentive Stock Option,* then to the extent that the Option (together with all Incentive Stock Options granted to the Participant under all stock option plans of the Participating Company Group, including the Plan) becomes exercisable for the first time during any calendar year for shares having a Fair Market Value greater than One Hundred Thousand Dollars ($100,000), the portion of such options which exceeds such amount will be treated as Nonstatutory Stock Options. For purposes of this Section, options designated as Incentive Stock Options are taken into account in the order in which they were granted, and the Fair Market Value of stock is determined as of the time the option with respect to such stock is granted. If the Code is amended to provide for a different limitation from that set forth in this Section, such different limitation shall be deemed incorporated herein effective as of the date required or permitted by such amendment to the Code. If the Option is treated as an Incentive Stock Option in part and as a Nonstatutory Stock Option in part by reason of the limitation set forth in this Section, the Participant may designate which portion of such Option the Participant is exercising. In the absence of such designation, the Participant shall be deemed to have exercised the Incentive Stock Option portion of the Option first. Separate certificates representing each such portion shall be issued upon the exercise of the Option. (NOTE TO PARTICIPANT: If the aggregate Exercise Price of the Option (that is, the Exercise Price multiplied by the Number of Option Shares) plus the aggregate exercise price of any other Incentive Stock Options you hold (whether granted pursuant to the Plan or any other stock option plan of the Participating Company Group) is greater than $100,000, you should contact the Chief Financial Officer of the Company to ascertain whether the entire Option qualifies as an Incentive Stock Option.)

3. **ADMINISTRATION.**

All questions of interpretation concerning the Grant Notice, this Option Agreement, the Plan or any other form of agreement or other document employed by the Company in the administration of the Plan or the Option shall be determined by the Board. All such determinations by the Board shall be final, binding and conclusive upon all persons having an interest in the Option, unless fraudulent or made in bad faith. Any and all actions, decisions and determinations taken or made by the Board in the exercise of its discretion pursuant to the Plan or the Option or other agreement thereunder (other than determining questions of interpretation pursuant to the preceding sentence) shall be final, binding and conclusive upon all persons having an interest in the Option. Any Officer shall have the authority to act on behalf of the Company with respect to any matter, right, obligation, or election which is the responsibility of or which is allocated to the Company herein, provided the Officer has apparent authority with respect to such matter, right, obligation, or election.

4. **EXERCISE OF THE OPTION.**

4.1 **Right to Exercise**. Except as otherwise provided herein, the Option shall be exercisable on and after the Initial Vesting Date and prior to the termination of the Option (as provided in Section 6) in an amount not to exceed the number of Vested Shares less the number of shares previously acquired upon exercise of the Option, subject to the Company's repurchase rights set forth in Sections 11 and 12. In no event shall the Option be exercisable for more shares than the Number of Option Shares, as adjusted pursuant to Section 9.

4.2 **Method of Exercise.** Exercise of the Option shall be by means of electronic or written notice (the *"**Exercise Notice**"*) in a form authorized by the Company. An electronic Exercise Notice must be digitally signed or authenticated by the Participant in such manner as required by the notice and transmitted to the Company or an authorized representative of the Company (including a third-party administrator designated by the Company). In the event that the Participant is not authorized or is unable to provide an electronic Exercise Notice, the Option shall be exercised by a written Exercise Notice addressed to the Company, signed by the Participant and delivered in person, by certified or registered mail, return receipt requested, by confirmed facsimile transmission, or by such other means as the Company may permit, to the Company, or an authorized representative of the Company (including a third-party administrator designated by the Company). Each Exercise Notice, whether electronic or written, must state the Participant's election to exercise the Option, the number of whole shares of Stock for which the Option is being exercised and such other representations and agreements as to the Participant's investment intent with respect to such shares as may be required pursuant to the provisions of this Option Agreement. Further, each Exercise Notice must be received by the Company prior to the termination of the Option as set forth in Section 6 and must be accompanied by full payment of the aggregate Exercise Price for the number of shares of Stock being purchased. The Option shall be deemed to be exercised upon receipt by the Company of such electronic or written Exercise Notice and the aggregate Exercise Price.

4.3 **Payment of Exercise Price.**

(a) ***Forms of Consideration Authorized*.** Except as otherwise provided below, payment of the aggregate Exercise Price for the number of shares of Stock for which the Option is being exercised shall be made (i) in cash, by check or in cash equivalent, (ii) if permitted by the Company and subject to the limitations contained in Section 4.3(b), by means of (1) a Stock Tender Exercise, (2) a Cashless Exercise or (3) a Net-Exercise; or (iii) by any combination of the foregoing.

(b) ***Limitations on Forms of Consideration.*** The Company reserves, at any and all times, the right, in the Company's sole and absolute discretion, to establish, decline to approve or terminate any program or procedure providing for payment of the Exercise Price through any of the means described below, including with respect to the Participant notwithstanding that such program or procedures may be available to others.

(i) **Stock Tender Exercise.** A *"**Stock Tender Exercise**"* means the delivery of a properly executed Exercise Notice accompanied by (1) the Participant's tender to the Company, or attestation to the ownership, in a form acceptable to the Company of whole shares of Stock having a Fair Market Value that does not exceed the aggregate Exercise Price for the shares with respect to which the Option is exercised, and (2) the Participant's payment to the Company in cash of the remaining balance of such aggregate Exercise Price not satisfied by such shares' Fair Market Value. A Stock Tender Exercise shall not be permitted if it would constitute a violation of the provisions of any law, regulation or agreement restricting the redemption of the Company's stock. If required by the Company, the Option may not be exercised by tender to the Company, or attestation to the ownership, of shares of Stock unless such shares either have been owned by the Participant for a period of time required by the Company (and not used for another option exercise by attestation during such period) or were not acquired, directly or indirectly, from the Company.

(ii) **Cashless Exercise.** A Cashless Exercise shall be permitted only upon the class of shares subject to the Option becoming publicly traded in an established securities market. A *"**Cashless Exercise**"* means the delivery of a properly executed Exercise Notice together with irrevocable instructions to a broker in a form acceptable to the Company providing for the assignment to the Company of the proceeds of a sale or loan with respect to shares of Stock acquired upon the exercise of the Option in an amount not less than the aggregate Exercise Price for such shares (including, without limitation, through an exercise complying with the provisions of Regulation T as promulgated from time to time by the Board of Governors of the Federal Reserve System).

(iii) **Net-Exercise.** A *"**Net-Exercise**"* means the delivery of a properly executed Exercise Notice electing a procedure pursuant to which (1) the Company will reduce the number of shares otherwise issuable to the Participant upon the exercise of the Option by the largest whole number of shares having a Fair Market Value that does not exceed the aggregate Exercise Price for the shares with respect to which the Option is exercised, and (2) the Participant shall pay to the Company in cash the remaining balance of such aggregate Exercise Price not satisfied by such reduction in the number of whole shares to be issued. Following a Net-Exercise, the number of shares remaining subject to the Option, if any, shall be reduced by

the sum of (1) the net number of shares issued to the Participant upon such exercise, and (2) the number of shares deducted by the Company for payment of the aggregate Exercise Price.

4.4 **Tax Withholding.**

(a) ***In General.*** At the time the Option is exercised, in whole or in part, or at any time thereafter as requested by a Participating Company, the Participant hereby authorizes withholding from payroll and any other amounts payable to the Participant, and otherwise agrees to make adequate provision for any sums required to satisfy the federal, state, local and foreign tax (including social insurance) withholding obligations of the Participating Company Group, if any, which arise in connection with the Option. The Company shall have no obligation to deliver shares of Stock until the tax withholding obligations of the Participating Company Group have been satisfied by the Participant.

(b) ***Withholding in or Directed Sale of Shares.*** The Company shall have the right, but not the obligation, to require the Participant to satisfy all or any portion of a Participating Company's tax withholding obligations upon exercise of the Option by deducting from the shares of Stock otherwise issuable to the Participant upon such exercise a number of whole shares having a fair market value, as determined by the Company as of the date of exercise, not in excess of the amount of such tax withholding obligations determined by the applicable minimum statutory withholding rates. The Company may require the Participant to direct a broker, upon the exercise of the Option, to sell a portion of the shares subject to the Option determined by the Company in its discretion to be sufficient to cover the tax withholding obligations of any Participating Company and to remit an amount equal to such tax withholding obligations to the Company in cash.

4.5 **Beneficial Ownership of Shares; Certificate Registration.** Except in the event the Exercise Price is paid by means of a Cashless Exercise, the Participant hereby authorizes the Company, in its sole discretion, to deposit for the benefit of the Participant with any broker with which the Participant has an account relationship of which the Company has notice any or all shares acquired by the Participant pursuant to the exercise of the Option. Except as provided by the preceding sentence, a certificate for the shares as to which the Option is exercised shall be registered in the name of the Participant, or, if applicable, in the names of the heirs of the Participant.

4.6 **Restrictions on Grant of the Option and Issuance of Shares.** The grant of the Option and the issuance of shares of Stock upon exercise of the Option shall be subject to compliance with all applicable requirements of federal, state or foreign law with respect to such securities. The Option may not be exercised if the issuance of shares of Stock upon exercise would constitute a violation of any applicable federal, state or foreign securities laws or other law or regulations or the requirements of any stock exchange or market system upon which the Stock may then be listed. In addition, the Option may not be exercised unless (i) a registration statement under the Securities Act shall at the time of exercise of the Option be in effect with respect to the shares issuable upon exercise of the Option or (ii) in the opinion of legal counsel to the Company, the shares issuable upon exercise of the Option may be issued in accordance with the terms of an applicable exemption from the registration requirements of the Securities Act. THE PARTICIPANT IS CAUTIONED THAT THE OPTION MAY NOT BE EXERCISED

UNLESS THE FOREGOING CONDITIONS ARE SATISFIED. ACCORDINGLY, THE PARTICIPANT MAY NOT BE ABLE TO EXERCISE THE OPTION WHEN DESIRED EVEN THOUGH THE OPTION IS VESTED. The inability of the Company to obtain from any regulatory body having jurisdiction the authority, if any, deemed by the Company's legal counsel to be necessary to the lawful issuance and sale of any shares subject to the Option shall relieve the Company of any liability in respect of the failure to issue or sell such shares as to which such requisite authority shall not have been obtained. As a condition to the exercise of the Option, the Company may require the Participant to satisfy any qualifications that may be necessary or appropriate, to evidence compliance with any applicable law or regulation and to make any representation or warranty with respect thereto as may be requested by the Company.

4.7 **Fractional Shares.** The Company shall not be required to issue fractional shares upon the exercise of the Option.

5. **NONTRANSFERABILITY OF THE OPTION.**

During the lifetime of the Participant, the Option shall be exercisable only by the Participant or the Participant's guardian or legal representative. The Option shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution. Following the death of the Participant, the Option, to the extent provided in Section 7, may be exercised by the Participant's legal representative or by any person empowered to do so under the deceased Participant's will or under the then applicable laws of descent and distribution. Notwithstanding the foregoing, for so long as the Company is relying on the exemption provided by Rule 12h-1(f) under the Exchange Act, the Option and, prior to its exercise, the shares to be issued upon the exercise of the Option, shall not be transferred except in compliance with the restrictions on transfer under Rule 12h-1(f) (including the requirement under such rule that any permitted transferee may not further transfer the Option) or be made subject to any short position, "put equivalent position" or "call equivalent position" by the Participant, as such terms are defined in Rule 16a-1 of the Exchange Act.

6. **TERMINATION OF THE OPTION.**

The Option shall terminate and may no longer be exercised after the first to occur of (a) the close of business on the Option Expiration Date, (b) the close of business on the last date for exercising the Option following termination of the Participant's Service as described in Section 7, or (c) a Change in Control to the extent provided in Section 8.

7. **EFFECT OF TERMINATION OF SERVICE.**

7.1 **Option Exercisability.** The Option shall terminate immediately upon the Participant's termination of Service to the extent that it is then unvested and shall be exercisable after the Participant's termination of Service to the extent it is then vested only during the applicable time period as determined below and thereafter shall terminate.

(a) ***Disability.*** If the Participant's Service terminates because of the Disability of the Participant, the Option, to the extent unexercised and exercisable for Vested

Shares on the date on which the Participant's Service terminated, may be exercised by the Participant (or the Participant's guardian or legal representative) at any time prior to the expiration of twelve (12) months after the date on which the Participant's Service terminated, but in any event no later than the Option Expiration Date.

(b) ***Death.*** If the Participant's Service terminates because of the death of the Participant, the Option, to the extent unexercised and exercisable for Vested Shares on the date on which the Participant's Service terminated, may be exercised by the Participant's legal representative or other person who acquired the right to exercise the Option by reason of the Participant's death at any time prior to the expiration of twelve (12) months after the date on which the Participant's Service terminated, but in any event no later than the Option Expiration Date. The Participant's Service shall be deemed to have terminated on account of death if the Participant dies within three (3) months after the Participant's termination of Service.

(c) ***Termination for Cause.*** Notwithstanding any other provision of this Option Agreement, if the Participant's Service is terminated for Cause, the Option shall terminate in its entirety and cease to be exercisable immediately upon such termination of Service.

(d) ***Other Termination of Service.*** If the Participant's Service terminates for any reason, except Disability, death or Cause, the Option, to the extent unexercised and exercisable for Vested Shares by the Participant on the date on which the Participant's Service terminated, may be exercised by the Participant at any time prior to the expiration of three (3) months after the date on which the Participant's Service terminated, but in any event no later than the Option Expiration Date.

7.2 **Extension if Exercise Prevented by Law.** Notwithstanding the foregoing other than termination of the Participant's Service for Cause, if the exercise of the Option within the applicable time periods set forth in Section 7.1 is prevented by the provisions of Section 4.6, the Option shall remain exercisable until the later of (a) thirty (30) days after the date such exercise first would no longer be prevented by such provisions or (b) the end of the applicable time period under Section 7.1, but in any event no later than the Option Expiration Date.

8. **EFFECT OF CHANGE IN CONTROL.**

In the event of a Change in Control, except to the extent that the Board determines to settle the Option in accordance with Section 9.1(c) of the Plan, the surviving, continuing, successor, or purchasing corporation or other business entity or parent thereof, as the case may be (the *"**Acquiror**"*), may, without the consent of the Participant, assume or continue in full force and effect the Company's rights and obligations under all or any portion of the Option or substitute for all or any portion of the Option a substantially equivalent option for the Acquiror's stock. For purposes of this Section, the Option or any portion thereof shall be deemed assumed if, following the Change in Control, the Option confers the right to receive, subject to the terms and conditions of the Plan and this Option Agreement, for each share of Stock subject to such portion of the Option immediately prior to the Change in Control, the consideration (whether stock, cash, other securities or property or a combination thereof) to which a holder of a share of Stock on the effective date of the Change in Control was entitled (and if holders were offered a

choice of consideration, the type of consideration chosen by the holders of a majority of the outstanding shares of Stock); provided, however, that if such consideration is not solely common stock of the Acquiror, the Board may, with the consent of the Acquiror, provide for the consideration to be received upon the exercise of the Option for each share of Stock to consist solely of common stock of the Acquiror equal in Fair Market Value to the per share consideration received by holders of Stock pursuant to the Change in Control. If any portion of such consideration may be received by holders of Stock pursuant to the Change in Control on a contingent or delayed basis, the Board may, in its discretion, determine such Fair Market Value per share as of the time of the Change in Control on the basis of the Board's good faith estimate of the present value of the probable future payment of such consideration. If the Acquiror elects not to so assume, continue or substitute for any portion of the Option in connection with the Change in Control, then provided that the Participant's Service has not terminated prior to the Change in Control such portion of the Option shall become immediately exercisable and vested in full as of a date determined by the Board that is prior to, but conditioned upon, the consummation of the Change in Control. The Option shall terminate and cease to be outstanding effective as of the time of consummation of the Change in Control to the extent that the Option is neither assumed or continued by the Acquiror in connection with the Change in Control nor exercised as of the time of the Change in Control. Notwithstanding the foregoing, shares acquired upon exercise of the Option prior to the Change in Control and any consideration received pursuant to the Change in Control with respect to such shares shall continue to be subject to all applicable provisions of this Option Agreement except as otherwise provided herein.

9. **ADJUSTMENTS FOR CHANGES IN CAPITAL STRUCTURE.**

Subject to any required action by the stockholders of the Company and the requirements of Sections 409A and 424 of the Code to the extent applicable, in the event of any change in the Stock effected without receipt of consideration by the Company, whether through merger, consolidation, reorganization, reincorporation, recapitalization, reclassification, stock dividend, stock split, reverse stock split, split-up, split-off, spin-off, combination of shares, exchange of shares, or similar change in the capital structure of the Company, or in the event of payment of a dividend or distribution to the stockholders of the Company in a form other than Stock (excepting normal cash dividends) that has a material effect on the Fair Market Value of shares of Stock, appropriate and proportionate adjustments shall be made in the number, Exercise Price and kind of shares subject to the Option, in order to prevent dilution or enlargement of the Participant's rights under the Option. For purposes of the foregoing, conversion of any convertible securities of the Company shall not be treated as "effected without receipt of consideration by the Company." Any fractional share resulting from an adjustment pursuant to this Section shall be rounded down to the nearest whole number, and the Exercise Price shall be rounded up to the nearest whole cent. In no event may the Exercise Price be decreased to an amount less than the par value, if any, of the stock subject to the Option. Such adjustments shall be determined by the Board, and its determination shall be final, binding and conclusive.

10. **RIGHTS AS A STOCKHOLDER, DIRECTOR, EMPLOYEE OR CONSULTANT.**

The Participant shall have no rights as a stockholder with respect to any shares covered by the Option until the date of the issuance of the shares for which the Option has been exercised

(as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company). No adjustment shall be made for dividends, distributions or other rights for which the record date is prior to the date the shares are issued, except as provided in Section 9. If the Participant is an Employee, the Participant understands and acknowledges that, except as otherwise provided in a separate, written employment agreement between a Participating Company and the Participant, the Participant's employment is "at will" and is for no specified term. Nothing in this Option Agreement shall confer upon the Participant any right to continue in the Service of a Participating Company or interfere in any way with any right of the Participating Company Group to terminate the Participant's Service as a Director, an Employee or Consultant, as the case may be, at any time.

11. **RIGHT OF FIRST REFUSAL.**

11.1 **Grant of Right of First Refusal.** Except as provided in Section 11.7 and Section 17 below, in the event the Participant, the Participant's legal representative, or other holder of shares acquired upon exercise of the Option proposes to sell, exchange, transfer, pledge, or otherwise dispose of any Shares (the *"**Transfer Shares**"*) to any person or entity, including, without limitation, any stockholder of a Participating Company, the Company shall have the right to repurchase the Transfer Shares under the terms and subject to the conditions set forth in this Section 11 (the *"**Right of First Refusal**"*).

11.2 **Notice of Proposed Transfer.** Prior to any proposed transfer of the Transfer Shares, the Participant shall deliver written notice (the *"**Transfer Notice**"*) to the Company describing fully the proposed transfer, including the number of Transfer Shares, the name and address of the proposed transferee (the *"**Proposed Transferee**"*) and, if the transfer is voluntary, the proposed transfer price, and containing such information necessary to show the bona fide nature of the proposed transfer. In the event of a bona fide gift or involuntary transfer, the proposed transfer price shall be deemed to be the Fair Market Value of the Transfer Shares, as determined by the Board in good faith. If the Participant proposes to transfer any Transfer Shares to more than one Proposed Transferee, the Participant shall provide a separate Transfer Notice for the proposed transfer to each Proposed Transferee. The Transfer Notice shall be signed by both the Participant and the Proposed Transferee and must constitute a binding commitment of the Participant and the Proposed Transferee for the transfer of the Transfer Shares to the Proposed Transferee subject only to the Right of First Refusal.

11.3 **Bona Fide Transfer.** If the Company determines that the information provided by the Participant in the Transfer Notice is insufficient to establish the bona fide nature of a proposed voluntary transfer, the Company shall give the Participant written notice of the Participant's failure to comply with the procedure described in this Section 11, and the Participant shall have no right to transfer the Transfer Shares without first complying with the procedure described in this Section 11. The Participant shall not be permitted to transfer the Transfer Shares if the proposed transfer is not bona fide.

11.4 **Exercise of Right of First Refusal.** If the Company determines the proposed transfer to be bona fide, the Company shall have the right to purchase all, but not less than all, of the Transfer Shares (except as the Company and the Participant otherwise agree) at the purchase price and on the terms set forth in the Transfer Notice by delivery to the Participant

of a notice of exercise of the Right of First Refusal within thirty (30) days after the date the Transfer Notice is delivered to the Company. The Company's exercise or failure to exercise the Right of First Refusal with respect to any proposed transfer described in a Transfer Notice shall not affect the Company's right to exercise the Right of First Refusal with respect to any proposed transfer described in any other Transfer Notice, whether or not such other Transfer Notice is issued by the Participant or issued by a person other than the Participant with respect to a proposed transfer to the same Proposed Transferee. If the Company exercises the Right of First Refusal, the Company and the Participant shall thereupon consummate the sale of the Transfer Shares to the Company on the terms set forth in the Transfer Notice within sixty (60) days after the date the Transfer Notice is delivered to the Company (unless a longer period is offered by the Proposed Transferee); provided, however, that in the event the Transfer Notice provides for the payment for the Transfer Shares other than in cash, the Company shall have the option of paying for the Transfer Shares by the present value cash equivalent of the consideration described in the Transfer Notice as reasonably determined by the Company. For purposes of the foregoing, cancellation of any indebtedness of the Participant to any Participating Company shall be treated as payment to the Participant in cash to the extent of the unpaid principal and any accrued interest canceled. Notwithstanding anything contained in this Section to the contrary, the period during which the Company may exercise the Right of First Refusal and consummate the purchase of the Transfer Shares from the Participant shall terminate no sooner than the completion of a period of eight (8) months following the date on which the Participant acquired the Transfer Shares upon exercise of the Option.

11.5 **Failure to Exercise Right of First Refusal.** If the Company fails to exercise the Right of First Refusal in full (or to such lesser extent as the Company and the Participant otherwise agree) within the period specified in Section 11.4 above, the Participant may conclude a transfer to the Proposed Transferee of the Transfer Shares on the terms and conditions described in the Transfer Notice, provided such transfer occurs not later than ninety (90) days following delivery to the Company of the Transfer Notice or, if applicable, following the end of the period described in the last sentence of Section 11.4. The Company shall have the right to demand further assurances from the Participant and the Proposed Transferee (in a form satisfactory to the Company) that the transfer of the Transfer Shares was actually carried out on the terms and conditions described in the Transfer Notice. No Transfer Shares shall be transferred on the books of the Company until the Company has received such assurances, if so demanded, and has approved the proposed transfer as bona fide. Any proposed transfer on terms and conditions different from those described in the Transfer Notice, as well as any subsequent proposed transfer by the Participant, shall again be subject to the Right of First Refusal and shall require compliance by the Participant with the procedure described in this Section 11.

11.6 **Transferees of Transfer Shares.** All transferees of the Transfer Shares or any interest therein, other than the Company, shall be required as a condition of such transfer to agree in writing (in a form satisfactory to the Company) that such transferee shall receive and hold such Transfer Shares or interest therein subject to all of the terms and conditions of this Option Agreement, including this Section 11 providing for the Right of First Refusal with respect to any subsequent transfer. Any sale or transfer of any shares acquired upon exercise of the Option shall be void unless the provisions of this Section 11 are met.

11.7 **Transfers Not Subject to Right of First Refusal.** The Right of First Refusal shall not apply to any transfer or exchange of the shares acquired upon exercise of the Option if such transfer or exchange is in connection with an Ownership Change Event. If the consideration received pursuant to such transfer or exchange consists of stock of a Participating Company, such consideration shall remain subject to the Right of First Refusal unless the provisions of Section 11.9 result in a termination of the Right of First Refusal.

11.8 **Assignment of Right of First Refusal.** The Company shall have the right to assign the Right of First Refusal at any time, whether or not there has been an attempted transfer, to one or more persons as may be selected by the Company.

11.9 **Early Termination of Right of First Refusal.** The other provisions of this Option Agreement notwithstanding, the Right of First Refusal shall terminate and be of no further force and effect upon (a) the occurrence of a Change in Control, unless the Acquiror assumes the Company's rights and obligations under the Option or substitutes a substantially equivalent option for the Acquiror's stock for the Option, or (b) the existence of a public market for the class of shares subject to the Right of First Refusal. A *"**public market**"* shall be deemed to exist if (i) such stock is listed on a national securities exchange (as that term is used in the Exchange Act) or (ii) such stock is traded on the over-the-counter market and prices therefor are published daily on business days in a recognized financial journal.

12. REPURCHASE OPTION.

12.1 **Grant of Repurchase Option.** In the event the Participant's Service is terminated for any reason or no reason, with or without cause, the Company shall have the right to repurchase the shares acquired upon exercise of this Option (the "***Shares***") under the terms and subject to the conditions set forth in this Section (the *"**Repurchase Option**"*).

12.2 **Exercise of Repurchase Option.** The Company may exercise the Repurchase Option by written notice to the Participant within ninety (90) days after (a) termination of the Participant's Service or (b) in the case of Shares issued upon exercise of this Option after termination of Service, within ninety (90) days after the date of exercise. If the Company fails to give notice within such ninety (90) day period, the Repurchase Option shall terminate unless the Company and the Participant have extended the time for the exercise of the Repurchase Option. The Repurchase Option may be exercised, if at all, for all or any portion of the Shares, as determined in the sole discretion of the Company.

12.3 **Payment for Shares and Return of Shares to Company.** The purchase price per Share being repurchased by the Company shall be an amount equal to the Fair Market Value of the Shares on the Participant's date of termination of Service (the *"**Repurchase Price**"*). The Company shall pay the aggregate Repurchase Price to the Participant in cash on or before the termination of the ninety (90) day period described in Section 12.2. The Shares being repurchased shall be delivered to the Company by the Participant at the same time as the delivery of the Repurchase Price to the Participant.

12.4 **Assignment of Repurchase Option.** The Company shall have the right to assign the Repurchase Option at any time, whether or not such option is then exercisable, to one or more persons as may be selected by the Company.

12.5 **Ownership Change Event.** Upon the occurrence of an Ownership Change Event, any and all new, substituted or additional securities or other property to which the Participant is entitled by reason of the Participant's ownership of Shares shall be immediately subject to the Repurchase Option and included in the terms "Stock" and "Shares" for all purposes of the Repurchase Option with the same force and effect as the Shares immediately prior to the Ownership Change Event. While the aggregate Repurchase Price shall remain the same after such Ownership Change Event, the Repurchase Price per Share upon exercise of the Repurchase Option following such Ownership Change Event shall be adjusted as appropriate.

12.6 Termination of Vested Share Repurchase Option. The Repurchase Option shall terminate and be of no further force and effect upon the existence of a public market (as defined in Section 11.9) for the class of shares subject to the Repurchase Option.

13. **STOCK DISTRIBUTIONS SUBJECT TO OPTION AGREEMENT.**

If, from time to time, there is any stock dividend, stock split or other change, as described in Section 9, in the character or amount of any of the outstanding stock of the corporation the stock of which is subject to the provisions of this Option Agreement, then in such event any and all new, substituted or additional securities to which the Participant is entitled by reason of the Participant's ownership of the shares acquired upon exercise of the Option shall be immediately subject to the Right of First Refusal with the same force and effect as the shares subject to the Right of First Refusal immediately before such event.

14. **NOTICE OF SALES UPON DISQUALIFYING DISPOSITION.**

The Participant shall dispose of the shares acquired pursuant to the Option only in accordance with the provisions of this Option Agreement. In addition, *if the Grant Notice designates this Option as an Incentive Stock Option,* the Participant shall (a) promptly notify the Chief Financial Officer of the Company if the Participant disposes of any of the shares acquired pursuant to the Option within one (1) year after the date the Participant exercises all or part of the Option or within two (2) years after the Date of Grant and (b) provide the Company with a description of the circumstances of such disposition. Until such time as the Participant disposes of such shares in a manner consistent with the provisions of this Option Agreement, unless otherwise expressly authorized by the Company, the Participant shall hold all shares acquired pursuant to the Option in the Participant's name (and not in the name of any nominee) for the one-year period immediately after the exercise of the Option and the two-year period immediately after Date of Grant. At any time during the one-year or two-year periods set forth above, the Company may place a legend on any certificate representing shares acquired pursuant to the Option requesting the transfer agent for the Company's stock to notify the Company of any such transfers. The obligation of the Participant to notify the Company of any such transfer shall continue notwithstanding that a legend has been placed on the certificate pursuant to the preceding sentence.

15. **LEGENDS.**

The Company may at any time place legends referencing the Right of First Refusal and any applicable federal, state or foreign securities law restrictions on all certificates representing shares of stock subject to the provisions of this Option Agreement. The Participant shall, at the request of the Company, promptly present to the Company any and all certificates representing shares acquired pursuant to the Option in the possession of the Participant in order to carry out the provisions of this Section. Unless otherwise specified by the Company, legends placed on such certificates may include, but shall not be limited to, the following:

15.1 "THE SECURITIES EVIDENCED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, AND MAY NOT BE SOLD, TRANSFERRED, ASSIGNED OR HYPOTHECATED UNLESS THERE IS AN EFFECTIVE REGISTRATION STATEMENT UNDER SUCH ACT COVERING SUCH SECURITIES, THE SALE IS MADE IN ACCORDANCE WITH RULE 144 OR RULE 701 UNDER THE ACT, OR THE COMPANY RECEIVES AN OPINION OF COUNSEL REASONABLY SATISFACTORY TO THE COMPANY, STATING THAT SUCH SALE, TRANSFER, ASSIGNMENT OR HYPOTHECATION IS EXEMPT FROM THE REGISTRATION AND PROSPECTUS DELIVERY REQUIREMENTS OF SUCH ACT."

15.2 "THE SHARES REPRESENTED BY THIS CERTIFICATE ARE SUBJECT TO CERTAIN RESTRICTIONS ON TRANSFER AND REPURCHASE OPTIONS IN FAVOR OF THE CORPORATION OR ITS ASSIGNEE SET FORTH IN AN AGREEMENT BETWEEN THE CORPORATION AND THE REGISTERED HOLDER, OR SUCH HOLDER''S PREDECESSOR IN INTEREST, A COPY OF WHICH IS ON FILE AT THE PRINCIPAL OFFICE OF THIS CORPORATION."

16. **LOCK-UP AGREEMENT.**

The Participant hereby agrees that in the event of any underwritten public offering of stock, including an initial public offering of stock, made by the Company pursuant to an effective registration statement filed under the Securities Act, the Participant shall not offer, sell, contract to sell, pledge, hypothecate, grant any option to purchase or make any short sale of, or otherwise dispose of any shares of stock of the Company or any rights to acquire stock of the Company for such period of time from and after the effective date of such registration statement as may be established by the underwriter for such public offering; provided, however, that such period of time shall not exceed one hundred eighty (180) days from the effective date of the registration statement to be filed in connection with such public offering; provided, further, however, that such one hundred eighty (180) day period may be extended for an additional period, not to exceed twenty (20) days, upon the request of the Company or the underwriter to accommodate regulatory restrictions on (i) the publication or other distribution of research reports and (ii) analyst recommendations and opinions, including but not limited to, the restrictions contained in NASD Rule 2711(f)(4) or NYSE Rule 472(f)(4), or any successor provisions or amendments thereto). The foregoing limitation shall not apply to shares registered in the public offering under the Securities Act. The Participant hereby agrees to enter into any agreement reasonably required by the underwriters to implement the foregoing within a reasonable timeframe if so requested by the Company.

17. **RESTRICTIONS ON TRANSFER OF SHARES.**

At any time prior to the existence of a public market for the Stock, the Board may prohibit the Participant and any transferee of such Participant from selling, transferring, assigning, pledging, or otherwise disposing of or encumbering any shares acquired pursuant to the Option (each, a *"**Transfer**"*) without the prior written consent of the Board. The Board may withhold consent for any reason, including without limitation any Transfer (i) to any individual or entity identified by the Company as a potential competitor or considered by the Company to be unfriendly, or (ii) if such Transfer increases the risk of the Company having a class of security held of record by such number of persons as would require the Company to register any class of securities under the Exchange Act; or (iii) if such Transfer would result in the loss of any federal or state securities law exemption relied upon by the Company in connection with the initial issuance of such shares or the issuance of any other securities; or (iv) if such Transfer is facilitated in any manner by any public posting, message board, trading portal, Internet site, or similar method of communication, including without limitation any trading portal or Internet site intended to facilitate secondary transfers of securities; or (v) if such Transfer is to be effected in a brokered transaction; or (vi) if such Transfer would be of less than all of the shares of Stock then held by the stockholder and its affiliates or is to be made to more than a single transferee. No shares acquired upon exercise of the Option may be sold, exchanged, transferred (including, without limitation, any transfer to a nominee or agent of the Participant), assigned, pledged, hypothecated or otherwise disposed of, including by operation of law in any manner which violates any of the provisions of this Option Agreement, and any such attempted disposition shall be void. The Company shall not be required (a) to transfer on its books any shares which will have been transferred in violation of any of the provisions set forth in this Option Agreement or (b) to treat as owner of such shares or to accord the right to vote as such owner or to pay dividends to any transferee to whom such shares will have been so transferred.

18. **MISCELLANEOUS PROVISIONS.**

18.1 **Termination or Amendment.** The Board may terminate or amend the Plan or the Option at any time; provided, however, that except as provided in Section 8 in connection with a Change in Control, no such termination or amendment may have a materially adversely effect on the Option or any unexercised portion hereof without the consent of the Participant unless such termination or amendment is necessary to comply with any applicable law or government regulation, including, but not limited to Section 409A of the Code. No amendment or addition to this Option Agreement shall be effective unless in writing.

18.2 **Compliance with Section 409A**. The Company intends that income realized by the Participant pursuant to the Plan and this Option Agreement will not be subject to taxation under Section 409A of the Code. The provisions of the Plan and this Option Agreement shall be interpreted and construed in favor of satisfying any applicable requirements of Section 409A of the Code. The Company, in its reasonable discretion, may amend (including retroactively) the Plan and this Agreement in order to conform to the applicable requirements of Section 409A of the Code, including amendments to facilitate the Participant's ability to avoid taxation under Section 409A of the Code. **However, the preceding provisions shall not be construed as a guarantee by the Company of any particular tax result for income realized by the Participant pursuant to the Plan or this Option Agreement.** In any event, and except

for the responsibilities of the Company set forth in Section 4.4, no Participating Company shall be responsible for the payment of any applicable taxes incurred by the Participant on income realized by the Participant pursuant to the Plan or this Option Agreement.

18.3 **Further Instruments.** The parties hereto agree to execute such further instruments and to take such further action as may reasonably be necessary to carry out the intent of this Option Agreement.

18.4 **Binding Effect.** This Option Agreement shall inure to the benefit of the successors and assigns of the Company and, subject to the restrictions on transfer set forth herein, be binding upon the Participant and the Participant's heirs, executors, administrators, successors and assigns.

18.5 **Delivery of Documents and Notices.** Any document relating to participation in the Plan, or any notice required or permitted hereunder shall be given in writing and shall be deemed effectively given (except to the extent that this Option Agreement provides for effectiveness only upon actual receipt of such notice) upon personal delivery, electronic delivery at the e-mail address, if any, provided for the Participant by a Participating Company, or upon deposit in the U.S. Post Office or foreign postal service, by registered or certified mail, or with a nationally recognized overnight courier service, with postage and fees prepaid, addressed to the other party at the address of such party set forth in the Grant Notice or at such other address as such party may designate in writing from time to time to the other party.

(a) **Description of Electronic Delivery.** The Plan documents, which may include but do not necessarily include: the Plan, the Grant Notice, this Option Agreement, and any reports of the Company provided generally to the Company's stockholders, may be delivered to the Participant electronically. In addition, if permitted by the Company, the Participant may deliver electronically the Grant Notice and Exercise Notice called for by Section 4.2 to the Company or to such third party involved in administering the Plan as the Company may designate from time to time. Such means of electronic delivery may include but do not necessarily include the delivery of a link to a Company intranet or the Internet site of a third party involved in administering the Plan, the delivery of the document via e-mail or such other means of electronic delivery specified by the Company.

(b) **Consent to Electronic Delivery.** The Participant acknowledges that the Participant has read Section 18.5(a) of this Option Agreement and consents to the electronic delivery of the Plan documents and, if permitted by the Company, the delivery of the Grant Notice and Exercise Notice, as described in Section 18.5(a). The Participant acknowledges that he or she may receive from the Company a paper copy of any documents delivered electronically at no cost to the Participant by contacting the Company by telephone or in writing. The Participant further acknowledges that the Participant will be provided with a paper copy of any documents if the attempted electronic delivery of such documents fails. Similarly, the Participant understands that the Participant must provide the Company or any designated third party administrator with a paper copy of any documents if the attempted electronic delivery of such documents fails. The Participant may revoke his or her consent to the electronic delivery of documents described in Section 18.5(a) or may change the electronic mail address to which such documents are to be delivered (if Participant has provided an electronic

mail address) at any time by notifying the Company of such revoked consent or revised e-mail address by telephone, postal service or electronic mail. Finally, the Participant understands that he or she is not required to consent to electronic delivery of documents described in Section 18.5(a).

18.6 **Integrated Agreement.** The Grant Notice, this Option Agreement and the Plan, together with any employment, service or other agreement with the Participant and a Participating Company referring to the Option, shall constitute the entire understanding and agreement of the Participant and the Participating Company Group with respect to the subject matter contained herein or therein and supersede any prior agreements, understandings, restrictions, representations, or warranties among the Participant and the Participating Company Group with respect to such subject matter. To the extent contemplated herein or therein, the provisions of the Grant Notice, the Option Agreement and the Plan shall survive any exercise of the Option and shall remain in full force and effect.

18.7 **Applicable Law.** This Option Agreement shall be governed by the laws of the State of California as such laws are applied to agreements between California residents entered into and to be performed entirely within the State of California.

18.8 **Counterparts.** The Grant Notice may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

✕ Incentive Stock Option
✕ Nonstatutory Stock Option

Participant: _____

Date: _____

STOCK OPTION EXERCISE NOTICE

aTyr Pharma, Inc.
Attention: Chief Financial Officer
3545 John Hopkins Court, Suite 250
San Diego, CA 92121

Ladies and Gentlemen:

1. **Option.** I was granted an option (the ***"Option"***) to purchase shares of the common stock (the ***"Shares"***) of aTyr Pharma, Inc. (the ***"Company"***) pursuant to the Company's 2014 Stock Plan (the ***"Plan"***), my Notice of Grant of Stock Option (the ***"Grant Notice"***) and my Stock Option Agreement (the ***"Option Agreement"***) as follows:

Date of Grant:	_____
Number of Option Shares:	_____
Exercise Price per Share:	$ _____

2. **Exercise of Option.** I hereby elect to exercise the Option to purchase the following number of Shares, all of which are Vested Shares, in accordance with the Grant Notice and the Option Agreement:

Total Shares Purchased:	_____
Total Exercise Price (Total Shares X Price per Share)	$ _____

3. **Payments.** I enclose payment in full of the total exercise price for the Shares in the following form(s), as authorized by my Option Agreement:

✕ Cash:	$ _____
✕ Check:	$ _____
✕ Stock Tender Exercise:	Contact Plan Administrator
✕ Cashless Exercise:	Contact Plan Administrator
✕ Net Exercise:	Contact Plan Administrator

4. **Tax Withholding.** I authorize payroll withholding and otherwise will make adequate provision for the federal, state, local and foreign tax withholding obligations of the Company, if any, in connection with the Option. If I am exercising a Nonstatutory Stock Option, I enclose payment in full of my withholding taxes, if any, as follows:

(Contact Plan Administrator for amount of tax due.)

✕ Cash:	$ _____
✕ Check:	$ _____

5. **Participant Information.**

My address is: _____

_____

My Social Security Number is: _____

6. **Notice of Disqualifying Disposition.** If the Option is an Incentive Stock Option, I agree that I will promptly notify the Chief Financial Officer of the Company if I transfer any of the Shares within one (1) year from the date I exercise all or part of the Option or within two (2) years of the Date of Grant.

7. **Binding Effect.** I agree that the Shares are being acquired in accordance with and subject to the terms, provisions and conditions of the Grant Notice, the Option Agreement, including the Right of First Refusal set forth therein, and the Plan, to all of which I hereby expressly assent. This Agreement shall inure to the benefit of and be binding upon my heirs, executors, administrators, successors and assigns.

8. **Transfer.** I understand and acknowledge that the Shares have not been registered under the Securities Act of 1933, as amended (the *"**Securities Act**"*), and that consequently the Shares must be held indefinitely unless they are subsequently registered under the Securities Act, an exemption from such registration is available, or they are sold in accordance with Rule 144 or Rule 701 under the Securities Act. I further understand and acknowledge that the Company is under no obligation to register the Shares. I understand that the certificate or certificates evidencing the Shares will be imprinted with legends which prohibit the transfer of the Shares unless they are registered or such registration is not required in the opinion of legal counsel satisfactory to the Company.

I am aware that Rule 144 under the Securities Act, which permits limited public resale of securities acquired in a nonpublic offering, is not currently available with respect to the Shares and, in any event, is available only if certain conditions are satisfied. I understand that any sale of the Shares that might be made in reliance upon Rule 144 may only be made in limited amounts in accordance with the terms and conditions of such rule and that a copy of Rule 144 will be delivered to me upon request.

I understand that I am purchasing the Shares pursuant to the terms of the Plan, the Grant Notice and my Option Agreement, copies of which I have received and carefully read and understand.

Very truly yours,

_____

(Signature)

Receipt of the above is hereby acknowledged.

aTyr Pharma, Inc.

By: _____

Title: _____

Dated: _____

Exhibit 10.3

EMPLOYMENT AGREEMENT

This Employment Agreement (this "Agreement") is made by and between aTyr Pharma, Inc., a Delaware corporation (the "Company"), and John D. Mendlein ("Employee").

WHEREAS, Employee has been providing services as a consultant to the Company since September 24, 2009;

WHEREAS, the Company desires to employ Employee and Employee desires to be employed by the Company on the terms contained herein; and

WHEREAS, the Company and Employee have simultaneously entered into that certain Restricted Stock Purchase Agreement (the "Restricted Stock Purchase Agreement");

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein contained and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

1. Term. The term of Employee's employment under this Agreement (hereafter referred to as the "Term") will commence on January 1, 2010 and will continue until terminated in accordance with Section 4. The parties agree that Employee will be treated as an employee, and not an independent contractor, of the Company during the Term. For the avoidance of doubt, Employee's employment will be "at will", will not be for any fixed term, and will be terminable by the Company or Employee at any time, with or without cause or notice, but subject in all events to the consequences set forth in this Agreement.

2. Title and Duties. During the Term, Employee will serve as the executive chairman of the Board of Directors of the Company (the "Board"). Employee agrees to devote for the first 18 months of the Term two days per week and thereafter for the remainder of the Term one day per week during normal working hours to the performance of his duties in accordance with the supervision and direction of the Company's Chief Executive Officer. Notwithstanding the foregoing, Employee may be an employee or consultant to one or more other entities, may serve on other boards of directors, and may engage in religious, charitable or other community activities as long as such services and activities (all such activities, "Employee's Other Work") do not materially interfere with Employee's performance of his duties to the Company and are not in violation of Section 7(e). During the Term, the Company's headquarters will be located in San Diego county, California.

3. Compensation and Benefits. As compensation for services performed by Employee during the Term, the Company will pay Employee as follows:

(a) Base Salary. Employee's annual base salary will initially be one hundred fifty thousand dollars ($150,000) for the first 18 months of the Term and one hundred thousand dollars ($100,000) after July 1, 2011, less applicable tax deductions and withholdings. Employee's base salary may be subject to increase (but not decrease except as part of, and on a pro rata percentage basis with, reductions by the Company of the annual base salary of its executive employees generally) as determined by the Board, from time to time. The base salary in effect at any given time is referred to herein as "Base Salary." The Base Salary will be

payable in periodic installments in accordance with the Company's usual practice for its senior executives. The parties hereby acknowledge and agree that on the Company's first regular payroll date after date of the last signature to this Agreement, the Company shall pay to Employee all unpaid Base Salary for January 1, 2010 through June 30, 2010, which the parties hereby agree is seventy-five thousand dollars ($75,000.00), less applicable tax deductions and withholdings.

(b) Bonus Compensation. The Board, in its sole discretion, will determine Employee's annual bonus ("Bonus"), if any, based on Employee's performance and the performance of the Company. Employee's target Bonus will be forty percent (40%) of the Base Salary, based upon achievement of reasonably attainable performance targets, with such amount subject to upward adjustment in the good faith determination of a majority of all members of the Board, excluding Employee (the "Other Directors"). Notwithstanding the foregoing, in lieu of some or all of any cash Bonus, Employee may elect to instead receive a grant of fully-vested shares of the Company's common stock (the "Stock Bonus Award"), the number of shares of which shall be determined in accordance with a formula set forth on Exhibit B hereto, unless an alternative formula is mutually agreed upon by Employee and a majority of the Other Directors. Such election shall be made within fifteen (15) days following the Board's determination of any such Bonus. The issuance of a Stock Bonus Award will be subject to applicable tax deductions and withholdings (including Employee's payment of any required withholding amounts) and other normal salary taxation and the Company will not provide a "gross up" payment to cover such taxes or withholding amounts or otherwise have any liability to Employee with respect thereto. The annual performance targets will be set by the Other Directors or, if so delegated by the Other Directors, by the Compensation Committee of the Board in good faith after consultation with Employee. Any Bonus will be payable no later than two months following the calendar year for which the Bonus was earned, or, if any portion of such Bonus is based upon financial milestones, such portion shall be paid within two months following the start of the calendar year following the calendar year to which such milestones apply, promptly following the availability of the Company's annual audited (or unaudited, as applicable) financial statements for such calendar year.

(b) Vacation. For the first 18 months of the Term, Employee will be entitled to 12 days of vacation per calendar year, and thereafter during the Term six days of vacation per calendar year, in each case to be taken at such times and intervals as will be determined by Employee, subject to the reasonable business needs of the Company. Any unused vacation days, holidays and sick days may be rolled-over or accumulated from calendar year to year and will be settled in cash upon any termination of Employee's employment; provided that no more than six days for any calendar year during the first 18 months of the Term, and no more than three days for any calendar year thereafter, may be rolled-over and accumulated per calendar year, with any excess days forfeited by Employee at year end. Vacation will otherwise be governed by the policies of the Company, as in effect from time to time.

(c) Health and Other Benefits. During the Term, Employee will be entitled to participate in any and all employee benefit plans from time to time in effect for Employees of the Company generally for which Employee is eligible. Such participation will be subject to the terms of the applicable plan documents and generally applicable Company policies. Without limiting the generality of the foregoing, (i) Employee will be entitled to receive medical, dental,

health and vision insurance coverage and a health savings account for himself and his immediate family (as defined below) on reasonable terms and in reasonable amounts, and (ii) the Company will promptly purchase and maintain on behalf of Employee with benefits payable to Employee a disability insurance plan which provides for annual payments in an amount equal to at least two-thirds (2/3) of the Base Salary in effect at the time of termination due to Disability (as defined below). The employee benefit plans, programs or arrangements in which Employee is entitled to participate at any given time as described in this Section 3(d) are referred to herein as "Employee Benefits." In addition, the Company will reimburse Employee for all unreimbursed fees and expenses (not to exceed $10,000 per calendar year) associated with the Executive Health Program at Scripps (or its substantial equivalent as may be selected by Employee); such reimbursement for the Executive Health Program at Scripps will not be treated as an "Employee Benefit" hereunder. For purposes of this Agreement, "immediate family" will mean Employee's existing spouse or non-spousal partner, and lineal descendants of Employee (including, without limitation, stepchildren and adopted children).

(d) Indemnification and Directors' and Officers' Insurance. During Employee's employment and for the period of time following termination of Employee for any reason during which time Employee could be subject to any claim based on his position in the Company, Employee will receive the maximum indemnification protection from the Company as permitted by the Company's by-laws and will receive directors' and officers' insurance coverage equivalent to that which is provided to any other director or officer of the Company (including mandatory advancement of expenses).

(e) Business Expenses. The Company will pay or reimburse Employee for all reasonable business expenses incurred or paid by Employee in the performance of his duties and responsibilities hereunder, subject to reasonable substantiation and documentation as may be specified by the Company from time to time. The Company acknowledges that due to Employee's medical condition, the foregoing reasonable business expenses shall include business or first class airfare for all flights over 60 minutes. The Company will also reimburse Employee for all reasonable expenses (including attorneys fees) incurred by him in connection with the negotiation and preparation of this Agreement and the agreements referred to herein, up to an aggregate maximum of $10,000, provided that reasonable documentation of such fees and expenses is delivered to the Company within ninety (90) days following the execution of this Agreement.

(f) Signing Bonus. The Employee will receive a one-time signing bonus of $31,250.00, less applicable tax deductions and withholdings, on the Company's first regular payroll date after date of the last signature to this Agreement.

4. Termination. Except for termination as specified in Section 4(a), any termination of Employee's employment by the Company or any such termination by Employee will be communicated by written notice of termination to the other party hereto ("Notice of Termination"). Upon termination from the Company for any reason (or for no reason), and if so requested, Employee agrees to deliver his resignation as a director of the Company upon the request of a majority of the Other Directors.

(a) Death. Employee's employment hereunder will terminate upon his death.

(b) Disability. The Company may terminate Employee's employment hereunder upon his Disability. For purposes of this Agreement, "Disability" will mean the incapacity of Employee due to physical or mental illness or other physical disability such that a physician selected by agreement of Employee (or Employee's legal guardian) and the Company determines that it is more likely than not that Employee will be unable to fully perform Employee's duties hereunder and that such incapacity will continue for a period of at least 180 days. If Employee (or Employee's legal guardian) and the Company are unable to agree upon the selection of a physician, then each will select a physician, and these physicians, together with a third physician selected by agreement of these two physicians, will make the determination whether such incapacity will continue for a period of at least 180 days.

(c) Termination by Company For Cause. At any time during the Term, the Company may terminate Employee's employment for Cause if such termination is approved by not less than a majority of the Other Directors. For purposes of this Agreement, "Cause" will mean:

(i) conduct by Employee constituting a material act of willful misconduct in connection with the performance of his duties (provided that if such misconduct is reasonably capable of cure, Employee has failed to cure the same within 30 days following written notice of such purported misconduct requesting its cure);

(ii) Employee's conviction of, or the entry of a pleading of guilty or nolo contendere by Employee to, any crime involving (A) fraud or embezzlement that results in material damage to the Company, or (B) any felony;

(iii) willful and repeated failure by Employee to substantially perform the duties, functions and responsibilities of Employee's positions that results in material damage to the Company, that continues after Employee has received prior written notice from the Board of such purported repeated failure, which notice details the grounds of such purported repeated failure and requests its cure, and Employee has been given a reasonable opportunity to cure which will not be less than 30 days;

(iv) a material breach by Employee of any of the material provisions contained in this Agreement which has continued for more than 30 days following written notice of such purported breach from the Board, which notice details the grounds of such purported breach, provided, however, a material breach of Section 7 need not continue for more than 30 days if such breach is not reasonably capable of being cured as determined in good faith by a majority of the Other Directors; or

(v) termination in connection with the bankruptcy, dissolution, liquidation, winding up, assignment for the benefit of creditors, or other cessation of the business of the Company as a going concern; provided however, that if any such event is undertaken to effectuate a Change of Control, then this clause (v) will not apply.

(d) Termination Without Cause. At any time during the Term, the Company may terminate Employee's employment hereunder without Cause if such termination is approved by not less than a majority of all the Other Directors. Any termination by the Company of

Employee's employment under this Agreement which does not (i) constitute a termination for Cause under Section 4(c) or (ii) result from the death or Disability of Employee under Sections 4(a) or 4(b) or (iii) result from the transfer of Employee's employment to an acquirer or affiliate thereof in connection with a Change of Control (as defined below) provided the acquirer or affiliate fully performs the Company's obligations hereunder, will be deemed a termination without Cause.

(e) Termination by Employee. At any time during the Term, Employee may terminate his employment hereunder for any reason, including but not limited to Good Reason. To constitute a termination for Good Reason, (1) Employee will reasonably determine that a "Good Reason" condition has occurred; (2) Employee will provide notice to the Company of the event constituting Good Reason within 60 days of the occurrence of the event; (3) Employee may not terminate employment pursuant to this Section 4(e) unless the Company fails to take action to remedy the event constituting Good Reason within 30 days of such notice (the "Cure Period"); and (4) Employee terminates his employment within 60 days after the end of the Cure Period. For purposes of this Agreement, "Good Reason" will mean:

(i) a substantial diminution or other substantive adverse change, not consented to by Employee, in the nature or scope of Employee's responsibilities, authorities, powers, functions or duties;

(ii) an involuntary material reduction in the Base Salary except for a decrease as part of, and on a pro rata percentage basis with, reductions by the Company of the annual base salary of its executive employees generally;

(iii) a breach by the Company of any of its other material obligations under this Agreement, the Restricted Stock Purchase Agreement or any other agreement between the Company and Employee and the failure of the Company to cure such breach with in 30 days after written notice thereof by Employee; or

(iv) the Company's headquarters are located more than twenty five (25) miles away from San Diego, California.

(f) Date of Termination. For purposes of this Agreement. "Date of Termination" will mean: (i) if Employee's employment is terminated by his death, the date of his death; (ii) if Employee's employment is terminated under Section 4(b), or under Section 4(c), the date on which Notice of Termination is given; (iii) if Employee's employment is terminated by the Company under Section 4(d), 30 days after the date on which a Notice of Termination is given; (iv) if Employee's employment is terminated by Employee under Section 4(e), the date on which a Notice of Termination is given and (v) if Employee's employment is terminated by Employee with Good Reason under Section 4(e), the date on which a Notice of Termination is given after the end of the Cure Period.

5. Compensation Upon Termination. In the event of the termination of Employee's employment, for whatever reason, the Company will pay Employee within ten days after the Date of Termination (i) all accrued and unpaid Base Salary through the Date of Termination, (ii) any earned but unpaid Bonus from the prior calendar year (but in no event earlier than the date

such Bonus is payable under Section 3(b)), (iii) any unpaid reimbursement for any expenses hereunder, and (iv) accrued but unused vacation and any vested benefits the Executive may have under any Employee Benefits (collectively "Accrued Benefit"). In addition to the foregoing, upon termination of Employee's employment under certain circumstances, Employee shall be entitled to certain rights with respect to his equity ownership in the Company, as set forth in the Restricted Stock Purchase Agreement, which the Company hereby acknowledges are in addition to, and not in lieu of, the compensation upon termination set forth herein.

(a) Death. If Employee's employment terminates by reason of his death, the Company will pay to such person as Employee will designate in a notice filed with the Company or, if no such person is designated, to Employee's estate, the Accrued Benefit and the pro-rata portion (based on days worked during the calendar year) of the Bonus that Employee would have received had the Company met all of the targets in the annual bonus plan that has been approved by the Board for the calendar year in which the Date of Termination occurred, payable within 30 days after the Date of Termination ("Pro Rata Bonus"). In addition, upon the death of Employee, for a period of six months following the Date of Termination, the Company will maintain in full force and effect, at Company's sole expense and on substantially the same terms, for the continued benefit of his immediate family, the Employee Benefits (or with respect to those Employee Benefits covered by COBRA, provide payments for such period equal to the COBRA payments .that would reasonably be required by Employee to obtain those overlapping Employee Benefits, plus pay for any other Employee Benefits as provided above).

(b) Disability. Upon the Date of Termination corresponding to Employee's termination by the Company for his Disability in accordance with Section 4(b), Employee will receive the Accrued Benefit and his Pro Rata Bonus. In addition, upon such Date of Termination, for a period of six months following the Date of Termination, the Company will maintain in full force and effect, at Company's sole expense and on substantially the same terms, for the continued benefit of Employee and his immediate family, the Employee Benefits (or with respect to those Employee Benefits covered by COBRA, provide payments for such period equal to the COBRA payments that would reasonably be required by Employee to obtain those overlapping Employee Benefits, plus pay for any other Employee Benefits as provided above).

(c) By Employee Without Good Reason. If Employee's employment is terminated by Employee other than for Good Reason as provided in Section 4(e), then the Company will pay Employee his Accrued Benefit and his Pro Rata Bonus.

(d) By Employee With Good Reason or by the Company Without Cause. If Employee terminates his employment for Good Reason as provided in Section 4(e) or if Employee's employment is terminated by the Company without Cause as provided in Section 4(d), then the Company will pay Employee his Accrued Benefit and his Pro Rata Bonus. In addition, the Company will provide the following benefits to Employee:

(i) the Company will pay Employee an amount equal to the sum of (1) six months of the Base Salary in effect at the time of termination and (2) one-half of the full Bonus that Employee would have received had the Company met all of the targets in the annual bonus plan that has been approved by the Board for the calendar year in which the Date of Termination occurred (the "Severance Amount"). The Severance Amount

will be paid out in substantially equal bi-weekly installments over six months, in arrears beginning on the first payroll date after the Date of Termination; and

(ii) for a period of six months following the Date of Termination, the Company will maintain in full force and effect, at Company's sole expense and on substantially the same terms, for the continued benefit of Employee and his immediate family, the Employee Benefits (or with respect to those Employee Benefits covered by COBRA, provide payments for such period equal to the COBRA payments that would reasonably be required by Employee to obtain those overlapping Employee Benefits, plus pay for any other Employee Benefits as provided above). No provision of this Agreement will be deemed to waive any rights of Employee under the Family and Medical Leave Act of 1993,29 U.S.C. §2601 et seq. and the Americans with Disabilities Act, 42 U.S.C. §12101 et seq. and any other applicable federal, state or local anti-discrimination laws.

(e) By the Company For Cause. If Employee's employment is terminated by the Company for Cause as provided in Section 4(c), then the Company will pay Employee his Accrued Benefit.

(f) Definition of Change of Control. For purposes of this Agreement, "Change of Control" will mean (i) any "person," as such term is used in Sections 13(d) and 14(d) of the Securities Exchange Act of 1934, as amended (the "Act") (other than the Company or any of its subsidiaries), together with all "affiliates" and "associates" (as such terms are defined in Rule 12b-2 under the Act) of such person, will become the "beneficial owner" (as such term is defined in Rule 13d-3 under the Act), directly or indirectly, of securities of the Company representing fifty percent (50%) or more of the combined voting power of the Company's then outstanding securities having the right to vote in an election of the Board ("Voting Securities") (in such case other than as a result of an acquisition of securities directly from the Company); or (ii) the consummation of (A) any consolidation or merger of the Company where the stockholders of the Company, immediately prior to the consolidation or merger, would not, immediately after the consolidation or merger, beneficially own (as such term is defined in Rule 13d-3 under the Act), directly or indirectly, shares representing in the aggregate more than fifty percent (50%) of the voting shares of the Company issuing cash or securities in the consolidation or merger (or of its ultimate parent corporation, if any), or (B) any sale or other transfer (in one transaction or a series of transactions contemplated or arranged by any party as a single plan) of all or substantially all of the assets of the Company; provided that "Change of Control" will not include any transaction effected by the Company solely (i) for equity financing purposes with venture capital or other institutional investors before the IPO, or (ii) to reincorporate the Company into a new jurisdiction or formation.

(g) Potential Overlap. For clarity, the Company will not have any obligations under Sections 5(c) through 5(e) if and to the extent Employee was terminated for death or Disability and Section 5(a) or 5(b) applies (provided that in the event of termination for Disability, the disability insurance plan specified in Section 3(d)(ii) is making payments to Employee).

(h) No Mitigation. Employee will not be required to mitigate the amount of

any payment provided for in this Agreement by seeking other employment or otherwise, nor will the amount of any payment provided for herein be reduced by any compensation earned by Employee as a result of employment by another employer or by retirement benefits after the date of termination of Employee's employment.

(i) Miscellaneous. Upon any termination of Employee's employment hereunder, (i) Employee will retain ownership of and may remove from the Company all personal property owned by him, (ii) nothing contained in Sections 5(a) through 5(e) will be construed so as to affect Employee's rights or the Company's obligations relating to agreements or benefits that are unrelated to termination of employment, and (iii) Employee will be entitled to participate in Employee's group health plan to the extent authorized by 29 U.S.C. §1161 et seq. ("COBRA"), with such participation at Employee's expense to commence on the later of termination of employment or termination of the period in which post-termination benefits are provided hereunder. Solely for purposes of Section 409A of the Internal Revenue Code of 1986, as amended (the "Code"), each payment by the Company to Employee post-termination is considered a separate payment.

(j) Full General Release. Notwithstanding anything in this Agreement (other than Section 5(i)) to the contrary, the obligation of the Company to pay any severance or other employment benefits or amounts following the termination of employment of Employee will be expressly conditioned upon (i) the execution, delivery, non-revocation of, and compliance with, a full general release of (A) claims by Employee, releasing all claims known or unknown that Employee may have against the Company as of the date of such release, and allowing such release to become effective and (B) claims by the Company, releasing all claims known or unknown that the Company may have against Employee as of the date of such release, in each case to the continuing rights and obligations of this Agreement and the Restricted Stock Purchase Agreement, and (ii) written acknowledgment by Employee of Employee's continuing obligations with respect to the protection of the confidential information and intellectual property of the Company as set forth in this Agreement.

6. 409A.

(a) Anything in this Agreement to the contrary notwithstanding, if at the time of Employee's separation from service within the meaning of Section 409A of the Code, the Company determines that Employee is a "specified employee" within the meaning of Section 409A(a)(2)(B)(i) of the Code, then to the extent any payment or benefit that Employee becomes entitled to under this Agreement would be considered deferred compensation subject to the twenty percent (20%) additional tax imposed pursuant to Section 409A(a) of the Code as a result of the application of Section 409A(a)(2)(B)(i) of the Code, such payment will not be payable and such benefit will not be provided until the date that is the earlier of (A) six months and one day after Employee's separation from service, or (B) Employee's death. If any such delayed cash payment is otherwise payable on an installment basis, the first payment will include a catch-up payment covering amounts that would otherwise have been paid during the six-month period but for the application of this provision, and the balance of the installments will be payable in accordance with their original schedule. Any such delayed cash payment will earn interest at an annual rate equal to the applicable federal short-term rate published by the Internal Revenue Service for the month in which the date of separation from service occurs, from such date of

separation from service until the payment. The determination of whether and when a separation from service has occurred shall be made in accordance with the presumptions set forth in Treasury Regulation Section 1.409A-l(h).

(b) The parties intend that this Agreement will be administered in accordance with Section 409A of the Code. To the extent that any provision of this Agreement is ambiguous as to its compliance with Section 409A of the Code, the provision will be read in such a manner so that all payments hereunder comply with Section 409A of the Code. The parties agree that this Agreement may be amended, as reasonably requested by either party, and as may be necessary to fully comply with Section 409A of the Code and all related rules and regulations in order to preserve the payments and benefits provided hereunder without additional cost to either party.

7. Confidential Information and Noncompetition.

(a) Confidential Information. For purposes of this Agreement, "Confidential Information" means all information of the Company disclosed or made available to Employee. Confidential Information includes, without limitation, financial information, reports, and forecasts; inventions, improvements and other intellectual property; trade secrets; know how; designs, processes or formulae; software; market or sales information or plans; customer lists; and business plans, prospects and opportunities (such as possible acquisitions or dispositions of businesses or facilities) which have been discussed or considered by the management of the Company. Confidential Information includes information developed by Employee in the course of Employee's employment by the Company, as well as other information to which Employee may have access in connection with Employee's employment. Confidential Information also includes the confidential information of others with which the Company has a business relationship. Notwithstanding the foregoing, "Confidential Information" will not include any information that is generally known in the industry or that becomes known in the industry through sources other than Employee, or information received by Employee from a third party not known to him to be under an obligation of confidentiality to the Company. Notwithstanding the foregoing, Employee may disclose Confidential Information (A) at the express direction of any authorized government entity; (B) pursuant to a subpoena or other court process; (C) as otherwise required by law or the rules, regulations or orders of any applicable regulatory body; or (D) as otherwise necessary, in the opinion of counsel for Employee, to be disclosed by Employee in connection with the prosecution of any legal action or proceeding initiated by Employee against Company or any of its affiliates or the defense of any legal action or proceeding initiated against Employee in his capacity as an employee or director of the Company or of any of its affiliates.

(b) Confidentiality. Employee understands and agrees that Employee's employment creates a relationship of confidence and trust between Employee and the Company with respect to all Confidential Information. At all times, both during Employee's employment with the Company and after its termination, Employee will keep in confidence all Confidential Information, and will not use or disclose any such Confidential Information without the written consent of the Company, except as may be reasonably necessary or useful in the routine performance of Employee's duties as an employee of the Company.

(c) Documents, Records, etc. All documents, records, data, apparatus, equipment and other physical property, whether or not pertaining to Confidential Information, which are furnished to Employee by the Company or are produced by Employee in connection with Employee's employment will be and remain the sole property of the Company. Employee will return to the Company all such materials and property as and when requested by the Company. In any event, Employee will return all such materials and property immediately upon termination of Employee's employment for any reason, other than one copy for Employee's records.

(d) Inventions and Innovations. Employee agrees to communicate to the Company, promptly and fully, and to assign to the Company, all inventions, trade secrets, and technical or business innovations, developed or conceived solely by Employee, or jointly with others, while employed by the Company, which were developed on the time of the Company, using Confidential Information or otherwise using Company resources. Employee further agrees to execute all necessary papers and otherwise to assist the Company, at the Company's sole expense, to obtain patents or other legal protection as the Company deems fit, and to assist in perfecting in the Company all rights granted to it hereunder. Both the Company and Employee intend that all original works of authorship created by Employee while working in the employ of the Company will be works for hire within the meaning of applicable copyright laws and will belong to the Company. Employee understands that, notwithstanding anything to the contrary herein, this Agreement will not require assignment to the Company of any invention which qualifies fully under the provisions of California Labor Code Section 2870, a copy of which is attached hereto as Exhibit A.

(e) Noncompetition. During the Term, Employee will not, whether as owner, partner, shareholder, consultant or employee, engage or invest in any Competing Business (as hereinafter defined). Employee understands that the restrictions set forth in this Section 7(e) are intended to protect the Company's interest in its Confidential Information, and agrees that such restrictions are reasonable and appropriate for this purpose. For purposes of this Agreement, the term "Competing Business" will mean a business directly competitive with any business which the Company or any of its affiliates conducts during the employment of Employee. Notwithstanding the foregoing, Employee may own up to one percent (1%) of the outstanding stock of a publicly held corporation which constitutes or is affiliated with a Competing Business. For the avoidance of doubt, the term "Competing Business" does not include a business or any entity which does not have a focus on any resectin-based therapy.

(f) Third-Party Agreements and Rights. Employee hereby confirms that Employee is not bound by the terms of any agreement with any previous Company or other party which restricts in any way Employee's use or disclosure of information or Employee's engagement in any business. Employee represents to the Company that Employee's execution of this Agreement, Employee's employment with the Company and the performance of Employee's proposed duties for the Company will not violate any obligations Employee may have to any such previous Company or other party.

(g) Injunction. Employee agrees that it would be difficult to measure any damages caused to the Company which might result from any breach by Employee of the promises set forth in this Section 7, and that in any event money damages would be an

inadequate remedy for any such breach. Accordingly, Employee agrees that if Employee breaches, or proposes to breach, any portion of this Agreement, the Company will be entitled, in addition to all other remedies that it may have, to an injunction or other appropriate equitable relief to restrain any such breach without showing or proving any actual damage to the Company.

(h) Employee's Other Work. Notwithstanding the foregoing, the Company understands that Employee will engage in Employee's Other Work. As part of Employee's Other Work, the Company acknowledges and agrees that Employee will among other things be obligated to keep third parties information confidential, to assign inventions to third parties, and to agree to non-compete provisions with third parties. Employee will endeavor to keep his work for the Company separate and apart from Employee's Other Work. In particular, with respect to Sections 7(b) and 7(d), if Employee believes that he has developed or conceived any inventions or technical or business innovations that could be viewed as being assignable to the Company and one or more other companies, the Company and Employee will discuss how Employee may disclose such invention or innovation to the Company without breaching his obligations to such other companies and the parties will endeavor to resolve rights with respect thereto by working with such other companies. Employee will endeavor include a similar provision in his agreements with such other companies.

8. Section 280G.

(a) Post-IPO. Upon the Company's consummation of an initial public offering of the Company's common stock pursuant to an effective registration statement under the Securities Act of 1933, as amended (an "IPO"), the Company agrees to enter into an agreement with Employee regarding a Change of Control at Employee's request. This agreement will provide that the Company will make a "gross-up" payment to Employee such that, in the event certain excise taxes and penalties are imposed on Employee as a result of the provisions of Sections 280G and/or 4999 of the Code, Employee's net after-tax payments and benefits will be equal to what Employee would have received absent the penalty tax. Such Change of Control agreement will not supersede any of the material terms of this Agreement without the Employee's written consent.

(b) Pre-IPO. In the event that the Company undergoes a Change of Control prior to an IPO, the Company agrees, upon Employee's request, that it will seek the requisite approval by its stockholders, and encourage that they grant such approval, of the payments proposed to be made to Employee in connection with such Change of Control in order to prevent having the payments characterized as "parachute payments" under Sections 280G and 4999 of the Code. In connection with the obtaining of such approval, Employee agrees to undertake any such waivers that may be required of Employee in order for the Company to validly seek the approval of its stockholders. In addition, in the event that Employee's employment ends within 12 months after the completion of any Change of Control other than as a result of a termination of Employee's employment by the Company for Cause, the Company agrees to enter into a consulting or advisory relationship with Employee following the completion of such Change of Control such that any unvested stock options or restricted stock that could have accelerated as a result of such Change of Control under the Restricted Stock Purchase Agreement or otherwise absent Employee's waiver of any such acceleration will continue to vest in accordance with the

terms of any applicable stock option or restricted stock agreements. The Company agrees to maintain such relationship with Employee in good faith, provided Employee continues to provide bona fide consulting or advisory services to the Company, until such time as all options or restricted shares which were unvested as of the consummation of such Change of Control become fully vested. For the avoidance of doubt, if the provision of services as a consultant would result in the Employee's not having had a "separation from service" under Section 409A of the Code, any payments that would have been due upon a termination of employment shall be deferred until such separation from service shall have occurred.

9. Survival. Provisions of this Agreement will survive any termination if so provided herein or if necessary or desirable to accomplish the purposes of other surviving provisions. The Company will continue to indemnify Employee as an officer and/or director of the the Company to the full extent permitted under law for Employee's service prior to termination.

10. Taxes. The Company will undertake to make deductions, withholdings and tax reports with respect to payments and benefits under this Agreement to the extent that it reasonably and in good faith determines that it is required to make such deductions, withholdings and tax reports. Payments under this Agreement will be in amounts net of any such deductions or withholdings. All reimbursements, payments and benefits provided to Employee pursuant to this Agreement (other than Base Salary and Bonuses, including but not limited to Stock Bonus Awards, and post-termination amounts payable by the Company to Employee under Section 5 based on Base Salary or Bonuses, including but not limited to Stock Bonus Awards) to the extent that such reimbursements, payments and benefits are taxable for federal, state and local income tax purposes, will be increased by an amount (the "Gross-Up Payment") so that the net amount of such reimbursements, payments and benefits after payment of federal, state and local income taxes is equal, on an after-tax basis, to the amount required to fulfill the Company's obligation under the terms of this Agreement with respect to such reimbursements, payments and benefits., with the understanding that any such Gross-Up Payment will be based on the overall marginal tax rate (including but not limited to federal and state tax obligations) applicable to Employee based on the payments by the Company to him and without reference to Employee's other circumstances, and will not include any further payments for the tax consequences of any such Gross-Up Payment by the Company to Employee. Any Gross-Up Payment made pursuant to this Section 10 will be paid to Employee in the calendar year in which the underlying reimbursement, payment or benefit is paid, but in no event later than the 25th day of the third month of the following calendar year.

11. Arbitration. To ensure rapid and economical resolution of any disputes that may arise in connection with Employee's employment, Employee and the Company agree that any and all disputes, claims, or controversies of any nature whatsoever arising out of, or relating to, this agreement, or its interpretation, enforcement, breach, performance or execution, Employee's employment with the Company, or the termination of such employment, will be resolved, to the fullest extent permitted by law, by final, binding and confidential arbitration in San Diego, CA conducted before a single arbitrator by Judicial Arbitration and Mediation Services, Inc. ("JAMS") or its successor, under the then-applicable JAMS rules. By agreeing to this arbitration procedure, both Employee and the Company waive the right to resolve any such dispute, claim or demand through a trial by jury or judge or by administrative proceeding. Employee will have the right to be represented by legal counsel at any arbitration proceeding. The arbitrator will: (a)

have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be available under applicable law in a court proceeding; and (b) issue a written statement signed by the arbitrator regarding the disposition of each claim and the relief, if any, awarded as to each claim, the reasons for the award, and the arbitrator's essential findings and conclusions on which the award is based. The arbitrator, and not a court, will be authorized to determine whether the provisions of this paragraph apply to a dispute, controversy, or claim sought to be resolved in accordance with these arbitration procedures. The Company will pay all JAMS' arbitration fees. Nothing in this Agreement is intended to prevent either Employee or the Company from obtaining injunctive relief in court if necessary to prevent irreparable harm pending the conclusion of any arbitration.

12. Integration. This Agreement along with the Restricted Stock Purchase Agreement constitute the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior agreements between the parties with respect to any related subject matter.

13. Assignment: Successors and Assigns, etc. Neither the Company nor Employee may make any assignment of this Agreement or any interest herein, by operation of law or otherwise, without the prior written consent of the other party; provided that the Company may assign its rights and obligations under this Agreement in full without the consent of Employee in the event that the Company will effect a reorganization, consolidate with or merge into any other corporation, partnership, organization or other entity, or transfer all or substantially all of its properties or assets to any other corporation, partnership, organization or other entity.

14. Successors. This Agreement will be binding on and inure to the benefit of Employee, Employee's heirs, executors, administrators and other legal representatives and will be binding on and inure to the benefit of the Company and its respective successors and assigns. If Employee should die while any amounts would still be payable to him hereunder if he had continued to live, all such amounts, unless otherwise provided herein, will be paid in accordance with the terms of this Agreement to his designee or, if there be no such designee, to his estate.

15. Enforceability. If any portion or provision of this Agreement will to any extent be declared illegal or unenforceable by a court of competent jurisdiction, then the remainder of this Agreement, or the application of such portion or provision in circumstances other than those as to which it is so declared illegal or unenforceable, will not be affected thereby, and each portion and provision of this Agreement will be valid and enforceable to the fullest extent permitted by law.

16. Waiver. No waiver of any provision hereof will be effective unless made in writing and signed by the waiving party. The failure of any party to require the performance of any term or obligation of this Agreement, or the waiver by any party of any breach of this Agreement, will not prevent any subsequent enforcement of such term or obligation or be deemed a waiver of any subsequent breach.

17. Notices. Any notices, requests, demands and other communications provided for by this Agreement will be sufficient if in writing and delivered in person or sent by a nationally recognized overnight courier service or by registered or certified mail, postage prepaid, return receipt requested, to Employee at the last address Employee has filed in writing with the

Company at its main offices, attention of the Chief Executive Officer, and will be effective on the date of delivery in person or by courier or three days after the date mailed.

18. Amendment. This Agreement may be amended or modified only by a written instrument signed by Employee and the Company (where such amendment has been approved by a majority of the Other Directors).

19. Governing Law. This contract will be construed under and be governed in all respects by the laws of The State of California, without giving effect to the conflict of laws principles. With respect to any disputes concerning federal law, such disputes will be determined in accordance with the law as it would be interpreted and applied by the appropriate United States Court of Appeals.

20. Counterparts. This Agreement may be executed in two or more counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument.

[remainder of this page intentionally left blank]

IN WITNESS WHEREOF, this Agreement has been executed as a sealed instrument of the Company, by its duly authorized representative, and by Employee, as of the date first above written.

aTyr Pharma, Inc.		Employee	
By:	/s/ Jeffrey D. Watkins	/s/ John D. Mendlein	
Name:	Jeffrey D. Watkins	Name:	John D. Mendlein
Title:	CEO	Date:	July 14, 2010
Date:	July 14, 2010		

EXHIBIT A

California Labor Code

§2870. Application of provision providing that employee will assign or offer to assign rights in invention to employer.

(a) Any provision in an employment agreement which provides that an employee will assign, or offer to assign, any of his or her rights in an invention to his or her employer will not apply to an invention that the employee developed entirely on his or her own time without using the employer's equipment, supplies, facilities, or trade secret information except for those inventions that either:

(1) Relate at the time of conception or reduction to practice of the invention to the employer's business, or actual or demonstrably anticipated research or development of the employer.

(2) Result from any work performed by the employee for the employer.

(b) To the extent a provision in an employment agreement purports to require an employee to assign an invention otherwise excluded from being required to be assigned under subdivision (a), the provision is against the public policy of this state and is unenforceable.

EXHIBIT B

Stock Bonus Award Formula

Upon the written election by the Employee to receive a Stock Bonus Award in accordance with Section 3(b) of this Agreement, Employee shall be entitled to receive a number of fully-vested shares of the Company's common stock determined in accordance with the following formula and at a per share price equal to the fair market value of one share of the Company's common stock on the date of issuance, as determined by the Board at the time:

X = Y/Z

where

X = Number of shares of the Company's Common Stock subject to the Stock Bonus Award;

Y = The Base Amount (as defined below); and

Z = The Conversion Rate (as defined below).

As used herein, (i) the "Base Amount" shall be a number equal to the cash amount Employee would have received if Employee had elected to receive a cash Bonus pursuant to Section 3(b) of this Agreement and (ii) the "Conversion Rate" shall be a number which is equal to the lesser of (A) the price per share (as adjusted for stock splits, combinations, recapitalizations and the like) at which shares of preferred stock of the Company were most recently issued (calculated at such time) by the Company in a transaction or series of related transactions with venture capital or institutional or strategic investors for capital raising purposes and (B) an amount equal to three (3) times the then-current fair market value of the Company's Common Stock as determined by the Board.

Exhibit 10.4

aTyr Pharma
Brave Science, Meaningful Medicines

December 20, 2013

Mr. Frederic Chereau
[***]

Dear Fred,

This letter is a formal offer setting forth the principal terms for you to join aTyr Pharma, Inc. (the "Company"), a Delaware corporation, which is located in San Diego, California. This offer is contingent upon satisfactory completion of a background check.

Position:	President and Chief Operating Officer
Location:	San Diego, CA
Status:	Full-Time, Exempt. This means you are paid for the job and not by the hour. Accordingly, you will not receive overtime pay if you work more than 8 hours in a work day or 40 hours in a workweek.
Reporting to:	John Mendlein, Ph.D., Executive Chairman and Chief Executive Officer
Base Salary Rate:	$15,000.00 semi-monthly (which equals $360,000.00 per year) less applicable withholdings, paid in accordance with Company's normal payroll practices. Future adjustments in compensation, if any, will be made by the Company in its sole and absolute discretion.
Target Bonus:	Your annual target bonus will be 40% of your base salary with a range of 0-50% based upon the achievement of your individual goals, the achievement of team goals and the achievement of corporate goals. Your annual target bonus is subject to review and approval by the aTyr Board of Directors. Any bonus would be prorated based upon service in the year.
Equity:	Shortly after commencement of your employment with the Company, and subject to approval by the board of directors, you will be granted an Option to purchase 1,987,795 shares of the Common Stock of the Company pursuant to the 2007 Stock Plan. The exercise price per share of the Option shall be the fair market value of the Common Stock, as determined by the board of directors at the time of the Option grant. The specific terms and conditions of your Option will be subject to the terms

of the 2007 Stock Plan, as well as the terms set forth in a Stock Option Agreement between you and the Company. This Stock Option Agreement will be entered into and executed after you commence your employment with the Company. In addition to the foregoing, in connection with the Company option grant, we anticipate that you will also be granted options to purchase a corresponding type and number of shares in each of the entities which the Company has previously spun-out as stand-alone entities (the "Related Entities"). The specific terms and conditions of your options in the Related Entities will be subject to the terms of the 2012 Stock Plan for each Related Entity, as well as the terms set forth in a Stock Option Agreement between you and the Related Entity.

Relocation Assistance: You will be offered a lump sum relocation assistance payment in the amount of $45,000.00 to be paid at the time of your first paycheck. This amount will be grossed up for tax purposes. This payment will be subject to repayment to the Company if you voluntarily resign within one year of commencing your employment. We will also reimburse you up to $6,000.00 per month for up to 6 months for temporary housing.

Benefits: You will be entitled to receive standard medical, life and dental insurance benefits for yourself and your dependents in accordance with Company policy. Company reserves the right to change or eliminate these benefits on a prospective basis at any time.

401(k) Plan: You will be eligible to participate in the aTyr Pharma, Inc. 401(k) Savings Plan immediately following the start of your employment.

Vacation & Sick Time: You will be entitled to accrue 15 days of vacation per year. You will have 6 days of sick time available each year.

Holidays: You will be eligible for aTyr's paid holidays. The schedule is published prior to the beginning of each calendar year.

Employment at Will: Your employment will be at-will, which means it may be terminated at any time by you or the Company with or without cause and that your employment is not for any specific period of time. Any change to the at-will employment relationship must be by a specific, written agreement signed by you and the Company's Chief Executive Officer.

Start Date: January 9, 2014 based on a mutually agreed prorated part-time basis through February 28, 2014 or other mutually agreed full time status start date.

As a condition of your employment, you will be required to sign and abide by our Employee Nondisclosure and Assignment Agreement when you begin your employment. A copy is attached for your reference. In addition, in order to comply with the Immigration Reform and Control Act of 1986, within three (3) days of your Start Date you will be required to provide sufficient documentation to verify your identity and legal authorization to work in the United States. Please bring with you on your Start Date, the original of one of the documents noted in List A or one document from List B and one document from List C as itemized in the enclosed "Lists of Acceptable Documents". If you do not have the originals of any of these documents, please contact me immediately.

In the event of any dispute or claim relating to or arising out of your employment relationship with the Company, this agreement, or the termination of your employment with the Company for any reason (including, but not limited to, any claims of breach of contract, defamation, wrongful termination or age, sex, sexual orientation, race, color, national origin, ancestry, marital status, religious creed, physical or mental disability or medical condition or other discrimination, retaliation or harassment), you and the Company agree that all such disputes shall be fully resolved by confidential, binding arbitration conducted by a single arbitrator through the American Arbitration Association ("AAA") under the AAA's National Rules for the Resolution of Employment Disputes then in effect, which are available online at the AAA's website at www.adr.org. The arbitrator shall permit adequate discovery and is empowered to award all remedies otherwise available in a court of competent jurisdiction and any judgment rendered by the arbitrator may be entered by any court of competent jurisdiction. By executing this letter, you and the Company are both waiving the right to a jury trial with respect to any such disputes. Company shall bear the costs of the arbitrator, forum and filing fees. Each party shall bear its own respective attorney fees and all other costs, unless otherwise provided by law and awarded by the arbitrator.

It is aTyr's policy to respect fully the rights of your previous employers in their proprietary or confidential information. No employee is expected to disclose, or is allowed to use for aTyr's purposes, any confidential or proprietary information he or she may have acquired as a result of previous employment.

I am pleased to extend this offer to you and look forward to your acceptance. Please sign and return the enclosed copy of this offer letter as soon as possible to indicate your agreement with the terms of this offer. This offer will lapse if not signed and returned by December 24, 2013.

Once signed by you, this letter will constitute the complete agreement between you and aTyr Pharma, Inc. regarding employment matters and will supersede all prior written or oral agreements or understandings on these matters.

Our mission is to discover life-changing therapies with relentless determination for people with grave maladies where others fall short. I believe you will be able to make an immediate contribution to this mission and I think you will enjoy the rewards of working for an innovative, fast-paced company. One of the keys to our success is top people. We hope you accept our offer to be one of those people.

Yours sincerely,

/s/ John Mendlein, Ph.D.

John Mendlein, Ph.D.
Executive Chairman and Chief Executive Officer

Enclosures

I accept the terms of employment as described in this offer letter dated December 20th, 2013 and will start my employment on January 9th, 2014. I confirm that by my start date at aTyr Pharma, Inc. I will be under no contract or agreement with any other entity which would in any way restrict my ability to work at aTyr Pharma, Inc. or perform the functions of my job for aTyr, including, but, not limited to, any employment agreement and/or non-compete agreement.

/s/ Frederic Chereau ***Date 1/09/14***
Frederic Chereau

Exhibit 10.5

aTyr Pharma
Brave Science, Meaningful Medicines

February 20, 2014

David Weiner, M.D.
[***]

Dear Dave,

This letter is a formal offer setting forth the principal terms for you to join aTyr Pharma, Inc. ("aTyr" or the "Company"), a Delaware corporation, which is located in San Diego, California. This offer is contingent upon satisfactory completion of the Questionnaire for Directors and Executive Officers.

Position:	Chief Medical Officer
Location:	San Diego, CA
Status:	Full-Time, Exempt. This means you are paid for the job and not by the hour. Accordingly, you will not receive overtime pay if you work more than 8 hours in a work day or 40 hours in a workweek.
Reporting to:	John Mendlein, Ph.D., Executive Chairman and Chief Executive Officer
Base Salary Rate:	$13,958.34 semi-monthly (which equals $335,000.00 per year) less applicable withholdings, paid in accordance with Company's normal payroll practices. Future adjustments in compensation, if any, will be made by the Company in its sole and absolute discretion.
Target Bonus:	Your annual target bonus will be 30% of your base salary with a range of 0-40% based upon the achievement of your individual goals, the achievement of team goals and the achievement of corporate goals. Your annual target bonus is subject to review and approval by the aTyr Board of Directors. Any bonus will be prorated based upon service in a year.
Equity:	Shortly after commencement of your employment with the Company, and subject to approval by the board of directors, you will be granted an option to purchase 916,035 shares of the Common Stock of the Company (the "Initial Option") pursuant to the Company's 2007 Stock Plan (the "aTyr Plan"). Subject to your continued full-time employment with the Company, the shares subject to the Initial Option shall vest over a six (6)

year period, with a one (1) year cliff, such that one-sixth (1/6) of the shares subject to the Initial Option shall vest on the first year anniversary of your employment start date and the remainder of the shares shall thereafter vest in equal monthly installments over the subsequent five (5) years. In addition, after commencement of your employment with the Company, and subject to approval by the board of directors, you will be granted an additional option to purchase 45,801 shares of the Common Stock of the Company (the "Additional Option" and together with the Initial Option, the "Options") pursuant to the 2007 Stock Plan. Subject to your continued full-time employment with the Company, the shares subject to the Additional Option shall vest over a six (6) year period, with a one (1) year cliff, such that one-sixth (1/6) of the shares subject to the Additional Option shall vest on the first year anniversary of your employment start date and the remainder of the shares shall thereafter vest in equal monthly installments over the subsequent five (5) years. The exercise price per share of each of these Options shall be the fair market value of the Common Stock, as determined by the board of directors at the time the Options are grant. The specific terms and conditions of your Options will be subject to the terms of the 2007 Stock Plan, as well as the terms set forth in a Stock Option Agreement between you and the Company. This Stock Option Agreement will be entered into and executed after you commence your employment with the Company. In-addition to the foregoing, we anticipate that you will also be granted options to purchase a corresponding type and number of shares in each of the entities which the Company has previously spun-out as stand-alone entities (the "Related Entities"). The specific terms and conditions of the options in the Related Entities (the "Related Entity Options") will be subject to the terms of the 2012 Stock Plan for each Related Entity, as well as the terms set forth in a Stock Option Agreement between you and the Related Entity. The vesting of the shares subject to the Options and Related Entity Options will be subject to acceleration in full if your employment with the Company is terminated by the Company (or any successor thereto) without Cause (as defined in the aTyr Plan) within twelve (12) months following a Change in Control (as defined in the aTyr Plan).

Relocation Assistance:	You will be offered a lump sum relocation assistance payment in the amount of $50,000.00 to be paid at the time of your first paycheck. This amount will be grossed up for tax purposes. This payment will be subject to repayment to the Company if you voluntarily resign within one year following commencing your employment.
Benefits:	You will be entitled to receive standard medical, life and dental insurance benefits for yourself and your dependents in accordance with Company policy. Company reserves the right to change or eliminate these benefits on a prospective basis at any time.
401(k) Plan:	You will be eligible to participate in the aTyr Pharma, Inc. 401(k) Savings Plan immediately following the start of your employment.
Vacation & Sick Time:	You will be entitled to accrue 15 days of vacation per year. You will have 6 days of sick time available each year.
Holidays:	You will be eligible for aTyr's paid holidays. The schedule is published prior to the beginning of each calendar year.
Employment at Will:	Your employment will be at-will, which means it may be terminated at any time by you or the Company for any reason, with or without cause, and that your employment is not for any specific period of time. Any change to the at-will employment relationship must be by a specific, written agreement signed by you and the Company's Chief Executive Officer.
Start Date:	March 17, 2014 or a mutually agreed upon date.

As a condition of your employment, you will be required to sign and abide by our Employee Nondisclosure and Assignment Agreement (the "Employee NDA") when you begin your employment. A copy is attached for your reference. As a condition of your employment, you will also be required to abide by the Company's code of conduct and other policies applicable to

employees as set forth in the Company's employee handbook in effect from time to time. A copy will be made available to you during your employment. In addition, in order to comply with the Immigration Reform and Control Act of 1986, within three (3) days of your Start Date you will be required to provide sufficient documentation to verify your identity and legal authorization to work in the United States. Please bring with you on your Start Date, the original of one of the documents noted in List A or one document from List B and one document from List C as itemized in the enclosed "Lists of Acceptable Documents". If you do not have the originals of any of these documents, please contact me immediately.

In the event of any dispute or claim relating to or arising out of your employment relationship with the Company, this agreement, or the termination of your employment with the Company for any reason (including, but not limited to, any claims of breach of contract, defamation, wrongful termination or age, sex, sexual orientation, race, color, national origin, ancestry, marital status, religious creed, physical or mental disability or medical condition or other discrimination, retaliation or harassment), you and the Company agree that all such disputes shall be fully resolved by confidential, binding arbitration conducted by a single arbitrator through the American Arbitration Association ("AAA") under the AAA's National Rules for the Resolution of Employment Disputes then in effect, which are available online at the AAA's website at www.adr.org. The arbitrator shall permit adequate discovery and is empowered to award all remedies otherwise available in a court of competent jurisdiction and any judgment rendered by the arbitrator may be entered by any court of competent jurisdiction. By executing this letter, you and the Company are both waiving the right to a jury trial with respect to any such disputes. Company shall bear the costs of the arbitrator, forum and filing fees. Each party shall bear its own respective attorney fees and all other costs, unless otherwise provided by law and awarded by the arbitrator.

It is aTyr's policy to respect fully the rights of your previous employers in their proprietary or confidential information. No employee is expected to disclose, or is allowed to use for aTyr's purposes, any confidential or proprietary information he or she may have acquired as a result of previous employment.

I am pleased to extend this offer to you and look forward to your acceptance. Please sign and return the enclosed copy of this offer letter as soon as possible to indicate your agreement with the terms of this offer. This offer will lapse if not signed and returned by February 22, 2014.

Once signed by you, this letter, together with the Employee NDA, will constitute the complete agreement between you and the Company regarding employment matters and will supersede all prior written or oral agreements or understandings on these matters.

Our mission is to discover life-changing therapies with relentless determination for people with grave maladies where others fall short. I believe you will be able to make an immediate contribution to this mission and I think you will enjoy the rewards of working for an innovative, fast-paced company. One of the keys to our success is top people. We hope you accept our offer to be one of those people.

Yours sincerely,

/s/ John Mendlein, Ph.D.

John Mendlein, Ph.D.
Executive Chairman and Chief Executive Officer

Enclosures

I accept the terms of employment as described in this offer letter dated 2-21-14 and will start my employment on 3-17-14. I confirm that by my start date at aTyr Pharma, Inc. I will be under no contract or agreement with any other entity which would in any way restrict my ability to work at aTyr Pharma, Inc. or perform the functions of my job for aTyr, including, but not limited to, any employment agreement and/or non-compete agreement.

/s/ David Weiner, M.D. ***Date 2-21-14***
David Weiner, M.D.

aTyr Pharma, Inc.
3545 John Hopkins Court, Suite #250 San Diego CA 92121
Phone 858 731 8389 Fax 858 731 8394

Exhibit 10.6

AMENDED AND RESTATED RESTRICTED STOCK PURCHASE AGREEMENT

This Amended and Restated Restricted Stock Purchase Agreement (this "Agreement") is made and entered into as of December 18, 2014, by and between aTyr Pharma, Inc., a Delaware corporation (the "Company"), and John D. Mendlein (the "Purchaser"). Capitalized terms used but not otherwise defined herein will have the meanings ascribed to them in the Employment Agreement (as defined below).

WHEREAS, the Purchaser and the Company are parties to (i) an Employment Agreement, dated July 14, 2010, by and between the Purchaser and the Company (the "Employment Agreement") and (ii) a Restricted Stock Purchase Agreement, dated July 14, 2010, by and between the Purchaser and the Company, as amended by the First Amendment to Restricted Stock Purchase Agreement, dated April 18, 2012 (the "Prior Purchase Agreement");

WHEREAS, in connection with Purchaser's continued employment by the Company, the Purchaser and the Company desire to amend and restate the Prior Purchase Agreement on the terms set forth below.

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein contained and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

1. Issuance of Shares; Purchase Price. Prior to the date hereof, the Purchaser purchased, and the Company sold to Purchaser: (a) 1,157,200 shares of the Company's common stock, par value $0.001 (the "Time Vested Shares") and (b) 385,740 shares of the Company's common stock, par value $0.001 (the "Milestone Vested Shares" and collectively with the Time Vested Shares, the "Shares"), all at a purchase price of $0.09 per share (the "Purchase Price").

2. Right to Repurchase Shares.

2.1 Termination. If the Purchaser will cease to be an employee, director or consultant of the Company (an "Advisor"), the Company will, from such time (as determined by the Company in its discretion), have an irrevocable, exclusive option to repurchase (the "Repurchase Right") any Shares which have not yet been released from the Repurchase Right (the "Unreleased Shares"), at a price per share equal to the Purchase Price (as adjusted for stock splits, combinations, recapitalizations and the like).

2.2 Lapse of Repurchase Right. As of the date hereof, all of the Time Vested Shares and 192,870 of the Milestone Vested Shares are fully vested and not subject to the Repurchase Right. Subject to Section 2.4 below, the remaining Shares will be released from the Repurchase Right as follows: So long as the Purchaser's continuing status as an Advisor has not been terminated, (i) 192,870 Milestone Vested Shares will be released from the Repurchase Right upon the completion of a firm commitment underwritten initial public offering of the Company's securities pursuant to an effective registration statement under the Securities Act of 1933, as amended (the "Act") in which the Company's pre-money valuation exceeds $200 million and (ii) all or any portion of the remaining Milestone Vested Shares will be released from the Repurchase Right at the discretion of the Company's Board of Directors upon the achievement of any other milestone mutually agreed upon by the Purchaser and the Company.

2.3 Exercise of Repurchase Right. The Company may exercise its Repurchase Right by written notice to the Purchaser or Purchaser's legal representative within 90 days after the date on which the Purchaser ceases to be an Advisor. Such notice will specify the number of Unreleased Shares which the Company elects to purchase and a date for the closing under this Section 2.3, which date will not be more than 30 days from the date of such notice. If the Company exercises its Repurchase Right, the Purchaser will, if necessary, endorse and deliver to the Company the stock certificates representing the Shares being repurchased, and the Company will pay the Purchaser the total repurchase price in cash upon such delivery. For purposes of the foregoing, cancellation of any promissory note made by the Purchaser to the Company shall be treated as payment by the Company to the Purchaser in cash for the Unreleased Shares to the extent of the unpaid principal amount of such promissory note and any accrued and unpaid interest canceled with respect thereto. The Purchaser will cease to have any rights with respect to such repurchased Shares immediately upon receipt of such written notice, provided the repurchase price is paid timely.

2.4 Acceleration of Lapse of Repurchase Right Upon Certain Events. Notwithstanding the provisions of Section 2.2 regarding expiration of the Repurchase Right, the lapse of the Repurchase Right will be accelerated upon the occurrence of certain events as set forth below:

(a) If the Purchaser is no longer employed by the Company as a result of his Disability (as provided in the Employment Agreement) or dies, the Repurchase Right will expire with respect to 50% of the then remaining Unreleased Shares.

(b) Immediately prior to the closing of a firm commitment underwritten initial public offering of the Company's securities pursuant to an effective registration statement under the Act (an "IPO"), the Repurchase Right will expire with respect to 25% of the then remaining Unreleased Shares.

(c) Immediately prior to the completion of a Change of Control (as provided in the Employment Agreement), the Repurchase Right will expire with respect to 50% of the then remaining Unreleased Shares. In addition, in the event Purchaser resigns as an employee of the Company for Good Reason or is terminated as an employee by the Company without Cause, as provided in the Employment Agreement, at any time within 12 months after the completion of a Change of Control, the Repurchase Right will expire with respect to all of the then remaining Unreleased Shares upon Purchaser's resignation or termination.

(d) Upon the election of the Company's Board of Directors at any time, the Company may release all or a portion of the then remaining Unreleased Shares from the Repurchase Right.

With respect to the acceleration provided for in this Section 2.4, the Unreleased Shares for which vesting is accelerated will be the applicable percentage of the Unreleased Shares that would vest on each of the future dates or events on which vesting is to occur under Section 2.2. The acceleration in this Section 2.4 may be waived by the Purchaser at any time.

3. Other Restrictions on Resale of Shares.

3.1 Transfer Restrictions. The Purchaser may not dispose of or transfer any Shares that are subject to the Company's Repurchase Right under Section 2; provided that the Purchaser may transfer any or all of the Shares to: (i) any member of the Purchaser's immediate family or any trust for the benefit of the Purchaser or any such family member; or (ii) by will or the laws of descent and distribution. Prior to and as a condition of any transfer described in the preceding sentence, the transferee will agree (in a written agreement which will be satisfactory in form and substance to the Company and its counsel) to be bound by all of the provisions of this Agreement in the same manner as the Purchaser, and, whether or not the transferee so agrees, the Shares will remain Subject to, and the transferee will be bound by, those provisions (including, without limitation, the vesting provisions hereof, which will continue to relate to the Purchaser's status as an Advisor). Upon any permitted transfer and absent the Company's prior written approval to the contrary, the number of Unreleased Shares and released Shares transferred to the transferee will be in the same proportion as the number of Unreleased Shares and released Shares held by the Purchaser immediately prior to the transfer, and all subsequent vesting of Unreleased Shares will be attributed in the same proportion between the Purchaser and the transferee. For purposes of this Agreement, "immediate family" will mean the Purchaser's spouse and lineal descendants (including, without limitation, stepchildren and adopted children). In addition, any transfer of Shares will be subject to the restrictions set forth in this Section 3 and restrictions imposed by federal and state securities laws. Any person or entity receiving any Shares that are transferred in accordance with this Agreement will agree in writing to be bound by the applicable terms of this Agreement.

3.2 Legends. The Purchaser understands and acknowledges that the Shares are not registered under the Act, and that under the Act and other applicable laws the Purchaser may be required to hold such Shares for an indefinite period of time. Each stock certificate representing Shares will bear the following legends:

> "THE SECURITIES REPRESENTED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED. THE SECURITIES HAVE BEEN ACQUIRED FOR INVESTMENT AND MAY NOT BE SOLD, TRANSFERRED OR OTHERWISE DISPOSED OF EXCEPT IN COMPLIANCE WITH SUCH ACT.
>
> THE SECURITIES EVIDENCED BY THIS CERTIFICATE ARE SUBJECT TO AGREEMENTS, COVENANTS AND RESTRICTIONS PROVIDED IN THE FOURTH AMENDED AND RESTATED STOCKHOLDERS AGREEMENT DATED APRIL 8, 2013, AS AMENDED, RESTATED OR OTHERWISE MODIFIED FROM TIME TO TIME, BY AND AMONG THE COMPANY AND THE PERSONS NAMED THEREIN. A COPY OF SUCH AGREEMENT MAY BE OBTAINED BY ANY STOCKHOLDER OF THE COMPANY UPON REQUEST WITHOUT CHARGE FROM THE SECRETARY OF THE CORPORATION AT THE PRINCIPAL OFFICE OF THE COMPANY."

3.3 Market Standoff. The Purchaser hereby agrees that the Purchaser will not sell, offer, pledge, contract to sell, grant any option or contract to purchase, purchase any option or contract to sell, grant any right or warrant to purchase, lend or otherwise transfer or encumber, directly or indirectly, any Shares or other securities of the Company, nor will the Purchaser enter

into any swap, hedging or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of any Shares or other securities of the Company, during the period from the filing of the first registration statement of the Company under the Act that includes securities to be sold on behalf of the Company to the public in an underwritten public offering under the Act through the end of the 180-day period following the effective date of such registration statement (or such other period as may be requested by the Company or the underwriters to accommodate regulatory restrictions on (i) the publication or other distribution of research reports and (ii) analyst recommendations and opinions, including, without limitation, the restrictions contained in NASD Rule 2711, or any successor provisions or amendments thereto). Purchaser further agrees, if so requested by the Company or any representative of the underwriters, to enter into such underwriter's standard form of "lockup" or "market standoff" agreement in a form satisfactory to the Company and such underwriter. The Company may impose stop-transfer instructions with respect to securities subject to the foregoing restrictions until the end of any such restriction period.

4. Representations and Acknowledgments of the Purchaser. The Purchaser hereby represents, warrants, acknowledges and agrees that:

4.1 Investment. The Purchaser is accruing the Shares for the Purchaser's own account, and not directly or indirectly for the account of any other person or entity. The Purchaser is acquiring the Shares for investment and not with a view to distribution or resale thereof except in compliance with the Act and any applicable state law regulating securities.

4.2 Access to Information. The Purchaser has had the opportunity to ask questions of, and to receive answers from, appropriate executive officers of the Company with respect to the terms and conditions of the transactions contemplated hereby and with respect to the business, affairs, financial condition and results of operations of the Company. The Purchaser has had access to such financial and other information as is necessary in order for the Purchaser to make a fully informed decision as to investment in the Company, and has had the opportunity to obtain any additional information necessary to verify any of such information to which the Purchaser has had access.

4.3 Pre-Existing Relationship. The Purchaser further represents and warrants that the Purchaser has either (a) a pre-existing relationship with the Company or one or more of its officers or directors consisting of personal or business contacts of a nature and duration which enable the Purchaser to be aware of the character, business acumen and general business and financial circumstances of the Company or the officer or director with whom such relationship exists or (b) such business or financial expertise as to be able to protect the Purchaser's own interests in connection with the purchase of the Shares.

4.4 Speculative Investment. The Purchaser's investment in the Company represented by the Shares is highly speculative in nature and is subject to a high degree of risk of loss in whole or in part; the amount of such investment is within the Purchaser's risk capital means and is not so great in relation to the Purchaser's total financial resources as would jeopardize the personal financial needs of the Purchaser and the Purchaser's family in the event such investment were lost in whole or in part.

4.5 Accredited Investor. The Purchaser represents and warrants that the Purchaser is an "accredited investor" as denned in Rule 501 of Regulation D of the Act.

4.6 Unregistered Securities.

(a) The Purchaser must bear the economic risk of investment for an indefinite period of time because the Shares have not been registered under the Act and therefore cannot and will not be sold unless they are subsequently registered under the Act or an exemption from such registration is available. The Company has made no agreements, covenants or undertakings whatsoever to register any of the Shares under the Act. The Company has made no representations, warranties or covenants whatsoever as to whether any exemption from the Act, including, without limitation, any exemption for limited sales in routine brokers' transactions pursuant to Rule 144 under the Act, will become available and any such exemption pursuant to Rule 144, if available at all, will not be available unless: (i) a public trading market then exists in the Company's common stock, (ii) adequate information as to the Company's financial and other affairs and operations is then available to the public, and (iii) all other terms and conditions of Rule 144 have been satisfied.

(b) Transfer of the Shares has not been registered or qualified under any applicable state law regulating securities and therefore the Shares cannot and will not be sold unless they are subsequently registered or qualified under any such act or an exemption therefrom is available. The Company has made no agreements, covenants or undertakings whatsoever to register or qualify any of the Shares under any such act. The Company has made no representations, warranties or covenants whatsoever as to whether any exemption from any such act will become available.

5. Tax Matters.

(a) The Purchaser acknowledges that the Purchaser has not relied and will not rely upon the Company orthe Company's counsel with respect to any tax consequences related to the ownership, purchase, or disposition of the Shares. The Purchaser assumes full responsibility for all such consequences and for the preparation and filing of all tax returns and elections which may or must be filed in connection with such Shares.

(b) Purchaser understands that Section 83(a) of the Code taxes as ordinary income the difference between the amount paid for the Shares and the fair market value of the Shares as of the date any restrictions on the Shares lapse. In this context, "restriction" means the right of the Company to buy back the Shares pursuant to the Repurchase Right as set forth in Section 2.3. Purchaser understands that Purchaser may elect to be taxed at the time the Shares are purchased, rather than when and as the Repurchase Right expires, by filing an election under Section 83(b) (an "83(b) Election") of the Code with the Internal Revenue Service within 30 days from the date of purchase. Even if the fair market value of the Shares at the time of the execution of this Agreement equals the amount paid for the Shares, the election must be made to avoid income under Section 83(a) in the future. Purchaser understands that failure to file such an election in a timely manner may result in adverse tax consequences for Purchaser. Purchaser further understands that an additional copy of such election form should be filed with his or her federal income tax return for the calendar year in which the date of this Agreement falls.

Purchaser acknowledges that the foregoing is only a summary of the effect of United States federal income taxation with respect to purchase of the Shares hereunder, and does not purport to be complete. Purchaser further acknowledges that the Company has directed Purchaser to seek independent advice regarding the applicable provisions of the Code, the income tax laws of any municipality, state or foreign country in which Purchaser may reside, and the tax consequences of Purchaser's death.

6. No Commitment. Nothing in this Agreement constitutes an agreement that the Purchaser will be employed or retained by the Company for any term and the Purchaser acknowledges that the Purchaser serves "at will."

7. Escrow of Shares. For purposes of facilitating the enforcement of the provisions of Section 2 above, the Purchaser agrees, that any and all certificate(s) representing Unreleased Shares subject to the Repurchase Right shall be held in escrow by the Secretary of the Company, or the Secretary's designee, together with such assignment documentation as the Company deems reasonably necessary to enforce the provisions of Section 2 above and to effectuate all such transfers and/or releases as are in accordance with the terms of this Agreement. The Purchaser hereby acknowledges that the Secretary of the Company, or the Secretary's designee, is so appointed as the escrow holder with the foregoing authorities as a material inducement to make this Agreement and that said appointment is coupled with an interest and is accordingly irrevocable. The Purchaser agrees that said escrow holder shall not be liable to any party hereof (or to any other party). The escrow holder may rely upon any letter, notice or other document executed by any signature purported to be genuine and may resign at any time. The Purchaser agrees that if the Secretary of the Company, or the Secretary's designee, resigns as escrow holder for any or no reason, the Board shall have the power to appoint a successor to serve as escrow holder pursuant to the terms of this Agreement. At the written request of the Purchaser, and subject to the conditions set forth in the Joint Escrow Instructions entered into by the Company and Purchaser on the date of the Prior Purchase Agreement, the Company will promptly provide to the Purchaser a certificate representing any Shares that are not Unreleased Shares.

8. Arbitration. Purchaser and the Company agree that any and all disputes, claims, or controversies of any nature whatsoever arising out of, or relating to, this agreement, or its interpretation, enforcement, breach, performance or execution, will be resolved, to the fullest extent permitted by law, by final, binding and confidential arbitration in San Diego, CA conducted before a single arbitrator by Judicial Arbitration and Mediation Services, Inc. ("JAMS") or its successor, under the then-applicable JAMS rules. By agreeing to this arbitration procedure, both Purchaser and the Company waive the right to resolve any such dispute, claim or demand through a trial by jury or judge or by administrative proceeding. Purchaser will have the right to be represented by legal counsel at any arbitration proceeding. The arbitrator will: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be available under applicable law in a court proceeding; and (b) issue a written statement signed by the arbitrator regarding the disposition of each claim and the relief, if any, awarded as to each claim, the reasons for the award, and the arbitrator's essential findings and conclusions on which the award is based. The arbitrator, and not a court, will be authorized to determine whether the provisions of this paragraph apply to a dispute, controversy, or claim sought to be resolved in accordance with these arbitration procedures. The Company will pay all JAMS' arbitration fees. Nothing in this Agreement is intended to prevent either

Purchaser or the Company from obtaining injunctive relief in court if necessary to prevent irreparable harm pending the conclusion of any arbitration,

9. Integration. This Agreement, the Employment Agreement and any other agreements pursuant to which Purchaser has received, or is entitled to receive from the Company any equity securities or rights to acquire equity securities of the Company, constitute the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior agreements between the parties with respect to any related subject matter, including without limitation the Prior Purchase Agreement.

10. Successors. This Agreement will be binding on and inure to the benefit of the Purchaser, the Purchaser's heirs, executors, administrators and other legal representatives and will be binding on and inure to the benefit of the Company and its respective successors and assigns.

11. Enforceability. If any portion or provision of this Agreement will to any extent be declared illegal or unenforceable by a court of competent jurisdiction, then the remainder of this Agreement, or the application of such portion or provision in circumstances other than those as to which it is so declared illegal or unenforceable, will not be affected thereby, and each portion and provision of this Agreement will be valid and enforceable to the fullest extent permitted by law.

12. Waiver. No waiver of any provision hereof will be effective unless made in writing and signed by the waiving party. The failure of any party to require the performance of any term or obligation of this Agreement, or the waiver by any party of any breach of this Agreement, will not prevent any subsequent enforcement of such term or obligation or be deemed a waiver of any subsequent breach.

13. Notices. Any notices, requests, demands and other communications provided for by this Agreement will be sufficient if in writing and delivered in person or sent by a nationally recognized overnight courier service or by registered or certified mail, postage prepaid, return receipt requested, to the Purchaser at the last address the Purchaser has filed in writing with the Company at its main offices, attention of the Chief Executive Officer, and will be effective on the date of delivery in person or by courier or three days after the date mailed.

14. Amendment. This Agreement may be amended or modified only by a written instrument signed by the Purchaser and the Company (where such amendment has been approved by a majority of the members of the Board of Directors (excluding Purchaser)).

15. Governing Law. This contract will be construed under and be governed in all respects by the laws of the State of California, without giving effect to the conflict of laws principles. With respect to any disputes concerning federal law, such disputes will be determined in accordance with the law as it would be interpreted and applied by the appropriate United States Court of Appeals.

16. Counterparts; Facsimiles. This Agreement may be executed in two or more counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument, and such counterparts may be delivered via facsimile.

[*remainder of this page intentionally left blank*]

IN WITNESS WHEREOF, this Agreement has been executed as a sealed instrument by the Company, by its duly authorized representative, and by Purchaser, as of the date first above written.

aTyr Pharma, Inc.	Purchaser
By /s/ Nancy D. Krueger	By: /s/ John D. Mendlein
Name: Nancy D. Krueger	Name: John D. Mendlein
Title: V.P. Legal Affairs & Secretary	Date:
Date:	

CONSENT OF SPOUSE
(if applicable)

By execution of this Agreement, the undersigned spouse of the Purchaser agrees to be bound by the terms of this Agreement as to his or her interest, whether as community property or otherwise, if any, in the Shares purchased hereby, including, without limitation, the terms of Section 2.

Purchaser's Spouse, if applicable

Exhibit 10.7

CERTAIN CONFIDENTIAL PORTIONS OF THIS EXHIBIT WERE OMITTED AND REPLACED WITH "[***]". A COMPLETE VERSION OF THIS EXHIBIT HAS BEEN FILED SEPARATELY WITH THE SECRETARY OF THE SECURITIES AND EXCHANGE COMMISSION PURSUANT TO AN APPLICATION REQUESTING CONFIDENTIAL TREATMENT UNDER RULE 406 OF THE SECURITIES ACT OF 1933.

AMENDED AND RESTATED RESEARCH FUNDING AND OPTION AGREEMENT

by and between

THE SCRIPPS RESEARCH INSTITUTE
a California nonprofit
public benefit corporation

and

aTYR PHARMA, INC.

a Delaware corporation

TABLE OF CONTENTS

AMENDED AND RESTATED RESEARCH FUNDING AND OPTION AGREEMENT

This Agreement is entered into this 19th day of January 2015 (the "**Effective Date**"), by and between THE SCRIPPS RESEARCH INSTITUTE, a California nonprofit public benefit corporation located at 10550 North Torrey Pines Road, La Jolla, California 92037 ("**TSRI**"), and aTyr Pharma, Inc., a Delaware corporation located at 3545 John Hopkins Court, Suite #250, San Diego, CA 92121 ("**Sponsor**"), with respect to the facts set forth below.

RECITALS

A. **WHEREAS**, TSRI is a non-profit institution engaged in fundamental scientific biomedical and biochemical research including research relating to the function of aminoacyl tRNA synthetases in translation;

B. **WHEREAS**, Sponsor has provided, and desires to continue to provide, certain funding as part of TSRI's research activities into the structure and biological functions of aminoacyl tRNA synthetases, their fragments and accessory proteins;

C. **WHEREAS**, TSRI has the exclusive right to grant a license in and to any technology developed pursuant to the research program described herein, subject to any non-exclusive rights of the U.S. Government, resulting from the receipt by TSRI of U.S. Government funding, to use such technology for its own purposes;

D. **WHEREAS**, TSRI is willing to grant to Sponsor an option to acquire, under commercially reasonable terms taking into consideration Sponsor's status as an early-stage company with limited financial resources, rights and licenses to use, enhance and develop technology arising from the Research Program and develop, market and sell products and provide services in the field described below;

E. **WHEREAS**, Sponsor and TSRI are parties to that certain Research Funding and Option Agreement, dated as of October 31, 2007, as amended by First Amendment to Research Funding and Option Agreement, dated May 7, 2010, Second Amendment to Research Funding and Option Agreement, dated May 27, 2011, and Third Amendment to Research Funding and Option Agreement, dated June 1, 2011 (collectively, the "**Prior Agreement**"), pursuant to which, among other things, Sponsor had previously agreed to cause to be issued to TSRI shares of common stock in certain Affiliates of Sponsor representing the Equity Percentage (as defined in the Prior Agreement) (such obligation, the "**Affiliate Equity Obligation**"); and

F. **WHEREAS,** Sponsor and TSRI desire to amend and restate the Prior Agreement as set forth in this Agreement.

NOW, THEREFORE, in consideration of the mutual covenants and conditions contained herein, TSRI and Sponsor hereby agree as follows:

1. DEFINITIONS.

1.1 Affiliate. The term "**Affiliate**" shall mean any entity which directly or indirectly controls, or is controlled by Sponsor. The term "**control**" as used herein means (a) in

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the case of corporate entities, direct or indirect ownership of at least fifty percent (50%) of the stock or shares entitled to vote for the election of directors; or (b) in the case of non-corporate entities, direct or indirect ownership of at least fifty percent (50%) of the equity interest with the power to direct the management and policies of such non-corporate entities. Unless otherwise specified, the term Sponsor includes Affiliates.

1.2 Agreement Number. This Agreement is TSRI number SFP-1698.

1.3 Biological Materials. The term "**Biological Materials**" shall mean any Technology in the form of tangible materials together with any progeny, mutants or derivatives thereof developed in performance of the Research Program.

1.4 Confidential Information. The term "**Confidential Information**" shall mean any and all proprietary information of TSRI or Sponsor which may be exchanged between the parties at any time and from time to time during the term hereof. "**Proprietary Information**" shall include information of the disclosing party that the disclosing party would consider confidential or proprietary under the circumstances. The fact that a party may have marked or identified as confidential or proprietary any specific information shall be indicative that such party believes such information to be confidential or proprietary, but the failure to so mark information shall not conclusively determine that such information was or was not considered confidential information by such party. Information shall not be considered confidential to the extent that it:

(a) Is publicly disclosed through no act or omission of the receiving party, either before or after it becomes known to the receiving party; or

(b) Was known to the receiving party prior to the date of this Agreement as demonstrated by competent evidence, which knowledge was acquired independently and not from the other party hereto (including such party's employees); or

(c) Is subsequently disclosed to the receiving party in good faith by a third party who has a right to make such disclosure; or

(d) Has been published by a third party as a matter of right; or

(e) Is independently developed by the receiving party without reference to, aid from or reliance on the Confidential Information of the disclosing party as demonstrated by competent evidence.

If Confidential Information is required to be disclosed by law or court order the party required to make such disclosure shall limit the same to the minimum required to comply with the law or court order, and shall use reasonable efforts to attempt to seek confidential treatment for that disclosure, and prior to making such disclosure that party shall notify the other party, not later than ten (10) days (or such shorter period of time as may be reasonably practicable under the circumstances) before the disclosure in order to allow that other party to comment and/or to obtain a protective or other order, including extensions of time and the like, with respect to such disclosure.

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1.5 Field. The term "**Field**" shall mean any therapeutic, prognostic, diagnostic, or cosmeceutical use.

1.6 Joint Technology. The term "**Joint Technology**" shall mean any Technology developed jointly under principles arising under the patent laws of the United States of America by at least one employee of Sponsor that has assigned or has an obligation to assign its rights in such technology to Sponsor and one employee of TSRI that has assigned, or has an obligation to assign, its rights in such Technology to TSRI.

1.7 Patent Rights. The term "**Patent Rights**" shall mean rights arising out of or resulting from (a) any U.S./PCT patent application(s) (including without limitation continuations and divisionals) directed to the Technology; (b) the foreign patent applications associated with the patent applications referenced in subsection (a); (c) the patents issued from the patent applications referenced in subsection (a) and (b); (d) divisionals, continuations, reissues, reexaminations, restorations (including supplemental protection certificates) and extensions of any patent or application set forth in (a)—(c) above; and (e) any claims of continuations in part that are entitled to the benefit of the priority date of the application(s) referenced in sub clause (a) above.

1.8 Principal Investigator. The term "**Principal Investigator**" shall mean Dr. Xianglei Yang, together with such replacement persons selected in accordance with the provisions of Section 2.2 hereof.

1.9 Process. The term "**Process**" shall mean any method or process (a) the use, importation, sale, supply or performance of which would, in the absence of the license granted under a License Agreement substantially in the form of Exhibit E upon Sponsor successfully exercising its option under Section 3.4 of the Agreement, infringe a Valid Claim within the Patent Rights, or (b) that utilizes or incorporates Biological Materials.

1.10 Product. The term "**Product**" shall mean any product (a) the manufacture, use, importation, sale or offer for sale of which would, in the absence of the license granted under a License Agreement substantially in the form of Exhibit E upon Sponsor successfully exercising its option under Section 3.4 of the Agreement, infringe a Valid Claim within the Patent Rights, or (b) that utilizes or incorporates Biological Materials.

1.11 Research Program. The term "**Research Program**" shall mean the research program to be undertaken by TSRI under the direction and control of the Principal Investigator as contemplated by Exhibit A.

1.12 Research Tool. The term "**Research Tool**" shall mean any TSRI Technology which meets all three of the following criteria: (i) its primary usefulness is as a tool for discovery, and it is a broad, enabling invention that will be useful to many scientists (and not mainly to perform the research, or to develop the Products or the Processes, under the Research Project); and (ii) it is not used to produce a Product or incorporated into a Product; and (iii) it is not used to perform a Process.

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1.13 Service. **The term "Service**" shall mean the performance of a service for a third party, which performance uses or incorporates a Product or a Process.

1.14 Sponsor Technology. The term "**Sponsor Technology**" shall mean any Technology developed solely by Sponsor under principles arising under the patent laws of the United States of America.

1.15 Technology. The term "**Technology**" shall mean any invention, discovery, know-how, Biological Material, software, information, results, reagents and data, whether patentable or not, conceived, developed or reduced to practice in performance of the Research Program.

1.16 TSRI Technology. The term "**TSRI Technology**" shall mean any Technology, excluding Joint Technology, developed in whole or in part by TSRI under principles arising under the patent laws of the United States of America.

1.17 Valid Claim. The term "**Valid Claim**" shall mean a claim of an issued patent within the Patent Rights that has not lapsed, expired, been canceled, or become abandoned, and has not been held invalid by a court or other appropriate body of competent jurisdiction, unappealable or unappealed within the time allowed for appeal and which has not been admitted to be invalid or unenforceable through reissue or disclaimer or otherwise. The term Valid Claim shall also include the claims of a pending patent application within the Patent Rights, but only to the extent that such claim has been pending [***].

2. CONDUCT OF RESEARCH PROGRAM.

2.1 Conduct of Research Program. TSRI hereby agrees to use reasonable efforts to perform the Research Program subject to the provisions of this Agreement. Notwithstanding the foregoing, TSRI makes no warranties or representations regarding its ability to achieve, nor shall it be bound to accomplish, any particular research objective or results.

2.2 Supervision of Research Program. TSRI agrees that the Research Program at TSRI shall be conducted by or under the direct supervision of the Principal Investigator. In the event that the Principal Investigator leaves TSRI, or terminates his/her involvement in the Research Program, TSRI shall use its best efforts to find a replacement Principal Investigator acceptable to Sponsor, which acceptance shall not be unreasonably withheld. In the event that TSRI shall fail to appoint a replacement Principal Investigator reasonably acceptable to Sponsor, Sponsor shall have a right to terminate this Agreement upon delivery to TSRI of written notice of intent to terminate pursuant to this Section 2.2, which notice must be delivered to TSRI not less than [***] nor more than [***] after delivery by TSRI to Sponsor of the name of the replacement Principal Investigator.

2.3 Reports. TSRI agrees that within sixty (60) days following the last day of each calendar year during the term of this Agreement, TSRI shall furnish Sponsor with a written report summarizing the results of the research included within the scope of the Research Program conducted by TSRI during the immediately preceding calendar year, including but not limited to

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all data, conclusions, results, observations and a detailed description of all procedures (each, an "**Annual Report**"). Within sixty (60) days following the expiration or termination of this Agreement, TSRI shall provide Sponsor with a final written report containing (i) a summary of the results of the research performed under the Research Program and all conclusions and observations derived therefrom, and (ii) all data and results generated, and a detailed description of all procedures undertaken, during the Research Program (the "**Final Report**" and collectively with the Annual Reports, the "**Reports**"). All Reports shall constitute Confidential Information of TSRI. In the event that, resulting from its review of a Report, Sponsor identifies any Technology to which it would like to exercise its option and which has not been previously disclosed to Sponsor by TSRI in accordance with Section 3.1, Sponsor shall notify TSRI of such in writing. Upon such notification, TSRI shall provide Sponsor with a Technology Disclosure in accordance with Section 3.1. Sponsor may exercise its option to the Technology covered by the Technology Disclosure as specifically set forth in Section 3.4. For the avoidance of doubt, TSRI's obligation to provide an Annual Report pursuant to this Section 2.3 shall cease upon delivery to Sponsor of the Final Report.

2.4 TSRI Policies and Procedures. TSRI has developed internal policies and procedures regarding the dissemination of results, data, materials and other tangible information generated during sponsored research projects such as the Research Program. TSRI will instruct the Principal Investigator to comply with such policies and procedures during the performance of the Research Program.

2.5 Financial and Staffing Obligations.

(a) Contributions of Parties to Research Program. Contributions in the form of financial support, equipment, personnel, technology and other necessary components for the conduct of the Research Program shall be made by the parties in accordance with the terms set forth on Exhibit B attached to this Agreement, which will be completed by the parties in good faith within thirty (30) days of the Effective Date for the next twelve (12) months thereafter, and then updated by the parties in good faith for each next succeeding twelve (12) month period during the term of this Agreement. All payments due to TSRI by Sponsor shall be payable in U.S. Dollars by Sponsor in quarterly installments in advance, within ten (10) days following the dates set forth in the following payment schedule; provided, that the due dates and payment amounts set forth below may be adjusted by the parties from time to time by mutual written agreement:

Due Date	Amount
2/28/2015	$[***]
5/31/2015	$[***]
8/31/2015	$[***]
11/30/2015	$[***]
On each anniversary of the foregoing dates during the term of this Agreement	$[***]

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Each payment must reference the Research Project title, Agreement Number and Principal Investigator for purposes of identification. Payments under this Section shall be sent to:

The Scripps Research Institute
10550 North Torrey Pines Road, TPC-7
La Jolla, California 92037
Attn: Vice President, Sponsored Programs
Fax No.: (858) 784-8037

with a copy to:

The Scripps Research Institute
10550 North Torrey Pines Road, TPC-9
La Jolla, California 92037
Attn: Director, Technology Development
Fax No.: (858) 784-9910

TSRI shall not be obligated to perform any of the research specified herein or to take any other action required under this Agreement if the funding is not provided as set forth in Exhibit B and in accordance with the payment schedule as set forth in this Section 2.5(a). Sponsor and TSRI acknowledge and agree that as of the Effective Date, Sponsor has paid to TSRI all accrued amounts due to TSRI under the Prior Agreement.

(b) Capital Equipment. Equipment purchased by TSRI with funds provided by Sponsor shall be the property of TSRI. All capital equipment provided under this Agreement by Sponsor for the use of TSRI remains the property of the Sponsor unless other disposition is mutually agreed upon in writing by the parties. If title to this equipment remains with the Sponsor, Sponsor is responsible for maintenance and repair of the equipment, insuring the equipment against damage or loss, and the costs of its transportation to and from the site where it will be used.

3. INTELLECTUAL PROPERTY AND LICENSE OPTION.

3.1 Disclosure of Technology. After Principal Investigator submits an invention disclosure covering any Technology to TSRI's Office of Technology Development, TSRI shall disclose such Technology in writing to Sponsor (the "**Technology Disclosure**"). TSRI shall use reasonable efforts to provide a Technology Disclosure that contains sufficient detail to (i) enable both parties to determine whether or not the particular Technology is TSRI Technology or Joint Technology; and (ii) enable Sponsor to evaluate the advisability of exercising the option granted under Section 3.2. All such Technology Disclosures shall be Confidential Information of TSRI.

3.2 Grant of Option. Subject to the terms of this Agreement and the reservation of rights specified in Sections 4.2 and 4.3 hereof, TSRI hereby grants to Sponsor:

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(a) an exclusive option to acquire an exclusive, worldwide license, including the right to sublicense, under TSRI's rights in the Patent Rights to (i) practice the Patent Rights; (ii) make and have made, to use and have used, and to import Products, Services, Processes and Biological Materials in the Field; and (iii) offer for sale, sell and have sold Products, Services, Processes and Biological Materials in the Field. In the event that a Service or Process utilizes a Research Tool, such Research Tool shall be made available to Sponsor solely on a nonexclusive basis as set forth in Section 3.2(b); and

(b) an exclusive option to acquire a nonexclusive, worldwide license to make and have made, to use and have used, to sell and have sold, to offer to sell and to import any Biological Materials and Research Tools in the Field and the right to sublicense solely for research and development, manufacturing and/or distribution purposes.

3.3 Grant of License. Subject to Sections 4.2 and 4.3, TSRI hereby grants to Sponsor a nonexclusive, royalty-free, non-transferable license to make and use TSRI Technology solely for Sponsor's internal research purposes. Any transfer of materials to Sponsor under this Section 3.3 shall require the execution of a Material Transfer Agreement. The terms of such Material Transfer Agreement shall be materially consistent with the form Material Transfer Agreement attached hereto as Exhibit C. Subject to Sections 4.2 and 4.3, Sponsor has the right to acquire an exclusive, non-transferable, non-commercial license to make and use TSRI Technology (except for TSRI Technology that constitutes a Research Tool) for internal research purposes, pursuant to the terms and conditions of a non-commercial license agreement to be negotiated in good faith between the parties. Sponsor shall notify TSRI in writing within [***] following receipt of the particular Technology Disclosure of its desire to exclusively license such TSRI Technology pursuant to this Section 3.3. TSRI and Sponsor shall have a period of [***] from the date of that notification to execute a non-commercial, exclusive license agreement.

3.4 Exercise of Option.

(a) Good Faith Negotiations. TSRI and Sponsor covenant to negotiate with reasonable diligence and in good faith to enter into a License Agreement (as defined below) in the event the Sponsor elects to exercise the option granted in Section 3.2 hereof.

(b) Option Period. Sponsor shall have a period of [***] from receipt of the Technology Disclosure from TSRI within which to exercise its option in accordance with this Section 3.4 (the "**Option Period**").

(c) Option Notice. Subject to subsection (d) hereof, Sponsor shall exercise the option granted under Section 3.2 by delivering to TSRI a written notice within the Option Period (the "**Option Notice**") which specifies (i) the particular Technology Disclosure for which the option is being exercised; and (ii) the type of license that Sponsor wishes to obtain. Upon such notification, Sponsor and TSRI shall have a period of [***] from the date of the Option Notice (or such longer period as the parties mutually agree) to negotiate with reasonable diligence and in good faith to enter into an Option Agreement in the form attached hereto as Exhibit D, specifying license fees, royalty rates, commercial development obligations and other business terms of a license agreement (the "**License Agreement**"). The terms of the License Agreement shall be materially consistent with terms set forth in the Form of License Agreement

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attached hereto as Exhibit E. The "**Field**" in such License Agreement shall be as broad as the Field defined herein. Upon execution of the Option Agreement, and at Sponsor's expense, TSRI shall prepare, file and prosecute any patent applications necessary to protect the proprietary positions of both parties in the Technology in accordance with Section 4.4 hereof. TSRI and Sponsor shall have [***] from the filing of a patent application in which to execute a License Agreement to the resulting Patent Right.

(d) Patent Notice. In lieu of exercising its option in accordance with Section 3.4(c), Sponsor may, in its sole discretion, elect to pay for the filing of a provisional patent application claiming or covering the Technology that is the subject of the Technology Disclosure. In the event that the Sponsor determines it will support and pay the filing of a provisional patent application, it shall send written notice to TSRI within the Option Period, that it will pay for the filing of one or more provisional patent applications in respect of such Technology (the "**Patent Notice**"). The parties hereby agree that TSRI shall prepare and file such provisional patent application for the Technology identified by Sponsor in the Patent Notice in accordance with Section 4.4 hereof. Sponsor shall have [***] from the date of filing a patent application in which to deliver to TSRI an Option Notice for the patent application. Upon delivery of the Option Notice pursuant to this Section 3.4(d), the parties shall have [***] in which to negotiate with reasonable diligence and in good faith to enter into a License Agreement for the patent application, which shall be materially consistent with the terms of the License Agreement set forth in Exhibit E.

(e) Failure to Exercise Option. Upon the expiration of the Option Period, if TSRI has not received an Option Notice or a Patent Notice with respect to TSRI Technology disclosed in a Technology Disclosure, except as set forth in subsection (f) of this Section 3.4 the Sponsor's option with respect to such Technology shall be of no further force and effect. TSRI may thereafter file a patent application at its own expense for such TSRI Technology. In the event TSRI has not received an Option Notice or a Patent Notice with respect to Joint Technology disclosed in a Technology Disclosure, both parties shall (i) have no further obligations to each other with respect to such Joint Technology and any resulting Patent Rights; and (ii) subject to subsection (f) of this Section 3.4 be free to independently license or otherwise dispose of their rights to such Joint Technology and any resulting Patent Rights on a worldwide basis, with no obligation to obtain consent of the other party or to account to the other party for profits or otherwise.

(f) [***]

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3.5 Biological Materials. In the event Sponsor exercises its option under Section 3.2(b) to obtain a non-exclusive license to Biological Materials, the parties shall execute a material transfer agreement in substantially the form attached hereto as Exhibit C.

3.6 Non-Patented Technology. In the event that Sponsor exercises its option under Section 3.2(b) to obtain a non-exclusive license to Biological Material or Research Tools, and the parties agree not to obtain patent protection on such Biological Material or Research Tools, TSRI and Sponsor shall have [***] from the date of exercise of the option by Sponsor in which to execute a mutually acceptable license agreement to such Biological Material or Research Tools which agreement shall be on terms and conditions which are reasonable and customary for an agreement between an academic institution and a small company.

3.7 Equity. Within thirty (30) days of the Effective Date, Sponsor will issue 953,228 shares of its common stock, par value $0.001 per share (the "**Shares**"), to TSRI, at a price of $0.001 per share. Sponsor and TSRI shall enter into a Common Stock Purchase Agreement, in substantially the form attached hereto as Exhibit F (the "Common Stock Purchase Agreement"), in order to memorialize the purchase and sale of the Shares. The parties acknowledge that the shares to be issued pursuant to the Common Stock Purchase Agreement represent all of the shares of the capital stock of Sponsor that TSRI is currently entitled to receive pursuant to the TSRI Agreements (as defined below).

4. INTERESTS AND RIGHTS IN INTELLECTUAL PROPERTY.

4.1 Title. TSRI shall retain sole ownership and title to TSRI Technology and to all intellectual property rights related thereto. TSRI shall, in the good faith exercise of its discretion, undertake reasonable efforts to preserve and maintain its ownership and title as TSRI deems appropriate, *provided*, *however*, that TSRI cannot, by transfer of ownership, title or otherwise, take any action that would prevent TSRI from granting the rights to Sponsor under the option set forth in Section 3.2 or under a License Agreement, provided Sponsor properly exercises its rights thereunder. Ownership of and title to Joint Technology shall be vested jointly in TSRI and Sponsor, with each owning an undivided interest therein. Sponsor shall retain sole ownership and title to Sponsor Technology, and nothing in this Agreement shall be construed as granting TSRI any interest, express or implied, in the Sponsor Technology. Ownership of Patent Rights shall follow inventorship under principles arising under the patent laws of the United States of America.

4.2 Governmental Interest. TSRI and Sponsor acknowledge that TSRI has received, and expects to continue to receive, funding from the United States Government in support of TSRI's research activities. TSRI and Sponsor acknowledge and agree that their respective rights and obligations pursuant to this Agreement shall be subject to the rights of the United States Government, existing and as amended, which may arise or result from TSRI's receipt of research support from the United States Government, including but not limited to,

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37 CFR 401, the NIH Grants Policy Statement and the NIH Guidelines for Obtaining and Disseminating Biomedical Research Resources.

4.3 Reservation of Rights. TSRI reserves the right to use for any non-commercial research or educational purposes any Patent Rights, Biological Materials or Research Tools licensed hereunder, without TSRI being obligated to pay Sponsor any royalties or other compensation. In addition, TSRI reserves the right to grant non-commercial, non-exclusive research and educational use licenses to other nonprofit or academic institutions to Patent Rights, Biological Materials or Research Tools, without the other non-profit entity being obligated to pay Sponsor any royalties or other compensation. TSRI shall have no obligation to notify or inform Sponsor of such use or licenses.

4.4 Patent Prosecution.

(a) TSRI shall direct and control the preparation, filing and prosecution of the United States and foreign patent applications within Patent Rights (including without limitation any reissues, reexaminations, appeals to appropriate patent offices and/or courts, interferences and foreign oppositions). TSRI shall select the patent attorney, subject to Sponsor's written approval, which approval shall not be unreasonably withheld. The parties agree that TSRI shall have the right, at its sole discretion, to utilize TSRI's Office of Patent Counsel in addition to independent counsel for patent prosecution and maintenance described herein, and the fees and expenses associated with the work done by such Office of Patent Counsel and/or independent counsel shall be paid as set forth below. Sponsor shall have full rights of consultation with the patent attorney so selected on all matters relating to the Patent Rights. TSRI shall implement all reasonable and timely requests made by Sponsor with regard to the preparation, filing, prosecution and/or maintenance of the patent applications and/or patents within the Patent Rights, including without limitation requests relating to the jurisdictions in which TSRI shall prepare, file, prosecute and maintain patent applications. Pursuant to this Section 4.4(a) and as of the Effective Date, TSRI and Sponsor are using the services of Cooley LLP for matters related to the prosecution and maintenance of the Patent Rights.

(b) TSRI shall keep Sponsor timely informed with regard to the patent application and maintenance processes. TSRI shall deliver to Sponsor copies of all patent applications, amendments, related correspondence, and other related matters in a timely matter.

(c) Sponsor agrees to pay and shall pay all reasonable patent costs and expenses incurred by TSRI for the filing, prosecution and maintenance the United States and foreign patent applications as set forth in Section 3.4(c) and 3.4(d) hereof. Sponsor agrees to pay and shall pay all such reasonable expenses within thirty (30) days after Sponsor receives an itemized invoice therefor. Payment shall be made to TSRI. Failure of Sponsor to pay patent costs and expenses as set forth herein shall immediately relieve TSRI from its obligation to incur further patent costs and expenses or to continue to prosecute the patent applications, *provided*, *however*, that TSRI's obligation to incur patent costs and expenses and to prosecute the patent applications shall, to the extent possible, be immediately restored upon Sponsor's payment of such patent costs and expenses.

5. CONFIDENTIALITY AND PUBLICATION.

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5.1 Treatment of Confidential Information. The parties agree that during the term of this Agreement, and for a period of five (5) years after this Agreement terminates, a party receiving Confidential Information of the other party will (a) maintain in confidence such Confidential Information to the same extent such party maintains its own proprietary information, provided that such standard shall be not less than reasonable care; (b) not disclose such Confidential Information to any third party without the prior written consent of the other party; and (c) not use such Confidential Information for any purpose except those permitted by this Agreement.

5.2 Permitted Uses. Notwithstanding Section 5.1 above, the receiving party may use or disclose Confidential Information of the disclosing party only to the extent necessary to prepare, file and prosecute patent applications.

5.3 Publications. Sponsor acknowledges that it is the general policy of TSRI to encourage publication of research results in technical or scientific journals; and Sponsor agrees that TSRI shall have a right to publish in accordance with its general policy. For purposes of this Section 5, "**publish**" and "**publication**" shall include all types of written publication or dissemination of research results or data to third parties that have been actually submitted to TSRI's Office of Technology Development for review in accordance with TSRI's policies and procedures. TSRI shall submit to Sponsor copies of all proposed publications which describe Technology and afford Sponsor a period of [***] to review such publication to (i) ascertain whether Sponsor's Confidential Information would be disclosed by the publication; and (ii) ascertain whether or not the publication discloses any Technology to which Sponsor wishes to exercise its option. If such publication discloses Sponsor's Confidential Information and upon Sponsor's written request, TSRI shall at Sponsor's election remove such Confidential Information and/or delay publication for up to an additional [***] to allow Sponsor to protect its Confidential Information by filing a patent application(s). In the event that Sponsor identifies any Technology for which Sponsor may want to exercise its option, Sponsor shall notify TSRI of such in writing within the above [***] period. Upon such notification, TSRI may (i) file any patent applications necessary to protect the proprietary positions of both parties in the Technology in accordance with Section 4.4 hereof; and (ii) shall provide Sponsor with a Technology Disclosure in accordance with Section 3.1 hereof. Absent receipt by TSRI of any written instruction by Sponsor within the [***] review period, TSRI shall be free to make the proposed disclosure or publish the proposed publication.

5.4 Publicity. Except as otherwise provided herein, each party agrees not to disclose any terms of this Agreement to any third party without the prior written consent of the other party, except (i) as required by securities or other applicable laws and regulations, (ii) to existing and prospective investors, (iii) to existing or potential business partners or acquirers, (iv) to agencies of the government or private foundations for purposes of obtaining grants or other funding or providing reports to such agencies or foundations, and, (v) to accountants, attorneys and other professional advisors of such party, provided that except for subclause (ii) and (iii) above, such third parties have signed written confidentiality agreements at least as restrictive as the confidentiality obligations herein, or such third parties shall be under a duty of confidentiality, before any such disclosures, and with respect to subclause (i) above the disclosing party uses reasonable efforts to seek confidential treatment for the disclosure of any

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terms of this Agreement that the disclosing party reasonably believes are likely to cause substantial competitive harm to the parties if disclosed. Scientific publications published in accordance with Section 5.3 of this Agreement shall not be construed as publicity governed by this Section 5.4.

6. WARRANTIES.

6.1 Limited Warranty. TSRI hereby represents and warrants that it has full right and power to enter into this Agreement and to perform its obligations hereunder, to grant the options, licenses and other rights provided herein, and that this Agreement does not conflict with any other agreement or understanding to which TSRI is a party or by which TSRI may be bound. TSRI MAKES NO OTHER WARRANTIES CONCERNING PATENT RIGHTS, TECHNOLOGY, BIOLOGICAL MATERIALS, RESEARCH TOOLS OR ANY OTHER MATTER WHATSOEVER, INCLUDING WITHOUT LIMITATION, THE EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF THIRD PARTY RIGHTS OR ARISING OUT OF COURSE OF CONDUCT OR TRADE CUSTOM OR USAGE, AND TSRI DISCLAIMS ALL SUCH EXPRESS OR IMPLIED WARRANTIES. TSRI MAKES NO WARRANTY OR REPRESENTATION AS TO THE VALIDITY OR SCOPE OF PATENT RIGHTS, OR THAT ANY PRODUCT, TECHNOLOGY, PROCESS, SERVICE, RESEARCH TOOL, OR BIOLOGICAL MATERIALS WILL BE FREE FROM AN INFRINGEMENT ON PATENTS OR OTHER INTELLECTUAL PROPERTY RIGHTS OF THIRD PARTIES, OR THAT NO THIRD PARTIES ARE IN ANY WAY INFRINGING UPON ANY PATENT RIGHTS, TECHNOLOGY, BIOLOGICAL MATERIALS OR RESEARCH TOOLS COVERED BY THIS AGREEMENT. FURTHER, TSRI HAS MADE NO INVESTIGATION AND MAKES NO REPRESENTATION THAT THE TECHNOLOGY, PATENT RIGHTS, BIOLOGICAL MATERIALS OR RESEARCH TOOLS ARE SUITABLE FOR SPONSOR'S PURPOSES.

6.2 Limitation on Damages. IN NO EVENT SHALL EITHER PARTY BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, EXEMPLARY, PUNITIVE OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS OR EXPECTED SAVINGS OR OTHER ECONOMIC LOSSES, OR FOR INJURY TO PERSONS OR PROPERTY) ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ITS SUBJECT MATTER. [***] AGGREGATE LIABILITY FOR ALL DAMAGES OF ANY KIND RELATING TO THIS AGREEMENT OR ITS SUBJECT MATTER SHALL NOT EXCEED THE AMOUNT PAID BY SPONSOR TO TSRI UNDER THIS AGREEMENT. THE FOREGOING EXCLUSIONS AND LIMITATIONS SHALL APPLY TO ALL CLAIMS AND ACTIONS OF ANY KIND AND ON ANY THEORY OF LIABILITY, WHETHER BASED ON CONTRACT, TORT (INCLUDING, BUT NOT LIMITED TO NEGLIGENCE OR STRICT LIABILITY), OR ANY OTHER GROUNDS, AND REGARDLESS OF WHETHER SUCH PARTY HAS BEEN ADVISED, OR SHOULD HAVE KNOWN, OF THE POSSIBILITY OF SUCH DAMAGES, AND NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. THE PARTIES FURTHER AGREE THAT EACH WARRANTY DISCLAIMER, EXCLUSION OF DAMAGES OR OTHER LIMITATION OF LIABILITY HEREIN IS INTENDED TO BE

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SEVERABLE AND INDEPENDENT OF THE OTHER PROVISIONS SINCE THEY EACH REPRESENT SEPARATE ELEMENTS OF RISK ALLOCATION BETWEEN THE PARTIES.

7. TERM AND TERMINATION.

7.1 Term. Unless terminated sooner, the initial term of this Agreement shall commence on the Effective Date and terminate at 5:00 p.m. California time on May 30, 2015, and thereafter shall renew automatically for successive twelve (12) month periods from 9:00 a.m. California time on May 31st of one year until 5:00 p.m. California time on May 30th of the following year, unless Sponsor elects to terminate this Agreement effective on May 30, 2015 or on any May 30th thereafter by written notice to TSRI at least thirty (30) days before the applicable May 30th. Notwithstanding the foregoing, if a Technology Disclosure has previously been delivered to Sponsor or is delivered to Sponsor upon the expiration or termination of this Agreement pursuant to Section 7.6(b), the term of this Agreement shall automatically be extended until the earlier of the execution of a License Agreement with respect to such Technology or the expiration of any and all rights of Sponsor to enter into a License Agreement with respect to the Technology in accordance with Section 3.4.

7.2 Termination by Sponsor. This Agreement may be terminated at any time by Sponsor by giving six (6) months prior written notice to TSRI. In the absence of a written agreement to the contrary, no such termination shall have the effect of relieving Sponsor of its monetary obligations to fund the Research Program, to pay patent costs or other monetary obligations hereunder which shall have accrued up and to the date of such termination.

7.3 Termination Upon Non-Payment. In the event that Sponsor fails to pay to TSRI any payment within the time frame set forth in Section 2.5(a), TSRI shall not be obligated to perform any of the research specified herein or to take any other action required under this Agreement and may terminate this Agreement if TSRI has not received payment within ten (10) days after TSRI furnishes to Sponsor written notice of such non-payment. Termination pursuant to this Section 7.3 shall not relieve Sponsor of any liability under this Agreement that accrued prior to such termination.

7.4 Termination Upon Default. Except as specified in Sections 7.3 and 7.5, the failure of a party to perform any obligation required of it to be performed hereunder and the failure to cure within sixty (60) days after receipt of notice from the other party specifying in reasonable detail the nature of such default, shall constitute an event of default hereunder. Upon the occurrence of an event of default, the non-defaulting party may deliver to the defaulting party written notice of intent to terminate, such termination to be effective upon the date set forth in such notice. Such termination rights shall be in addition to and not in substitution for any other remedies that may be available to the non-defaulting party serving such notice against the defaulting party. Termination pursuant to this Section 7.4 shall not relieve the defaulting party of liability and damages to the non-defaulting party for breach of this Agreement. Waiver by any party of a single default or a succession of defaults shall not deprive such party of any right to terminate this Agreement arising by reason of any subsequent default.

7.5 Termination Upon Insolvency. This Agreement may be terminated as to any party ("**Insolvent Party**") by another party giving written notice of termination to the

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Insolvent Party upon the filing of bankruptcy or bankruptcy of the Insolvent Party or the appointment of a receiver of any of the Insolvent Party's assets, or the making by the Insolvent Party of any assignment for the benefit of creditors, or the institution of any proceedings against the Insolvent Party under any bankruptcy law which proceeding has not been terminated or dismissed after ninety (90) days. Termination shall be effective upon the date specified in this notice.

7.6 Effect of Expiration or Termination.

(a) Termination Upon Default of Sponsor. Upon the termination of this Agreement by reason of a default by Sponsor, neither party shall have any further rights or obligations with respect to this Agreement, other than the obligation of Sponsor to make any and all final payments accrued prior to the date of termination and the obligation of the parties to make all reports required hereunder. Upon such termination of this Agreement, the parties shall continue to abide by their non-disclosure obligations as described in Section 5.1 and each party hereto shall fulfill any other obligations incurred prior to such termination. Any such termination of this Agreement shall not constitute the termination of any license or any other agreements between the parties which are then in effect except as expressly provided therein. In addition, upon such termination, Sponsor's options under Section 3 shall be deemed automatically cancelled, and Sections 4, 6, 7 and 9 shall survive any such termination.

(b) Expiration or Termination upon Default of TSRI. Upon the expiration of this Agreement at its regularly scheduled expiration date, or upon a termination of this Agreement on account of a default by TSRI, then TSRI shall prepare and submit the Final Report in accordance with Section 2.3 and make the disclosures required by Section 3.1 for TSRI Technology conceived or reduced to practice up to the date of said expiration or termination; and Sponsor shall have the right to exercise its option with respect to said TSRI Technology in accordance with the schedule and procedures specified in Sections 3.2 and 3.4 above. Additionally, each party shall perform all other obligations up to the date of said expiration or termination; and the parties shall continue to abide by their non-disclosure obligations described in Section 5.1. Following receipt of a notice of termination from Sponsor, TSRI shall use its reasonable efforts to avoid incurring any additional non-cancelable commitments in connection with the Research Program without Sponsor's prior written approval. Any such expiration or termination of this Agreement shall not constitute the termination of any license or any other agreements between the parties which are then in effect except as expressly provided therein. Upon such expiration or termination, Sections 4, 6, 7 and 9 shall survive.

8. ASSIGNMENT; SUCCESSORS.

8.1 Assignment. This Agreement may not be assigned or otherwise transferred by either party without the prior express written consent of the other party, which consent shall not be unreasonably withheld; *provided*, *however*, that a party may, without such consent, assign this Agreement and its rights and obligations hereunder (i) to an Affiliate, (ii) in connection with a merger, acquisition, consolidation or a sale involving all or substantially all of the assets of such party. Any attempted assignment or transfer in violation of this Section 8.1 shall be void.

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8.2 Binding Upon Successors and Assigns. Subject to the limitations on assignment set forth herein, this Agreement shall be binding upon and inure to the benefit of any successors in interest and assigns of TSRI and Sponsor. Any such successor to or assignee of a party's interest shall expressly assume in writing the performance of all the terms and conditions of this Agreement to be performed by such party and such written assumption shall be delivered to the other party.

9. GENERAL PROVISIONS.

9.1 Independent Contractors. The relationship between TSRI and Sponsor is that of independent contractors. TSRI and Sponsor are not joint venturers, partners, principal and agent, master and servant, employer or employee, and have no other relationship other than independent contracting parties. TSRI and Sponsor shall have no power to bind or obligate each other in any manner, other than as is expressly set forth in this Agreement.

9.2 Arbitration. Any controversy or claim arising out of or relating to this Agreement, or the breach thereof, shall be settled by binding confidential arbitration in accordance with the Commercial Arbitration Rules of the American Arbitration Association ("**AAA**"), and the procedures set forth below. In the event of any inconsistency between the Rules of AAA and the procedures set forth below, the procedures set forth below shall control. Judgment upon the award rendered by the arbitrators may be enforced in any court having jurisdiction thereof.

(a) Location. The location of the arbitration shall be the County of San Diego, California. TSRI and Sponsor hereby irrevocably submit to the exclusive personal jurisdiction and venue of the American Arbitration Association arbitration panel selected by the parties and located in San Diego County, California for any dispute regarding this Agreement, and to the exclusive personal jurisdiction and venue of the federal and state courts located in San Diego County, California for any action or proceeding to enforce an arbitration award or as otherwise provided in Section 9.2(e) below, and waive any right to contest or otherwise object to such jurisdiction or venue.

(b) Selection of Arbitrators. The arbitration shall be conducted by a panel of three neutral arbitrators who are independent and disinterested with respect to the parties, this Agreement, and the outcome of the arbitration. Each party shall appoint one neutral arbitrator, and the two arbitrators so selected by the parties shall then select the third arbitrator. Each arbitrator must have at least ten (10) years' experience in mediating or arbitrating cases regarding the same or substantially similar subject matter as the dispute between TSRI and Sponsor. If one party has given written notice to the other party as to the identity of the arbitrator appointed by the party, and the party thereafter makes a written demand on the other party to appoint its designated arbitrator within the next ten days, and the other party fails to appoint its designated arbitrator within ten days after receiving said written demand, then the arbitrator who has already been designated shall appoint the other two arbitrators.

(c) Discovery. The arbitrators shall decide any disputes and shall control the process concerning these pre-hearing discovery matters. Pursuant to the Rules of AAA, the parties may subpoena witnesses and documents for presentation at the hearing.

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(d) Case Management. Prompt resolution of any dispute is important to both parties; and the parties agree that the arbitration of any dispute shall be conducted expeditiously. The arbitrators are instructed and directed to assume case management initiative and control over the arbitration process (including scheduling of events, pre-hearing discovery and activities, and the -conduct of the hearing), in order to complete the arbitration as expeditiously as is reasonably practical for obtaining a just resolution of the dispute.

(e) Remedies. The arbitrators may grant any legal or equitable remedy or relief that the arbitrators deem just and equitable, to the same extent that remedies or relief could be granted by a state or federal court, *provided however*, that no punitive damages shall be awarded. No court action shall be maintained seeking punitive damages. The decision of any two of the three arbitrators appointed shall be binding upon the parties. Notwithstanding anything to the contrary in this Agreement, prior to or while an arbitration proceeding is pending, either party has the right to seek and obtain injunctive and other equitable relief from a court of competent jurisdiction to enforce that party's rights hereunder.

(f) Expenses. The expenses of the arbitration, including the arbitrators' fees, expert witness fees, and attorney's fees, may be awarded to the prevailing party, in the discretion of the arbitrators, or may be apportioned between the parties in any manner deemed appropriate by the arbitrators. Unless and until the arbitrators decide that one party is to pay for all (or a share) of such expenses, both parties shall share equally in the payment of the arbitrators' fees as and when billed by the arbitrators.

(g) Confidentiality. Except as set forth below, and as necessary to obtain or enforce a judgment upon any arbitration award, the parties shall keep confidential the fact of the arbitration, the dispute being arbitrated, and the decision of the arbitrators. Notwithstanding the foregoing, the parties may disclose information about the arbitration to persons who have a need to know, such as directors, trustees, management employees, witnesses, experts, investors, attorneys, lenders, insurers, and others who may be directly affected. Additionally, if a party has stock which is publicly traded, the party may make such disclosures as are required by applicable securities laws but will use commercially reasonably efforts to seek confidential treatment for such disclosure.

9.3 Entire Agreement; Modification; Satisfaction and Termination of Affiliate Equity Obligation. This Agreement sets forth the entire agreement and understanding between the parties as to the subject matter hereof and supersedes all prior oral or written agreements or understandings with respect to the subject matter hereof, including without limitation the Prior Agreement. There shall be no amendments or modifications to this Agreement, except by a written document which is signed by both parties. Sponsor and TSRI hereby acknowledge and agree that notwithstanding anything to the contrary set forth in the Prior Agreement (including, without limitation the Affiliate Equity Obligation) or in any other agreement between the Sponsor and TSRI (collectively, the "**TSRI Agreements**"), the Affiliate Equity Obligation was satisfied in full prior to the date hereof. TSRI further acknowledges and agrees that upon the execution and delivery of this Agreement and the Assignment Agreement between Sponsor and TSRI with respect to certain patent applications relating to Structures of Human Histidyl-tRNA

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Synthetase and Methods of Use, the Affiliate Equity Obligation shall be cancelled and extinguished in full, and shall be of no further force or effect.

9.4 California Law. This Agreement shall be construed and enforced in accordance with the laws of the State of California notwithstanding any conflict of laws provisions.

9.5 No Use of Name. The use of the name "**The Scripps Research Institute**", "**Scripps**", "**TSRI**" or any variation thereof in connection with the advertising, sale or performance of Products, Processes, Services, Biological Materials or Research Tools is expressly prohibited. For the avoidance of doubt, nothing in this Section 9.5 shall prevent Sponsor from identifying TSRI as a contracting partner in connection with any disclosure permitted under Section 5.

9.6 Headings. The headings for each article and section in this Agreement have been inserted for the convenience of reference only and are not intended to limit or expand on the meaning of the language contained in the particular article or section.

9.7 Severability. Should any one or more of the provisions of this Agreement be held invalid or unenforceable by a court of competent jurisdiction, it shall be considered severed from this Agreement and shall not serve to invalidate the remaining provisions thereof. The parties shall make a good faith effort to replace any invalid or unenforceable provision with a valid and enforceable one such that the objectives contemplated by them when entering this Agreement may be realized.

9.8 No Waiver. Any delay in enforcing a party's rights under this Agreement or any waiver as to a particular default or other matter shall not constitute a waiver of such party's rights to the future enforcement of its rights under this Agreement, excepting only as to an express written and signed waiver as to a particular matter for a particular period of time.

9.9 Attorneys' Fees. In the event of a dispute among the parties hereto or in the event of any default hereunder, the party prevailing in the resolution of any such dispute or default shall be entitled to recover its reasonable attorneys' fees and other costs incurred in connection with resolving such dispute or default.

9.10 Notices. Any notices required by this Agreement shall be in writing, shall specifically refer to this Agreement and shall be sent by registered or certified airmail, postage prepaid, or by telefax, telex or cable, charges prepaid, or by overnight courier, postage prepaid, and shall be forwarded to the respective addresses set forth below unless subsequently changed by written notice to the other party:

FOR TSRI:

The Scripps Research Institute
10550 North Torrey Pines Road, TPC-9
La Jolla, California 92037
Attn: Director, Technology Development
Fax No.: (858)784-9910

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With a copy to:

The Scripps Research Institute
10550 North Torrey Pines Road, TPC-8
La Jolla, California 92037
Attention: General Counsel
Fax No.: (858) 784-9910

FOR SPONSOR:

aTyr Pharma, Inc.
3545 John Hopkins Court, Suite #250
San Diego, California 92121
Attn: Chief Executive Officer
Fax No.: (858) 731-8394

With a copy to:

Goodwin Procter LLP
Exchange Place, 53 State Street
Boston, MA 02109
Attn: Kingsley L. Taft, Esq.
Fax No. (617) 801-8857

Notices shall be deemed delivered upon the earlier of (i) when received; (ii) three (3) days after deposit into the U.S. mail; (iii) the date notice is sent via facsimile; or (iv) the day immediately following delivery to an overnight courier guaranteeing next-day delivery (except Sundays and holidays).

9.11 Compliance with U.S. Laws. Nothing contained in this Agreement shall require or permit TSRI or Sponsor to do any act inconsistent with the requirements of any United States law, regulation or executive order as the same may be in effect from time to time.

9.12 Further Assurances. Each Party agrees to execute, acknowledge and deliver such further reasonable instructions, and to do all such other reasonable acts, as may be necessary or appropriate in order to carry out the purposes and intent of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their duly authorized representatives as of the date set forth above.

TSRI:	SPONSOR:
The Scripps Research Institute	aTyr Pharma, Inc.
By: /s/ Scott Forrest	By: /s/ Andrew Cubitt
Name: Scott Forrest	Name: Andrew Cubitt
Title: VP, Business Development	Title: VP, Product Protection

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EXHIBIT A

RESEARCH PROGRAM

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Structural analysis of components of mammalian translation apparatus and analysis of alternative functions

Introduction

This project focuses on a subgroup of the components of the translation apparatus that, in some instances, are known to have functions beyond translation. This subgroup is known as the aminoacyl tRNA synthetases (AARSs), enzymes that catalyze the first step of protein synthesis by aminoacylation of transfer RNAs. Their alternative functions in mammalian cells suggest a broad connection of translation to signal transduction pathways in angiogenesis, inflammation, and neurogenesis (Park, Ewalt et al. 2005). Little is known about structural features of AARSs that are needed for functions beyond translation. Also, beyond the few examples known so far, little is known about the full scope of alternative functions carried out by these proteins. Two specific aims are given here. These aims lay the foundation for a deeper understanding of the particular structural features of these proteins that are needed for alternative functions and, in further work, define and analyze some of the alternative functions themselves.

X-ray crystallographic analysis of the 3-dimensional structures of specific human tRNA synthetases and their fragments will be determined. The proteins will be isolated, where possible, in large quantities from bacterial cells harboring plasmids encoding the human enzymes. Special plasmid constructions have already been generated for this purpose. The high-throughput Mosquito screening systems that is established in the laboratory will be used to obtain conditions specific for each protein for obtaining crystals that diffract to high resolution.

A series of assays will be deployed to investigate potential alternative functions of specific tRNA synthetases and their fragments. In the cases studied so far, some of the proteins are activated for cytokine functions by proteolysis or alternative splicing of mRNA. Thus, while the native protein is inactive for cytokine function (but active in protein synthesis), the cytokine function is unmasked when the protein is split. Structural information will be used to attempt to estimate likely places where a split could occur. In addition, antibody-based assays of whole cell extracts will search for naturally produced fragments. The fragments so identified will be put through assays for inflammation, angiogenesis, and neurogenesis.

Background

In the first step of protein synthesis, aminoacylation by an AARS occurs in a two step reaction. The amino acid AA is first activated by condensation with ATP to form the aminoacyl adenylate (AA-AMP), simultaneous with release of pyrophosphate (PPi). The adenylate then reacts with the cognate tRNA to yield AA-tRNA.

$$\text{AARS} + \text{AA} + \text{ATP} \Xi \text{AARS (AA-AMP)} + \text{Ppi} \qquad (1)$$

$$\text{AARS (AA-AMP)} + \text{tRNA} \Xi \text{AA-tRNA} + \text{AMP} + \text{AARS} \qquad (2)$$

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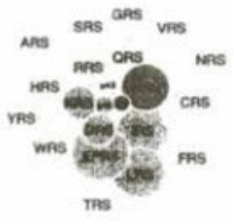
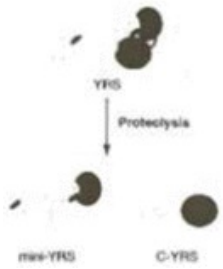
For each of the 20 amino acids, there is a distinct AARS and a group of isoaccepting tRNAs. The genetic code is established through equations 1 and 2, because the reactions link each amino acid to a nucleotide triplet. That triplet is the anticodon imbedded in the specific tRNA (or tRNA isoacceptors) that is cognate to the amino acid. Not surprisingly, the AARSs are essential to all life forms, and appeared at the time of the last common ancestor which eventually split into the 3 great kingdoms of the tree of life—archae, bacteria, and eukarya. Interestingly, in most instances, each cytoplasmic tRNA synthetase is encoded by only a single gene. Therefore, a single point mutation that ablates the activity of a synthetase is lethal. Mitochondria have a separate set of tRNA synthetases, the genes for which are all nuclear encoded. Thus, the mitochondrial synthetases are imported from the cytoplasm, where they are produced, into the mitochondria.

In mammalian cells, the synthetases are gathered together with other, accessory proteins, into a large complex known as the 'multi-synthetase complex' (Lee, Cho et al. 2004). Whether all of the synthetases are present in the complex, or only a subset of 9 are present, is not clear. What is clear, however, is that some are more tightly associated in the complex than others, along with specific accessory proteins known simply as p18, p38, and p43. This organization into a complex may facilitate protein synthesis, in a way that is not understood. Additionally or alternatively, the complex itself may be a reservoir or depository of un-activated cytokines. Here the idea is that, because some synthetases are known to have expanded functions, these functions can be mobilized by release of a synthetase from the complex.



For example, y-interferon induction mobilizes a specific fused tRNA synthetase pair—the Glu-Pro fusion synthetase that is present in higher eukaryotes (Sampath, Mazumder et al. 2004). The released fusion synthetase then enters the cytoplasm to act, through a multi-step mechanism with other proteins, as a translational repressor. After l-interferon induction, the fusion protein is phosphorylated, followed by release from the multi-synthetase complex. Ultimately, the phosphorylated protein becomes part of the GAIT complex (y-interferon-activated inhibitor of translation complex), where it shuts down translation by binding to a stem-loop structure of ceruloplasmin mRNA.



Ceruloplasmin is active in circuits for inflammation and iron homeostasis. The binding of the Glu-Pro fusion protein to the stem-loop structure (in the 3'-untranslated region) of the ceruloplasmin mRNA is speculated to occur through the linker that joins together the two synthetases.

In another example, TyrRS is secreted under certain conditions and, subsequently split into 2 cytokines (Wakasugi and Schimmel 1999), by the action of an extracellular protease such as leukocyte elastase. Each of the fragments, one harboring the active site domain (for aminoacylation) and the other a domain homologous to EMAP II (endothelial monocyte activating protein Ii) is a cytokine. Each of these fragments is a distinct cytokine, demonstrating

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activities in either angiogenesis or inflammatory pathways. In contrast, the full-length, native TyrRS is inactive as a cytokine. Thus, the splitting of the protein is the way that cytokine activation occurs. Similarly, TrpRS is activated as an angiostatic cytokine, by generation of fragments that come from either alternative splicing or natural proteolysis (Wakasugi, Slike et al. 2002). These and other examples illustrate how components of the translation apparatus can have expanded functions that go well beyond translation itself. These expanded functions make a connection of translation with the broader biological system, with the variety of activities essential for cell development, homeostasis, and growth.

Research Design and Methods

[***] In the past, we have successfully overexpressed functional human synthetases in E. coli. In order to enhance protein expression and solubility, all 6 human genes have been codon-optimized for translation in E. coli using the proprietary algorithms developed by CODA Genomics, Inc (http://www.codagenomics.com/). We have cloned the genes into pBAD vectors. Five out of the 6 genes have been expressed, and of these, two have good solubility.

Aminoacyl-tRNA synthetases have modular structures with distinct domains that are joined together (Jasin, Regan et al. 1983). Each domain is responsible for a specific task—for example, the catalytic domain for aminoacylation, anti-codon recognition domain for recognition of the triplet anti-codon embedded in the tRNA, and editing domain for clearance of the misactivated non-cognate amino acids or the mischarged tRNAs. Mammalian tRNA synthetases usually have acquired additional domains, each of which belongs to one of 3 types of structures; glutathione S-transferase (GST), helix-turn-helix (HTH), and endothelial monocyte activating peptide II (EMAP II). The extra domains often are dispensable for aminoacylation, and may provide a regulatory mechanism for non-canonical functions, as demonstrated for TyrRS and TrpRS. In addition, the extra domains may be involved with specific interactions between members of the multi-synthetase complex. With these considerations, we have also cloned domain fragments from the above 6 genes. As an additional benefit, most of the fragments have better expressions and improved solubility relative to the full-length proteins.

Gene	Fragment	Tag	MW (KD)	Expression	Solubility
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]

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[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]

2. X-ray crystallographic analysis of the 3-dimensional structures of specific human tRNA synthetases and their fragments

We will attempt to crystallize, if available, all 6 full-length proteins, 3 binary complexes with full-length proteins, and binary complexes between full-length proteins and fragments, and between different fragments. Because the laboratory is set up with our own high-throughput crystallization robot (Mosquito, Molecular Dimensions) and a microscopic imaging system (CrystalPro, TriTek) to monitor crystal growth, these attempts are realistic. The automated crystallization robot can setup 96 crystallization conditions in a 96-well plate in less then 2 minutes with minimal sample consumption (about 10 µl per plate). The crystallization plates are followed up at regular intervals using the microscopic imaging system that captures digital images for comparison as crystals grow. The obtained crystals will be evaluated by X-ray diffraction in house. We share X-ray facility with the Wilson lab at Scripps, which is equipped with a Rigaku FR-D high brilliance rotating anode X-ray generator, and a Mar 345mm CCD detector. An additional Siemens/Bruker system is also available in the facility. High resolution data collection will be performed at the Stanford Synchrotron Research Laboratory, where Scripps has it own beamline. Our laboratory has beam time on a regular basis.

2. A series of assays will be deployed to investigate potential alternative functions of specific tRNA synthetases and their fragments.

The full-length proteins and the fragments we generated will be put into cell-based assays to screen for alternative functions. We will start with a cell migration assay and chick chorioallantoic membrane (CAM) angiogenesis assay. Different cell types including leucocytes, endothelial cells, and so on (??) will be tested for migration in an AP48 chemotaxis chamber (Neuro Probe, Gaithersburg, MD). The protein samples will be placed in the lower chamber, and cell suspensions will be added to the upper chamber with a polycarbonate filter separating the two chambers. Cells will be allowed to migrate into the filter for 45 min at 37 °C in a 5% C02 incubator. After incubation, non-migrating cells will be removed, and migrating cells which are retained in the filter are stained with the Diff-Quik stain set (Dade Behring, Newark, DE), and are counted under a light microscope in high power fields (HPFs). Both a negative control, like medium alone, and a positive control, like IL-8 or VEGF, will be used to establish the boundaries of the activities. The assay can also be used to test for inhibition of cell migration.

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The CAM angiogenesis assay will be performed with samples that show promising results in the cell migration assay. The assay is performed on the chorioallantoic membrane of fertilized complement fixation for avian leukocysis virus (COFAL)-negative eggs (Charles River Labs, Storrs, CT). Eggs will be incubated for 3.5 days at 38 0 C / 60% humidity. Eggs are then opened and the embryos will be transferred into sterile plastic weigh boats. Embryos will be covered and incubated at 37.5 'C/ 90% humidity. After five days, collagen/mesh implants containing PBS (as negative control), VEGF/bFGF (as positive control) or protein samples will be placed onto the CAM membrane of the embryos, and incubated for an additional 66 hours. The upper mesh layers of the implants will be examined under a stereomicroscope and scored for the proportion of "boxes" (i.e., three dimensional regions defined by the mesh fibers), which contain a blood vessel relative to the total number of boxes.

In the cases of TyrRS and TrpRS, fragmentation happens naturally by either proteolysis or alternative splicing. Only the specific fragments, not the full-length proteins, have alternative functions. With this perspective in mind, we will also use antibody-based assays of whole cell extracts to search for naturally produced fragments. The fragments so identified will be produced by overexpression, and put through assays for inflammation, angiogenesis, or neurogenesis, depending on in what cell types the specific fragments are discovered. Structural analysis of these fragments can also be carried out.

Concluding Remarks

This project attempts to more broadly define the alternative activities of human tRNA synthetases and their fragments, and at the same time to define the structural motifs that are needed for these activities and the structural basis for how they bind together in a larger complex. [***] While we are initiating studies with a defined set of synthetases described above, as the work progresses we will expand the project to include all of the enzymes.

References

Jasin, M., L. Regan, et al. (1983). "Modular arrangement of functional domains along the sequence of an aminoacyl tRNA synthetase." Nature 306(5942): 441-7.

Lee, S. W., B. H. Cho, et al. (2004), "Aminoacyl-tRNA synthetase complexes: beyond translation." J Cell Sci 117(Pt 17): 3725-34.

Park, S. G., K. L. Ewalt, et al. (2005). "Functional expansion of aminoacyl-tRNA synthetases and their interacting factors: new perspectives on housekeepers." Trends Biochem Sci 30(10): 569-74.

Sampath, P., B. Mazumder, et al. (2004). "Noncanonical function of glutamyl-prolyl-tRNA synthetase: gene-specific silencing of translation." Cell 119(2): 195-208.

Wakasugi, K. and P. Schimmel (1999). "Two distinct cytokines released from a human aminoacyl-tRNA synthetase [see comments]." Science 284(5411): 147-51.

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Wakasugi, K., B. M. Slike, et al. (2002). “A human aminoacyl-tRNA synthetase as a regulator of angiogenesis.” Proc Natl Acad Sci U S A 99(1): 173-7.

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EXHIBIT B

BUDGET

Listed below is an exemplary budget for this Agreement that is provided for illustrative purposes only:

Name	Months	Salary	Fringe	Total
[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]
Salary Subtotal				[***]
Equipment				
[***]				[***]
Travel				
[***]				[***]
Other Costs				
[***]				[***]
[***]				[***]
[***]				[***]
Computer costs				[***]
[***]				[***]
[***]				[***]
Total Costs				[***]

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EXHIBIT C

FORM OF MATERIAL TRANSFER AGREEMENT

THE SCRIPPS RESEARCH INSTITUTE

MATERIAL TRANSFER AGREEMENT

[Date]

[Contact Name]
aTyr Pharma, Inc.
3545 John Hopkins Court, Suite #250
San Diego, California 92121

Dear Dr. [Name]:

This is to acknowledge your request for the [Materials Requested] to be provided by The Scripps Research Institute (TSRI) pursuant to [Section 3.3] [Section 3.5] of the Amended and Restated Research Funding and Option Agreement between TSRI and aTyr Pharma, Inc. (''Sponsor") dated January 19, 2015. This material and any progeny, mutants or derivatives of this material are referred to herein as "Materials."

TSRI is pleased to cooperate with Sponsor's use of these Materials for your scientific research. However, before forwarding them to you, TSRI needs you to agree to the following terms and conditions:

(1) that TSRI hereby grants Sponsor a nonexclusive, royalty-free, non-transferable license to make and use the Materials solely for internal research purposes;

(2) that the Materials shall be received by Sponsor only for use in scientific research in Sponsor's laboratories and that all applicable guidelines set forth by the National Institutes of Health (NIH), U.S. Department of Agriculture (USDA) or other government agencies regarding the use of these Materials shall be followed;

(3) that the Materials can be transferred by you to a third party contract provider, strategic partner or collaborator provided that such third party contract provider, strategic partner or collaborator has entered into a material transfer agreement with TSRI on terms substantially similar to this agreement.

Common provisions:

(3) these Materials are provided as a service to the research community. THE MATERIALS ARE BEING SUPPLIED TO YOU WITH NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OF ANY KIND, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF THIRD PARTY RIGHTS, OR ARISING OUT OF COURSE OF

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CONDUCT OR TRADE CUSTOM OR USAGE, ALL OF WHICH ARE DISCLAIMED BY TSRI;

(4) that Sponsor shall bear all risk to itself and/or any others resulting from any use, directly or indirectly, to which Sponsor puts the Materials or any other materials that could not have been made but for these Materials;

(5) that Sponsor hereby defends, indemnifies, and holds harmless TSRI, its affiliates, its trustees, officers, employees and agents from any loss, claim, damage, or liability of any kind whatsoever, including without limitation reasonable attorney's fees, expert witness fees and costs, whether or not a lawsuit or other proceeding is filed, which may arise from Sponsor's use, storage or disposal of the Materials or any other material that could not have been made but for the Materials, except to the extent such arise due to the gross negligence or willful misconduct of TSRI;

(6) that you provide us with your Federal Express account number or an account number for another courier service, so that we may ship the Materials to you.

The Materials are to be used with caution and prudence in any experimental work, since all of their characteristics are not known. Moreover, they are not to be used for testing in or treatment of humans.

If you agree to accept these Materials under the above conditions, please sign the enclosed duplicate copy of this letter, have it signed by an authorized representative of Sponsor and return one original to me. Upon receipt of that confirmation I will forward the Materials to you.

THE SCRIPPS RESEARCH INSTITUTE

_____

[Name]
Director, Technology Development
[Date]

ACCEPTED:

_____	_____
Recipient's Signature	Authorized Institutional Rep. Signature
_____	_____
Recipient's Printed Name and Title	Authorized Rep. Printed Name and Title
_____	_____
Date	Date

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EXHIBIT D

FORM OF OPTION AGREEMENT

[Date]

[Contact Name]
aTyr Pharma. Inc.
3545 John Hopkins Court, Suite #250
San Diego, California 92121

RE: Option to Technology Disclosure No._____

Dear [Contact]:

Pursuant to the Amended and Restated Research Funding and Option Agreement dated January 19, 2015 (the "Research Agreement") by and among The Scripps Research Institute ("TSRI") and aTyr Pharma, Inc. ("Sponsor"), Sponsor hereby executes its option to acquire (i) an exclusive, worldwide license, including the right to sublicense, to make, have made, use, have used, practice, import and have imported Products, Services, Processes and Biological Materials in the Field, and (ii) an exclusive, worldwide license, including the right to sublicense, to offer for sale, sell and perform Products, Services and Processes in the Field, under one or more patent applications to be filed ("Scripps Patent Rights") which shall cover the Technology disclosed in TSRI Technology Disclosure No. ____ entitled "_____" ("Patent Application(s)") and which inventions were reduced to practice as of the date of the applicable TSRI Technology Disclosure. The License Agreement shall be substantially as set forth in Exhibit F to the Research Agreement. Unless otherwise set forth herein, all capitalized terms shall have the meaning ascribed to them in the Research Agreement.

This option, as to each TSRI Technology Disclosure, shall be effective as of the date hereof, and shall automatically terminate on the date that is [***] after the date when Sponsor receives from TSRI written notice of the filing of a patent application covering said TSRI Technology Disclosure ("Option Period"),

After the filing of the Patent Application, and prior to the expiration of the Option Period, TSRI and Sponsor shall enter into a License Agreement that is materially consistent with the form of License Agreement attached as Exhibit F to the Research Agreement.

As consideration for the option, Sponsor shall pay all fees and costs related to the preparation, filing, prosecution and maintenance of Scripps Patent Rights associated with work performed by TSRI's Office of Patent Counsel and any independent counsel. Payment shall be made within [***] after Sponsor receives an invoice therefor. Failure of Sponsor to pay patent costs and expenses as set forth herein shall immediately relieve TSRI from its obligation to incur further patent costs and expenses or to continue to prosecute the patent applications, *provided*, *however*, that TSRI's obligation to incur patent costs and expenses and to prosecute the patent applications shall, to the extent possible, be immediately restored upon Sponsor's payment of such patent costs and expenses. Subject to the terms and conditions of the License Agreement, Sponsor's

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obligation to pay all patent fees and costs incurred pursuant to the Research Agreement shall survive the termination or expiration of the Research Agreement with respect to costs and expenses which accrued during the term of the Research Agreement. Both parties hereto agree that TSRI may, at its sole discretion, utilize TSRI's Office of Patent Counsel in lieu of or in addition to independent counsel for patent prosecution and maintenance of Patent Application(s). Sponsor shall have full rights of consultation with the patent attorney so selected on all matters relating to Patent Application(s). TSRI shall implement all reasonable and timely requests made by Sponsor with regard to the preparation, filing, prosecution and/or maintenance of the Patent Application(s), including without limitation requests relating to the jurisdictions in which TSRI shall prepare, file, prosecute and maintain patent applications.

TSRI agrees that it shall not grant any additional licenses, or additional options to enter into licenses covering Scripps Patent Rights, until the expiration of the time for Sponsor and TSRI to negotiate a License Agreement in accordance with Section 3.4(b) or 3.4(c), as applicable, of the Research Agreement, except to the U.S. Government and to nonprofit and academic institutions as set forth below. If the parties fail to execute a License Agreement for the Scripps Patent Rights within the time periods described in Sections 3.4(b) or 3.4 (c) of the Research Agreement, then TSRI shall be free thereafter to seek other licensees to such Scripps Patent Rights and shall have no further obligations to Sponsor with respect thereto.

TSRI reserves the right to use for any research or educational purposes any Scripps Patent Rights, Biological Materials or Research Tools, without TSRI being obligated to pay Sponsor any royalties or other compensation or to account to Sponsor in any way. In addition, TSRI reserves the right to grant non-exclusive, non-commercial research and educational use licenses to other nonprofit or academic institutions to TSRI Patent Rights, Biological Materials or Research Tools, without the other nonprofit or academic entity being obligated to pay Sponsor any royalties or other compensation or to account to Sponsor in any way.

Sponsor and TSRI acknowledge that TSRI has received, and expects to continue to receive, funding from the United States Government in support of TSRI's research activities. Sponsor and TSRI acknowledge and agree that their respective rights and obligations pursuant to this Agreement shall be subject to the rights of the United States Government which may arise or result from TSRI's receipt of research support from the United States Government.

If Sponsor agrees and accepts these terms, please sign below:

Sincerely,

_____

Director, Technology Development

Acknowledge and Agree:	Acknowledge and Agree:
TSRI	aTYR PHARMA, INC.

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Name:_____ Name:_____

Title:_____ Title:_____

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EXHIBIT E

FORM OF LICENSE AGREEMENT

This License Agreement (this "Agreement") is entered into and made effective as of this _____ day of _____, _____ (the "Effective Date"), by and between THE SCRIPPS RESEARCH INSTITUTE, a California nonprofit public benefit corporation located at 10550 North Torrey Pines Road, La Jolla, California 92037 ("TSRI"), and aTYR PHARMA, INC., a Delaware corporation ("Licensee") located at 3545 John Hopkins Court, Suite # 250, San Diego, CA 92121 with respect to the facts set forth below.

RECITALS

A. WHEREAS, TSRI and Licensee are parties to that certain Amended and Restated Research Funding and Option Agreement dated January 19, 2015 (as amended from time to time, the "Research Agreement"), pursuant to which Licensee agreed to sponsor certain research activities at TSRI related to aminoacyl tRNA synthetases, their fragments and accessory proteins, and in exchange TSRI granted Licensee an option to license the inventions resulting from those research activities;

B. WHEREAS, pursuant to the Research Agreement TSRI has disclosed to Licensee certain Technology (as defined in the Research Agreement), and TSRI and Licensee have prepared and filed a patent application covering or claiming such Technology; and

C. WHEREAS, TSRI has the right to grant an exclusive license to the Technology, subject to certain rights of the U.S. Government resulting from the receipt by TSRI of certain funding from the U.S. Government, and Licensee wishes to acquire from TSRI such license pursuant to the terms and conditions set forth herein.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual covenants and conditions set forth herein, TSRI and Licensee hereby agree as follows:

1. **Definitions**. Capitalized terms shall have the meaning set forth herein.

1.1 AAA. The term "AAA" is defined in Section 15.8.

1.2 Affiliate. The term "Affiliate" shall mean any entity, which directly or indirectly controls, or is controlled by Licensee. The term "control" as used herein means (a) in the case of corporate entities, direct or indirect ownership of at least fifty percent (50%) of the stock or shares entitled to vote for the election of directors; or (b) in the case of non-corporate entities, direct or indirect ownership of at least fifty percent (50%) of the equity interest with the power to direct the management and policies of such non-corporate entities. Unless otherwise specified, the term Licensee includes Affiliates.

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1.3 BLA. The term "BLA" shall mean a Biologics License Application, or similar application, that is submitted to the FDA, or a foreign equivalent of the FDA, for marketing approval of a Licensed Product in a jurisdiction.

1.4 Challenge. The term "Challenge" is defined in Section 3.1(b).

1.5 Claim. The term "Claim" is defined in Section 9.1.

1.6 Confidential Information. The term "Confidential Information" shall mean any and all proprietary information of TSRI or Licensee, which may be exchanged between the parties at any time and from time to time during the term hereof. "Proprietary Information" shall include information of the disclosing party that the disclosing party would consider confidential or proprietary under the circumstances. The fact that a party may have marked or identified as confidential or proprietary any specific information shall be indicative that such party believes such information to be confidential or proprietary, but the failure to so mark information shall not conclusively determine that such information was or was not considered confidential information by such party. Information shall not be considered confidential to the extent that it:

(a) Is publicly disclosed through no act or omission of the receiving party, either before or after it becomes known to the receiving party; or

(b) Was known to the receiving party prior to the date of this Agreement, as demonstrated by competent evidence, which knowledge was acquired independently and not from the other party hereto (including such party's employees); or

(c) Is subsequently disclosed to the receiving party in good faith by a third party who has a right to make such disclosure; or

(d) Has been published by a third party as a matter of right; or

(e) Is independently developed by the receiving party without reference to, aid from or reliance on the Confidential Information of the disclosing party, as demonstrated by competent evidence.

If Confidential Information is required to be disclosed by law or court order, then the party required to make such disclosure shall limit the same to the minimum required to comply with the law or court order, and shall use reasonable efforts to attempt to seek confidential treatment for that disclosure, and prior to making such disclosure that party shall notify the other party, not later than ten (10) days (or such shorter period of time as may be reasonably practicable under the circumstances) before the disclosure in order to allow the other party to comment and/or to

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obtain a protective or other order, including extensions of time and the like, with respect to such disclosure.

1.7 FDA. The term "FDA" shall mean the United States Food and Drug Administration, or any successor agency thereto, having the administrative authority to regulate the marketing of human pharmaceutical products or biological therapeutic products, delivery systems and devices in the United States of America.

1.8 Field. The term "Field" shall mean any reagent, therapeutic, prognostic, diagnostic or cosmeceutical use.

1.9 First Commercial Sale. The term "First Commercial Sale" shall mean the first transfer for consideration by or on behalf of Licensee of a Licensed Product, or the first performance for consideration by or on behalf of Licensee of a Licensed Process or Licensed Service, that takes place after final regulatory approval in the country of sale of such Licensed Product, Licensed Process and/or Licensed Service; provided, however, that a First Commercial Sale shall not be deemed to have occurred solely by reason of (a) transfers or performance for product testing or control; (b) promotional distribution or demonstration to potential purchasers; (c) distribution or performance for research on behalf of Licensee or any of its sublicensees; (d) any transfer or performance made in connection with a Regulatory Approval process; or (e) transfer to an Affiliate or sublicensee of Licensee for later resale to or use by an end consumer.

1.10 IND. The term "IND" shall mean an Investigational New Drug Application filed with the FDA, or the equivalent application or filing filed with any equivalent Regulatory Authority outside the United States of America (including any supra-national agency, such as in the European Union) necessary to commence human clinical trials in such jurisdiction.

1.11 Indemnitees. The term "Indemnitees" is defined in Section 9.1.

1.12 Licensed Patent Rights. The term "Licensed Patent Rights" shall mean (a) the U.S. patent application(s) listed on Exhibit A hereto; (b) foreign counterparts of the patent application(s) referenced in subsection (a); (c) the patents issued from the patent applications referenced in subsection (a) and (b); (d) divisionals, continuations, reissues, reexaminations, restorations (including supplemental protection certificates) and extensions of any patent or application set forth in subsections (a) - (c); and (e) any claims of continuations in part that are directed to subject matter in the applications referenced in subsection (a); and in all cases (b)-(e) entitled to the benefit of the priority date of the application(s) referenced in sub clause (a) above.

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1.13 Licensed Product. The term "Licensed Product" shall mean any product the manufacture, use, importation, sale or offer for sale of which would, but for the license granted herein, infringe a Valid Claim under the Licensed Patent Rights.

1.14 Licensed Process. The term "Licensed Process" shall mean any method or process the manufacture, use, importation, sale or offer for sale of which would, but for the license granted herein, infringe a Valid Claim under the Licensed Patent Rights.

1.15 Licensed Service. The term "Licensed Service" shall mean the performance of a service for a third party, which performance uses or incorporates a Licensed Product or Licensed Process.

1.16 Major Market Country. The term "Major Market Country" shall mean any of the following countries: the United States of America, the United Kingdom, France, Germany, Spain, Italy, Japan or Canada.

1.17 NDA. The term "NDA" shall mean a New Drug Application (as more fully defined in 21 C.F.R. 314.5 et seq.) and all amendments and supplements thereto filed with the FDA, or the equivalent application filed with any equivalent Regulatory Authority outside the United States of America (including any supra-national agency, such as in the European Union).

1.18 Net Sales. The term "Net Sales" shall mean the gross amount invoiced by Licensee, or sublicensees, or any of its Affiliates, on all sales of Licensed Products, Licensed Processes and Licensed Services less (a) trade, cash and quantity discounts or rebates actually allowed or taken, including discounts or rebates to governmental or managed care organizations; (b) credits or allowances actually given or made for rejection of or return of, previously sold Licensed Products or for retroactive price reductions (including Medicare and similar types of rebates); (c) any charges for insurance, freight, and other transportation costs directly related to the delivery of Licensed Product to the extent included in the gross invoiced sales price; (d) any tax, tariff, duty or governmental charge levied on the sales, transfer, transportation or delivery of a Licensed Product (including any tax such as a value added or similar tax or government charge) borne by the seller thereof, other than franchise or income tax of any kind whatsoever; (e) any import or export duties or their equivalent borne by the seller. Net Sales shall include all consideration charged by Licensee, sublicensees or its Affiliates in exchange for any Licensed Products, Licensed Processes, and Licensed Services, including, without limitation, any monetary payments or any other property whatsoever; and (f) [***]

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For purposes of determining Net Sales, a sale shall be deemed to have occurred when an invoice therefor shall be generated or the Licensed Product is shipped for delivery, Licensed Process is completed, or Licensed Service is provided. Sales of Licensed Products by Licensee, or sublicensee of Licensee to any Affiliate or sublicensee which is a reseller thereof shall be excluded, and only the subsequent sale of such Licensed Products by Affiliates or sublicensees of Licensee to unrelated parties shall be deemed Net Sales hereunder. For the avoidance of doubt, "Net Sales" shall not include (i) transfers for product testing or control; (ii) promotional distribution to potential purchasers; (iii) distribution for research on behalf of Licensee or any of its sublicensees; or (iv) any transfer made in connection with a Regulatory Approval process; or (v) transfer of a Licensed Product or performance of a Licensed Process or Licensed Service, by Licensee to an Affiliate or sublicensee for later resale to or use by an end customer, provided, however, that if the price invoiced by Licensee for the transfer to such Affiliate or sublicensee is higher than the price invoiced by such Affiliate or sublicensee for the subsequent resale to or use by the end customer, the Net Sales shall be determined on the gross amount invoiced by Licensee to such Affiliate or sublicensee, and not on the gross amount invoiced by such Affiliate or sublicensee to the end consumer.

1.19 Phase 1 Trial. The term "Phase 1 Trial" shall mean a human clinical trial conducted on a limited number of study subjects for the purpose of gaining evidence of the safety and tolerability of, and information regarding pharmacokinetics and potential pharmacological activity for, a product or compound, as described in 21 C.F.R. § 312.21(a) (including any such clinical study in any country other than the United States).

1.20 Phase 2 Trial. The term "Phase 2 Trial" shall mean a human clinical trial conducted on study subjects with the disease or condition being studied for the principal purpose of achieving a preliminary determination of efficacy or appropriate dosage ranges, as further described in 21 C.F.R. §312.21(b) (including any such clinical study in any country other than the United States).

1.21 Phase 3 Trial. The term "Phase 3 Trial" shall mean a pivotal clinical trial in humans performed to gain evidence with statistical significance of the efficacy of a product in a target population, and to obtain expanded evidence of safety for such product that is needed to evaluate the overall benefit-risk relationship of such product, to form the basis for the filing for approval of an NDA or BLA by a Regulatory Authority and to provide an adequate basis for physician labeling, as described in 21 C.F.R. § 312.21(c) or the corresponding regulation in jurisdictions other than the United States.

1.22 Regulatory Approval. The term "Regulatory Approval" shall mean any and all approvals (including pricing and reimbursement approvals), product and establishment licenses, registrations or authorizations of any kind of the FDA or its foreign equivalent necessary for the development, clinical testing, manufacture, quality testing, supply, use, storage, importation, export, transport, marketing and sale of a Licensed Product (or any component thereof) for use in the Field in any country or other jurisdiction.

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1.23 Regulatory Authority. The term "Regulatory Authority" shall mean the governmental authority or agency having the administrative authority to regulate the marketing of human pharmaceutical products or biological therapeutic products, delivery systems and devices in a particular country or jurisdiction, including, without limitation, the FDA.

1.24 Royalty Report. The term "Royalty Report" is defined in Section 6.4.

1.25 Sublicense Revenues. The term "Sublicense Revenues" is defined in Section 4.1.

1.26 Valid Claim. The term "Valid Claim" shall mean a claim of an issued patent within the Patent Rights that has not lapsed, expired, been canceled, or become abandoned, and has not been held invalid by a court or other appropriate body of competent jurisdiction, unappealable or unappealed within the time allowed for appeal and which has not been admitted to be invalid or unenforceable through reissue or disclaimer or otherwise. The term Valid Claim shall also include the claims of a pending patent application within the Patent Rights, but only to the extent that such claim has been pending [***].

2. **Grant of License**.

2.1 Grant of License for Licensed Products. TSRI hereby grants to Licensee and its Affiliates, subject to the terms and conditions of this Agreement, including, without limitation, Sections 2.6 and 2.7, an exclusive, worldwide license under TSRI's interest in the Licensed Patent Rights to develop, make and have made, to use and have used, to import and have imported, and to offer to sell, to sell and have sold Licensed Products in the Field.

2.2 Grant of License for Licensed Processes. TSRI hereby grants to Licensee and its Affiliates, subject to the terms and conditions of this Agreement, including, without limitation, Sections 2.6 and 2.7, an exclusive, worldwide license under TSRI's interest in the Licensed Patent Rights to develop, make and have made, to use and have used, to import and have imported, and to offer to sell, to sell and have sold Licensed Processes in the Field.

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2.3 Grant of License for Licensed Services. TSRI hereby grants to Licensee and its Affiliates, subject to the terms and conditions of this Agreement, including, without limitation, Sections 2.6 and 2.7, an exclusive, worldwide license under TSRI's interest in the Licensed Patent Rights to develop, make and have made, to use and have used, to import and have imported, and to offer to sell, to sell and have sold Licensed Services in the Field.

2.4 Sublicensing. Licensee and its Affiliates shall have the right to grant sublicenses to any third party with respect to the licenses granted to Licensee under this Agreement, provided, however, that any such sublicense shall be subject in all respects to the provisions contained in this Agreement. Sublicensees shall not further sublicense without TSRI prior written consent, which consent cannot unreasonably be withheld. Licensee shall forward to TSRI a copy of any and all fully executed sublicense agreements within thirty (30) days following execution.

2.5 No Other License. This Agreement confers no license or rights by implication, estoppel or otherwise under any patent applications or patents of TSRI, other than Licensed Patent Rights, regardless of whether such patents are dominant or subordinate to Licensed Patent Rights.

2.6 Governmental Interest. Licensee and TSRI acknowledge that TSRI has received, and expects to continue to receive, funding from the United States Government in support of TSRI's research activities. Licensee and TSRI acknowledge and agree that their respective rights and obligations pursuant to this Agreement shall be subject to the rights of the United States Government, existing and as amended, which may arise or result from TSRI's receipt of research support from the United States Government, including, but not limited to, 37 CFR 401, the NIH Grants Policy Statement and the NIH Guidelines for Obtaining and Disseminating Biomedical Research Resources.

2.7 Reservation of Rights. TSRI reserves the right to use for any non-commercial research or educational purposes any Licensed Patent Rights licensed hereunder, without TSRI being obligated to pay Licensee any royalties or other compensation. In addition, TSRI reserves the right to grant non-exclusive, non-commercial research and educational use licenses to other nonprofit or academic institutions to use any Licensed Patent Rights licensed hereunder, without the other nonprofit entity being obligated to pay Licensee any royalties or other compensation, provided, however, that TSRI shall use reasonable efforts to provide Licensee with a list of such non-exclusive research and educational licenses within sixty (60) days of written request by Licensee (but no more frequently than quarterly).

3. **Royalties.**

3.1 Running Royalties

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(a) Running Royalties for Licensed Products. Licensee agrees to pay and shall pay to TSRI a running royalty on a country by country basis in the amount [***] on annual Net Sales less than $[***], [***] on annual Net Sales between $[***] and $[***] and [***] on annual Net Sales above $[***], in each case of Licensed Products made by Licensee, sublicensees and its Affiliates.

(b) Royalty Increase for Licensed Products. Notwithstanding Section 3.1(a), in the event Licensee directly or indirectly alleges in any formal legal or administrative action or proceeding that (i) any of the Licensed Patent Rights are invalid or unenforceable, or (ii) no royalties, Sublicense Payments, milestone payments, patent costs or other monies are due or required to be paid to TSRI under this Agreement because the applicable Licensed Patent Rights are invalid or unenforceable (collectively "Challenges"), the royalty rate specified in Section 3.1 (a) shall increase by [***] during and after the pendency of such Challenges from the date Licensee first institutes or makes such Challenges.

(c) Running Royalties for Licensed Processes. Licensee agrees to pay and shall pay to TSRI a running royalty on a country by country basis in the amount [***] of Net Sales of products made using a Licensed Process.

(d) Royalty Increase for Licensed Processes. Notwithstanding Section 3.1 (c), in the event Licensee directly institutes or makes any Challenges, the royalty rate specified in Section 3.1 (c) shall be increased by [***] during and after the pendency of such Challenges from the date Licensee first institutes or makes such Challenges.

(e) Running Royalties for Licensed Services. Licensee agrees to pay and shall pay to TSRI [***] of any and all Net Sales of Licensed Services.

(f) Royalty Increase for Licensed Services. Notwithstanding Section 3.1 (e), in the event Licensee directly institutes or makes any Challenges, the royalty rate specified in Section 3.1 (e) shall be increased by [***] during and after the pendency of such Challenges from the date Licensee first institutes or makes such Challenges.

3.2 Multiple Royalties. No multiple royalties shall be due because any Licensed Product, Licensed Service or Licensed Process is covered by more than one of the Licensed Patent Rights. In such case, Licensee shall pay the highest applicable royalty actually owed to TSRI for such Licensed Patent Rights.

3.3 Arms-Length Transactions. On sales of Licensed Products, Licensed Services and Licensed Processes, which are made in other than an arm's-length transaction, the value of the Net Sales attributed under Section 3.1 to such a transaction shall be that which would have been received in an arm's-length transaction, based on sales of like quality and quantity products on or about the time of such transaction.

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3.4 **Duration of Royalty Obligations**. The royalty obligations of Licensee under this Section 3 as to each Licensed Product, Licensed Process or Licensed Service shall terminate on a country-by-country basis concurrently with the expiration of the last to expire of the Licensed Patent Rights that covers such Licensed Product, Licensed Process or Licensed Service.

3.5 [***]

4. **Non-royalty Revenues**.

4.1 Sublicense Payments.

(a) Any and all revenues, other consideration, equity interests and other property received by Licensee in consideration for granting a sublicense hereunder, other than (i) royalties, (ii) payments for the milestones set forth in Section 4.2, (iii) funding or reimbursement for specific research and development expenses as specified in such sublicense and incurred after the effective date of such sublicense, and (iv) amounts received in consideration for the issuance and sale of equity securities or debt of the Company, except to the extent such amounts exceed the fair market value of such equity or debt securities as determined in good faith by the Licensee's Board of Directors (collectively "Sublicense Revenues") shall be reported to TSRI by Licensee within thirty (30) days of receipt by Licensee.

(b) Licensee shall pay to TSRI a non-creditable, non-refundable percentage of these Sublicense Revenues according to the following schedule (''Sublicense Payments"):

Time of Sublicense Grant	Percentage
Prior to the dosing of first patient in a Phase 2 Trial	[***]
From dosing of first patient in a Phase 2 Trial and beyond	[***]

4.2 Product Development Milestones. Licensee agrees to pay and shall pay to TSRI the following non-creditable, non-refundable product development milestones within thirty (30) days after the first Licensed Product has reached the milestone set forth below (or its equivalent), in the first Major Market Country in which such milestone is reached, as follows:

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Milestone	Payment
[***]	$[***]
[***]	$[***]
[***]	$[***]
[***]	$[***]

For the avoidance of doubt, Licensee shall pay each such milestone payment only once, regardless of how many times, and in how many Major Market Countries, Licensee reaches such milestone.

5. **Royalty and Revenue Payments**.

5.1 Payment Terms. The amounts payable pursuant to Sections 3 and 4 shall be paid by Licensee quarterly, within sixty (60) days after the end of the calendar quarter in which such payment obligation accrued.

5.2 Combination Products and Other Licenses. Licensee may adjust the payment obligations to TSRI by one (but not both) of the following means:

(a) If a Licensed Product is sold in combination with another active ingredient, or needs to be modified or delivered using products acquired from a third party, which other active ingredients or products if sold alone would not be subject to a royalty payment hereunder, then Net Sales from such combination sales, for purposes of calculating the amounts due under Section 3 hereof, shall be calculated by multiplying the net selling price of the combination product by the fraction A/(A+B), where A is the gross selling price, during the royalty period in question, of the Licensed Product sold separately, and B is the gross selling price, during the royalty period in question, of the other ingredients and/or products sold separately. If the additional ingredients and/or products are not sold separately during that royalty period, then Net Sales for purposes of determining royalty payments shall be calculated by multiplying the net selling price of the combination product by the fraction C/(C+D), where C is the fair market value of the Licensed Product and D is the fair market value of such ingredients and/or products, or

(b) If, in any royalty period, Licensee or any of its Affiliates or sublicensees, in order to exploit the licenses granted under Section 2 of this Agreement in any country, is required to make royalty payments to one or more third parties ("Third Party Payments") to make, use, sell and/or import a Licensed Product, Licensed Process or Licensed Service, and the aggregate royalty payments to TSRI and such third party exceeds [***], then

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Licensee shall have the right to reduce the royalties otherwise due to Licensor pursuant to Section 3 hereof for such Licensed Product, Licensed Process or Licensed Service by [***] of such Third Party Payments, provided, however, that if the agreement between Licensee and such third party does not allow Licensee to offset against Licensee's royalty obligation to such third party a portion of the royalty payments made to TSRI hereunder, then the Third Party Payment to such third party will not count towards such [***] threshold. Notwithstanding the foregoing, the reductions pursuant to this Section 5.2(b) shall in no event reduce the royalty for such Licensed Product, Licensed Process or Licensed Service in any country to less than [***] of the royalties Licensor would have been entitled to pursuant to Section 3 hereof, but for such Third Party Payment.

6. **Diligence; Commercial Development Plan; Reports**.

6.1 Diligence. Licensee will exercise its commercially reasonable efforts and diligence in developing and commercializing Licensed Products, Licensed Processes and Licensed Services in each Major Market Country in accordance with its business, legal, medical and scientific judgment, and in obtaining Regulatory Approvals, as necessary, to market Licensed Products, Licensed Processes and Licensed Services, such commercially reasonable efforts and diligence to be in accordance with the efforts and resources Licensee would use for a pharmaceutical or diagnostic product or service owned by it or to which it has rights, which is of similar market potential at a similar stage in development as the applicable Licensed Product, Licensed Process or Licensed Service, taking into account the competitiveness of the marketplace, the proprietary position of the Licensed Product, Licensed Process or Licensed Service, the relative potential safety and efficacy, the regulatory requirements involved in its development, manufacture, commercialization and Regulatory Approval, the cost of goods and availability of capacity to manufacture, perform and/or supply the Licensed Products, Licensed Processes and/or Licensed Services and other relevant factors, including, without limitation, technical, legal, scientific or medical factors.

6.2 Commercial Development Plan. Prior to signing this Agreement, Licensee has provided to TSRI the Commercial Development Plan attached hereto as Exhibit B, under which Licensee intends to bring the subject matter of the Licensed Patent Rights to the point of commercial use. This Commercial Development Plan is hereby incorporated by reference into this Agreement. Based on this Commercial Development Plan, performance Benchmarks will be determined as specified in Exhibit C.

6.3 Progress Reports on Commercial Development Plan and Benchmarks. Licensee shall provide to TSRI a copy of Licensee's written annual reports on Licensee's product development progress and efforts to commercialize under the Commercial Development Plan

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within thirty (30) days after June 30 of each calendar year. These progress reports shall include progress on research and development, status of applications for regulatory approvals, as well as plans for the present calendar year. TSRI also encourages these reports to include information on any of Licensee's public service activities that relate to the Licensed Patent Rights. If reported progress differs materially from that projected in the Commercial Development Plan and Benchmarks, Licensee shall explain the reasons for such differences. In any such annual report, Licensee may propose amendments to the Commercial Development Plan, the acceptance of which by TSRI may not be denied unreasonably. Licensee agrees to provide any additional information reasonably required by TSRI to evaluate Licensee's performance under this Agreement, subject to Licensee's obligations of confidentiality to third parties. Licensee may amend the Benchmarks at any time upon written consent by TSRI, which consent cannot unreasonably be withheld. TSRI shall not unreasonably withhold approval of any request of Licensee to extend the time periods of this schedule if such request is supported by a reasonable showing by Licensee of diligence in its performance under the Commercial Development Plan and toward bringing the Licensed Products to the point of commercial use.

At any time after [***] from the Effective Date of this Agreement, TSRI may terminate this Agreement if the progress reports furnished by Licensee do not demonstrate, as determined in good faith by TSRI, that Licensee is engaged in research, development, manufacturing, marketing or sublicensing activities reasonably appropriate to put the licensed subject matter into commercial use in the country or countries hereby licensed, directly or through a sublicense, and to keep the licensed subject matter reasonably available to the public, taking into consideration scientific and/or development progress, regulatory requirements, relevant market factors and the size and financial resources of Licensee. Achievement of the Benchmarks specified in Exhibit C shall be considered fulfillment of Licensee's obligations hereunder. In the event TSRI determines that Licensee has not met its obligations under this Section 6.3, TSRI and Licensee shall meet and in good faith discuss the steps necessary to be undertaken by Licensee to satisfy TSRI's diligence requirements, and a timeline therefor. In addition, Licensee shall report to TSRI the dates for achieving Benchmarks specified in Exhibit C and Licensee's first achievement of the milestones set forth in Section 4.1 hereof, and the First Commercial Sale of a Licensed Product in each country, in each case within thirty (30) days following such occurrences. All reports provided to TSRI under this Section 6.3 shall constitute Confidential Information of Licensee, except that TSRI may disclose any Confidential Information contained in such reports to the U.S. government, consistent with its government reporting obligations; provided, however, that such disclosures shall be limited to the information minimally required for TSRI to comply with such reporting obligations.

6.4 Reports on Revenues and Payments. Licensee shall submit to TSRI, no later than sixty (60) days after the end of each calendar quarter, a royalty report (the "Royalty Report") setting forth for such quarter at least the following information:

(a) the number of Licensed Products sold by Licensee and its sublicensees;

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(b) the gross amounts due or charged for such Licensed Products;

(c) the gross amounts due or charged for all Licensed Processes used or sold by Licensee and its sublicensees;

(d) the gross amounts due or charged for all Licensed Services performed by Licensee and its sublicensees;

(e) deductions applicable to determine the Net Sales of Licensed Products, Licensed Processes and Licensed Services pursuant to Section 1.14;

(f) the amount of Sublicense Revenues received by Licensee; and

(g) the amount of royalty due pursuant to Section 3 hereof, or if no royalties are due to TSRI for any reporting period, the statement that no royalties are due and a detailed explanation why they are not due for that quarterly period.

Such Royalty Report shall be certified as correct in all material respects by an officer of Licensee and shall include a detailed listing of all deductions from royalties. Such Royalty Report shall constitute Confidential Information of Licensee.

6.5 Royalty Payments. Licensee agrees to pay and shall pay to TSRI with each Royalty Report the amount of royalty due with respect to such quarter. If multiple technologies are covered by the license granted hereunder, Licensee shall specify which Licensed Patent Rights are utilized for each Licensed Product, Licensed Process and/or Licensed Service included in the Royalty Report. All payments due hereunder shall be deemed received when funds are transferred to TSRI's bank account (which bank account shall be designated in writing to Licensee), and shall be payable by check or wire transfer in United States Dollars.

6.6 Foreign Sales. The remittance of royalties payable on sales outside the United States shall be payable to TSRI in United States Dollar equivalents at the official rate of exchange of the currency of the country from which the royalties are payable, as quoted in the Wall Street Journal for the last business day of the calendar quarter in which the royalties are payable. If the transfer of or the conversion into the United States Dollar equivalents of any such remittance in any such instance is not lawful or possible, the payment of such part of the royalties as is necessary shall be made by the deposit thereof, in the currency of the country where the sale was made on which the royalty was based to the credit and account of TSRI or its nominee in any commercial bank or trust company of TSRI's choice located in that country, prompt written notice of which shall be given by Licensee to TSRI.

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6.7 Foreign Taxes. Any tax required to be withheld by Licensee under the laws of any foreign country for any royalties or other amounts due hereunder or for the accounts of TSRI shall be promptly paid by Licensee for and on behalf of TSRI to the appropriate governmental authority, and Licensee shall furnish TSRI with proof of payment of such tax together with official or other appropriate evidence issued by the applicable government authority. Any such tax actually paid on TSRI's behalf shall be deducted from royalty payments due TSRI.

7. **Record Keeping**.

7.1 Record Keeping and Audits. Licensee shall keep, and shall require its Affiliates and sublicensees to keep, accurate records (together with supporting documentation) of Licensed Products, Licensed Services and/or Licensed Processes sold under this Agreement, appropriate to determine the amount of royalties, Sublicense Payments, milestone payments and other monies due to TSRI hereunder. Such records shall be retained for at least three (3) years following the end of the reporting period to which such records pertain. They shall be available with ten (10) days prior written notice during normal business hours for examination and copying by an accountant selected by TSRI, for the purpose of verifying Licensee's reports and payments hereunder and its compliance with this Agreement. In conducting examinations pursuant to this Section 7, TSRI's accountant shall have access to, and may disclose to TSRI, all records which such accountant reasonably believes to be relevant to the calculation of payments under Section 3, non-royalty revenues under Section 4 and Licensee's compliance with its payment obligations under this Agreement. Except as set forth above, TSRI's accountant shall not disclose to TSRI any information other than information relating to the accuracy of reports and payments made hereunder and to Licensee's compliance with its payment obligations under this Agreement. Such examination by TSRI's accountant shall be at TSRI's expense, except as set forth in Section 7.2 hereof.

7.2 Underpayments. In the event the examination described in Section 7.1 reveals an underreporting or underpayment, TSRI shall submit to Licensee a written notice of such discrepancy, which notice shall be accompanied by a written report prepared by TSRI's accountant setting forth, in reasonable detail, the basis of the alleged underreporting or underpayment. If Licensee does not notify TSRI that Licensee disputes the findings set forth in such report within thirty (30) days after receipt thereof, Licensee shall pay to TSRI the full amount of the underpayment in question at the end of such thirty (30) day period. If the underreporting or underpayment exceeds [***] for any twelve (12) month period, and Licensee does not dispute the result of such examination, or such examination or the discrepancy in excess of [***] is found to be correct following the dispute resolution procedure set forth in Section 7.3 hereof, then Licensee shall pay TSRI's costs of such examination (including, without limitation, TSRI's reasonable (i) attorney's fees, (ii) accountant's fees and (iii) other costs) as well as any additional sum that would have been

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payable to TSRI had the Licensee reported correctly, plus interest on such sum at the rate of [***] per month.

7.3 Royalty Disputes. If Licensee disputes the findings set forth in the written report, it shall so notify TSRI in writing within thirty (30) days after the receipt of such report. Representatives of TSRI and Licensee shall meet and, in good faith, seek to resolve the dispute through negotiation; provided, however, that if such dispute is not resolved within thirty (30) days of Licensee notifying TSRI of such dispute, TSRI and Licensee shall promptly retain, at Licensee's cost and expense, a mutually agreeable, regionally-recognized independent certified public accounting firm and the specific certified public accountant who has at least ten (10) years' experience with auditing life science royalty and similar reports, which firm or accountant does not have a current business or other relationship with either party, to resolve such dispute. The determination of such accountant in regard to the accuracy of the payments made by Licensee to TSRI shall be final and binding upon the parties, shall not be subject to appeal or review by any court or governmental agency and shall be enforceable in the appropriate California courts. If such review reveals that Licensee has failed to pay to TSRI the full amount of a royalty payment due pursuant to this Agreement, Licensee shall pay the full amount of such discrepancy, plus interest on such amount at the rate of [***] per month, to TSRI within thirty (30) days of the date of the report of such accountants. If such review reveals that Licensee has overpaid TSRI any royalty amounts due pursuant to this Agreement, Licensee shall, on the Royalty Reports submitted to TSRI, claim such overpaid amounts as a credit against Licensee's royalty obligations (if any) for the subsequent calendar quarter(s), and shall be entitled to reduce its royalty payments to TSRI accordingly until such time as the full amount of such overpayment has been credited to Licensee against royalty obligations otherwise due to TSRI hereunder.

8. **Patent Matters**.

8.1 Patent Prosecution and Maintenance. From and after the date of this Agreement, the provisions of this Section 8 shall control the prosecution of any patent application and maintenance of any patent included within Licensed Patent Rights. Subject to the requirements, limitations and conditions set forth in this Agreement, TSRI shall select the patent attorney, subject to Licensee's written approval, which approval shall not be unreasonably withheld. The parties agree that TSRI shall have the right, at its sole discretion, to utilize TSRI's Office of Patent Counsel in addition to independent counsel for patent prosecution and maintenance described herein and the reasonable attorney's fees and expenses associated with the work done by such Office of Patent Counsel and/or independent counsel shall be paid as set forth below. Licensee shall have full rights of consultation on all matters relating to the Licensed Patent Rights. TSRI shall implement all reasonable and timely requests made by Licensee with regard to the preparation, filing, prosecution and/or maintenance of the patent applications and/or patents within the Licensed Patent Rights, including, without

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limitation, requests relating to the jurisdictions in which TSRI shall prepare, file, prosecute and maintain patent applications and the type of patent application to file. As of the Effective Date, TSRI and Licensee shall continue to use the services of Cooley LLP for matters relating to the prosecution and maintenance of the Licensed Patent Rights.

8.2 Information to Licensee. TSRI shall keep Licensee timely and fully informed of the progress of all patent applications, patents and other submissions relating thereto and give Licensee and Licensee's counsel reasonable opportunity to review and comment on the text of each patent application within Licensed Patent Rights and other submissions relating thereto before filing, including, but not limited to, the type and the scope of the useful claims and the nature of supporting disclosures. TSRI shall provide Licensee with a copy of such patent application as filed, together with notice of its filing date and serial number, and each such submission. TSRI shall provide Licensee with copies of all patent applications, amendments, related correspondence and other relevant documentation relating to such prosecution. [***]

8.3 Patent Costs. Licensee acknowledges and agrees that the license granted hereunder is in partial consideration for Licensee's assumption of patent costs and expenses as described herein. Licensee agrees to pay and shall pay for all reasonable expenses referenced in Section 8.1 hereof for work performed by TSRI's Office of Patent Counsel and its independent counsel. In addition, Licensee agrees to reimburse and shall reimburse TSRI for all reasonable patent costs and expenses previously paid or associated with Licensed Patent Rights. Licensee agrees to pay and shall pay all such reasonable expenses within thirty (30) days after Licensee receives an itemized invoice therefor. Failure of Licensee to pay patent costs and expenses as set forth in this Section 8.3 shall immediately relieve TSRI from its obligation to incur further patent costs and expenses or to continue to prosecute the patent applications; provided, however, that TSRI's obligation to incur patent costs and expenses and to prosecute the patent applications shall, to the extent possible, be immediately restored upon Licensee's payment of such patent costs and expenses. Licensee may elect with a minimum of ninety (90) days prior written notice to TSRI, to discontinue payment for the filing, prosecution and/or maintenance of any patent application and/or patent within Licensed Patent Rights in those jurisdictions specified in such written notice. Licensee shall remain liable for all patent prosecution and maintenance costs of such patents or patent applications incurred prior to the date of notice of election and for a ninety (90) day period following date of such notice. Any such patent application or patent so elected shall, for the jurisdictions specified in the written notice, immediately be excluded from the definition of Licensed Patent Rights and from the scope of the licenses granted under this Agreement, and all rights relating thereto shall revert to TSRI and may be freely licensed by TSRI.

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8.4 Ownership. The patent applications filed and the patents obtained by TSRI pursuant to Section 8.1 hereof shall be owned solely by TSRI, assigned solely to TSRI and deemed a part of Licensed Patent Rights. For the avoidance of doubt, the foregoing shall not apply to patent applications and patents within the Licensed Patent Rights that are jointly owned by TSRI and Licensee.

8.5 Prosecution and Maintenance of Patents after Termination. If at any time during the term of this Agreement, Licensee's rights under this Agreement with respect to Licensed Patent Rights owned solely by TSRI are terminated, TSRI shall have the right to take whatever action TSRI deems appropriate to obtain or maintain the corresponding patent protection. If TSRI pursues patents under this Section 8.5, Licensee agrees to provide reasonable cooperation, including by providing, at TSRI's cost and expenses, all appropriate technical data and executing all necessary legal documents.

8.6 Infringement Actions.

(a) Licensee and TSRI shall each inform the other party promptly in writing of any alleged infringement by a third party of the Licensed Patent Rights covering Licensed Products, Licensed Services and/or Licensed Processes, which comes to their attention and of any available evidence thereof.

(b) During the term of this Agreement, the parties shall consult with each other regarding the infringement of any patent within the Licensed Patent Rights. During or following such consultation, Licensee shall have the first and sole right and obligation (except as provided below) to take steps to abate the infringement and/or to institute, prosecute and control, at its own expense, any action or proceeding with respect to any infringement of such patent by a third party and, in furtherance of such right, TSRI hereby agrees that Licensee may include and join TSRI as a party plaintiff in any such suit, without expense to TSRI; provided, however, that if Licensee determines, and provides TSRI with its reasons, that such action against an infringer would be commercially unreasonable, as determined in good faith by Licensee's Board of Directors, then Licensee shall not have the obligation to take any such action or institute any such proceeding. In this regard, Licensee shall be entitled to use its reasonable commercial discretion in determining (a) whether to contact and/or institute any action or proceeding against an alleged third party infringer; (b) the timing of any contact with an alleged third party infringer and/or action or proceeding to be instituted against an alleged third party infringer; (c) the location of any action or proceeding to be instituted against an alleged third party infringer; and (d) should there be more than one alleged third party infringer, which alleged infringer to contact regarding its alleged infringement or against whom any action or proceeding is to be brought, it being further understood and agreed that, during such time as Licensee is pursuing any action or proceeding against one alleged third party infringer, Licensee shall have no obligation to contact and/or pursue additional alleged infringers.

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(c) If, in the case of a third party infringement for which Licensee decides not to pursue an action and provides TSRI its reasons why such action is commercially unreasonable, TSRI disagrees with Licensee's assessment that such actions are commercially unreasonable, and TSRI desires to pursue an action to prevent such infringement, then TSRI may initiate an arbitration as provided in Section 15.8 below for a determination of whether Licensee's position is correct that it is commercially unreasonable to take action against such infringer. In the event such arbitrator finds that Licensee's reasons for not pursuing an action are legitimate (i.e., that an action would be commercially unreasonable), then Licensee shall have no further obligation with respect thereto and TSRI shall have no right to pursue the infringement action. In the event such arbitrator finds that Licensee's reasons are insufficient and that an action would be commercially reasonable, then Licensee or its sublicensee, at Licensee's option, may pursue an action against such third party infringer. In the event that Licensee or its sublicensee does not pursue such action, then TSRI shall have the right to pursue the infringement action against such third party infringer, in which case TSRI shall indemnify, defend and hold Licensee harmless from any costs, expenses or liability with respect to all such actions undertaken by TSRI. In the event that TSRI does take action against such third party infringer, then Licensee will pay up to [***] of TSRI's litigation expenses, including reasonable attorney's fees. In the event that TSRI recovers money as a result of a judgment or settlement in such action, Licensee shall receive [***] of such judgment or settlement, after reimbursement to TSRI and Licensee of the litigation expenses incurred by each party. Alternatively, at Licensee's option, Licensee may, upon written notice to TSRI, terminate its license to the patents within Licensed Patent Rights that are the subject of such action, in the jurisdictions where Licensee fails to pursue such action, in which case Licensee shall not have an obligation to pay for TSRI's litigation expenses in those jurisdictions. If TSRI takes no action against such third party infringer, then Licensee will have no obligation to TSRI.

(d) In the event that Licensee determines to bring suit against an alleged third party infringer, any recovery of damages shall be distributed pursuant to Section 8.6 (e) below. In the event such infringement adversely affects the scope or validity of the Licensed Patent Rights, no settlement, consent judgment or other voluntary disposition of any such suit may be entered into without the consent of TSRI, which consent shall not be unreasonably withheld or delayed. TSRI shall have fifteen (15) days from the date of Licensee's written notice to TSRI either to consent or object in writing, stating in reasonable detail the reasons for withholding consent. No response within such period shall be deemed to constitute TSRI's consent. Licensee shall indemnify TSRI against any order for costs that may be made against TSRI as a result of any action or inaction by Licensee in such proceedings. Notwithstanding the foregoing, TSRI may elect at its option to participate in the prosecution of any such infringement action through counsel of its own choice at its own expense.

(e) In the event Licensee shall undertake the enforcement of the Licensed Patent Rights covering the Licensed Products, Licensed Services or Licensed Processes, any recovery of damages by Licensee as a result of a judgment or settlement in such action, shall first be applied in satisfaction of any litigation expenses of Licensee and TSRI relating to such suit and TSRI shall receive [***] of the balance remaining from any such recovery.

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(f) In any infringement suit which either party may institute to enforce the Licensed Patent Rights pursuant to this Agreement, or in a suit for patent infringement, which is brought by a third party against TSRI or Licensee, which either party or both parties are required or elect to defend, the other party hereto shall, at the request and the expense of the party initiating or defending such suit, cooperate in all reasonable respects and, to the extent reasonably possible, have its employees testify when requested and make available relevant records, papers, information, samples, specimens and the like.

(g) Licensee shall have the sole right, subject to the terms and conditions hereof, to sublicense to any alleged infringer its rights within the Licensed Patent Rights to make, have made, use, sell, offer to sell and/or import Licensed Products, Licensed Services or Licensed Processes. Any upfront fees paid to Licensee in consideration for the sublicense granted as part of a settlement of the infringement action shall be applied first in satisfaction of any expenses and legal fees of Licensee relating to such suit and the balance remaining from any such recovery distributed as set forth in Section 4.1 above as it relates to Sublicense Revenues. Any other consideration (including, without limitation, actual and statutory damages) paid to Licensee shall be apportioned in accordance with Section 8.6(e) hereof.

(h) Licensee shall defend any suit in a Major Market Country against Licensee or sublicensees, which suit alleges infringement of any third party patent right due to the development and/or commercialization of Licensed Products, Licensed Services or Licensed Processes by Licensee, unless otherwise agreed to between TSRI and Licensee. Licensee shall notify TSRI if Licensee has a good faith belief that the defense of such suit will have no reasonable likelihood of success, and if TSRI disagrees with such assessment, TSRI and Licensee shall retain, at Licensee's expense, an independent attorney with at least ten (10) years of experience in litigating patent disputes relating to biological therapeutics to determine whether the defense of such suit will have no reasonable likelihood of success. Licensee shall not have to defend such suit pursuant to this Section 8.6(h) if the independent patent attorney finds that the defense of such suit will have no reasonable likelihood of success. If the alleged infringement results from the exercise of Licensed Patent Rights and not solely from the exercise of any other patent rights owned or controlled by Licensee, then this Section 8.6(h) shall apply. Licensee shall promptly notify TSRI, and TSRI and Licensee shall confer with each other and cooperate during the defense of any such action. If Licensee finds it necessary or desirable for TSRI to become a party to such action, TSRI shall execute all papers or perform such other acts as may reasonably be required by Licensee. Licensee shall bear the costs and expenses associated with any such suit or action. TSRI shall be entitled to, at its expense, participate in and have counsel selected by it participate in any such action. In no event shall TSRI have any out-of-pocket liability for costs of litigation or royalties, damages and/or settlement amounts due to any third party (except for costs of its own counsel as provided above). If the third party patent right is held not to be infringed, unenforceable or invalid, by a court or other tribunal from which no appeal can be or is taken, any recovery of damages for such suit shall first be applied to reimburse any fees and litigation expenses of the parties hereto, and Licensee shall be entitled to keep the balance remaining from any such recovery.

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9. **Indemnity and Insurance.**

9.1 Indemnity. Licensee hereby agrees to indemnify, defend and hold harmless TSRI and any parent, subsidiary or other affiliated entity and their trustees, directors, officers, employees, scientists, agents, successors, assigns and other representatives (collectively, the "Indemnitees") from and against all damages, claims, liabilities, losses and other expenses, including, without limitation, reasonable attorney's fees, expert witness fees and costs, whether or not a lawsuit or other proceeding is filed ("Claim"), that arise out of or relate to (a) Licensee's or any sublicensee's use of any of the Licensed Patent Rights, (b) alleged defects or other problems with any of the Licensed Products, Licensed Services or Licensed Processes manufactured, sold, distributed or rendered by Licensee or any sublicensee, including, without limitation, any personal injuries, death or property damages related thereto, (c) any advertising or other promotion of the Licensed Products, Licensed Services or Licensed Processes by Licensee or any sublicensees, (d) any allegations that the Licensed Products, Licensed Services or Licensed Processes developed, manufactured, sold, distributed or rendered by Licensee or any sublicensee and/or any trademarks, service marks, logos, symbols, slogans or other materials used in connection with or to market Licensed Products, Licensed Services or Licensed Processes violate or infringe upon the trademarks, service marks, trade dress, trade names, copyrights, patents, works of authorship, inventorship rights, trade secrets, database rights, rights under unfair competition laws, rights of publicity, privacy or defamation, or any other intellectual or industrial property rights of any third party, (e) Licensee's or any sublicensee's failure to comply with any applicable laws, rules or regulations, (f) Licensee's or any sublicensee's transactions with third parties or the operation of their respective businesses, and/or (g) the grossly negligent or willful acts or omissions of Licensee or any sublicensee, provided, however, that Licensee' s liability for damages under its indemnification obligation shall be reduced or apportioned to the extent such Claim are proximately caused by the grossly negligent or willful act or omission of TSRI or an Indemnitee. TSRI agrees to provide reasonable assistance of a technical nature, which Licensee may require in any litigation arising in accordance with the provisions of this Section 9.1, for which Licensee shall pay to TSRI a reasonable hourly rate of compensation. Licensee shall not enter into any settlement of such Claims that involve TSRI admitting any liability, paying any money or taking any action that would have an adverse effect on TSRI's reputation or business without TSRI's prior written consent. Notwithstanding the above, Indemnitees, at their expense, shall have the right to retain separate independent counsel to assist in defending any such Claims. In the event Licensee fails to promptly indemnify and defend such Claims and/or pay Indemnitees' expenses as provided above, Indemnitees shall have the right to defend themselves, and in that case, Licensee shall reimburse Indemnitees for all of their reasonable attorney's fees, costs and damages incurred in settling or defending such Claims within thirty (30) days following each of Indemnitees' written requests. This indemnity shall be a direct payment obligation and not merely a reimbursement obligation of Licensee to Indemnitees.

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9.2 Insurance. Licensee shall name TSRI and Indemnitees as "additional insureds" on any commercial general liability and product liability insurance policies maintained by Licensee, its Affiliates and sublicensees applicable to the Licensed Products, Licensed Processes and Licensed Services.

(a) Beginning by the time there is a first use on a human (including clinical studies) with any Licensed Product, Licensed Process or Licensed Service, Licensee shall, at its sole cost and expense, procure and maintain commercial general liability insurance (including product liability coverage) in amounts not less than $[***] per incident and $[***] annual aggregate and naming the Indemnitees as additional insureds. During clinical trials involving any Licensed Product, Licensed Process or Licensed Service, Licensee shall, at its sole cost and expense, procure and maintain commercial general liability insurance in such equal or lesser amount as TSRI shall require, naming the Indemnitees as additional insureds. Such commercial general liability insurance shall provide broad form contractual liability coverage for all of Licensee's obligations under this Agreement. If Licensee elects to self-insure all or part of the limits described above (including deductibles or retentions, which are in excess of $250,000 annual aggregate) such self-insurance program must be acceptable to TSRI, which consent cannot unreasonably be withheld. The insurance coverage amounts specified herein or the maintenance of such insurance policies shall not in any way limit Licensee's indemnity or other liability under this Agreement.

(b) In addition, Licensee, on behalf of itself and its insurance carriers, waives any and all claims and rights of recovery against TSRI and the Indemnitees, including, without limitation, all rights of subrogation, with respect to either party's performance under this Agreement or for any loss of or damage to Licensee or its property or the property of others under its control. Licensee's commercial general liability insurance policy shall also include a waiver of subrogation consistent with this paragraph in favor of TSRI and the Indemnitees. Licensee shall be responsible for obtaining such waiver of subrogation from its insurance carriers. Licensee's insurance policies shall be primary and not contributory to any insurance carried by its sublicensees or by TSRI. Upon TSRI's request, Licensee shall deliver to TSRI copies of insurance certificates or binders and such waiver of subrogation that complies with the requirements of this Section 9.

(c) Licensee shall provide TSRI with written notice at least thirty (30) days prior to the cancellation, nonrenewal or material change, in each case by Licensee, in such insurance. If Licensee does not obtain replacement insurance providing comparable coverage (including, without limitation, self-insurance) within such thirty (30) day period, TSRI shall have the right to terminate this Agreement effective at the end of such thirty (30) day period without notice or any additional waiting periods.

(d) Licensee shall maintain such commercial general liability insurance beyond the expiration or termination of this Agreement during (a) the period that any Licensed Product, Licensed Process or Licensed Service is being commercially distributed or sold by Licensee or by a sublicensee, Affiliate or agent of Licensee; and (b) a reasonable period after the period referred to in Section 9.2(a) above.

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(e) Pre-Challenge Requirements. In the event Licensee intends to institute a Challenge, Licensee will first provide written notice (the "Challenge Notice") to TSRI thereof for the purpose of allowing the parties to reach an amicable resolution. Licensee will include with such Challenge Notice [***]. As soon as practical after delivery of the Challenge Notice, Licensee and TSRI shall meet and with reasonable diligence and in good faith attempt to negotiate a resolution to the issues underlying such Challenge. Licensee and TSRI shall use reasonable efforts to undertake such negotiations for a period of time not exceeding [***] after the delivery by Licensee of the Challenge Notice. Licensee and TSRI shall in good faith provide each other with sufficient information and documentation, subject to each party's obligations of confidentiality to third parties, reasonably necessary to resolve such issues pursuant to this Section 9.2(e). If the parties fail to reach a mutually agreeable resolution within such [***] period, subject to provisions of this Agreement, Licensee may proceed with such Challenge. TSRI may not, for a period of [***] following the expiration of the [***] negotiation period, initiate the same or substantially similar proceeding that was the subject of the Challenge Notice with respect to the patent applications or patents within the Licensed Patent Right that were the subject of such Challenge Notice. Nothing herein shall prevent TSRI from engaging in (i) interactions with the US Patent and Trademark office, or its foreign equivalents, in the ordinary course of prosecuting and maintaining such patent applications and patents (including, without limitation, preparing, filing and prosecuting new patent applications), and (ii) proceedings or suits involving such patent applications or patents that were contemplated prior to the delivery of the Challenge Notice, as documented by written evidence; provided, however, that in the preparation or prosecution of any such proceeding or suit, TSRI cannot use or reference any information provided by Licensee to TSRI pursuant to this Section 9.2(e), except to the extent necessary to comply with TSRI's disclosure obligations to the US Patent and Trademark office or its foreign equivalents.

10. **Limited Warranty.**

10.1 Limited Warranty. TSRI hereby represents and warrants that it has full right and power to enter into this Agreement and to perform its obligations hereunder, that it has the right to grant the licenses hereunder, and that this Agreement does not conflict with any other agreement to which TSRI is a party or by which TSRI may be bound. TSRI MAKES NO OTHER WARRANTIES CONCERNING LICENSED PATENT RIGHTS OR ANY OTHER MATTER WHATSOEVER, INCLUDING, WITHOUT LIMITATION, ANY EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF THIRD PARTY RIGHTS OR ARISING OUT OF COURSE OF CONDUCT OR TRADE CUSTOM OR USAGE, AND TSRI DISCLAIMS ALL SUCH EXPRESS OR IMPLIED WARRANTIES. TSRI MAKES NO WARRANTY OR REPRESENTATION AS TO THE VALIDITY OR SCOPE OF LICENSED PATENT RIGHTS, OR THAT ANY LICENSED PRODUCT, LICENSED PROCESS OR LICENSED SERVICE WILL BE FREE FROM AN INFRINGEMENT ON PATENTS OR OTHER INTELLECTUAL PROPERTY RIGHTS OF

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THIRD PARTIES, OR THAT ANY THIRD PARTIES ARE IN ANY WAY INFRINGING UPON ANY LICENSED PATENT RIGHTS COVERED BY THIS AGREEMENT. FURTHER, TSRI HAS MADE NO INVESTIGATION AND MAKES NO REPRESENTATION THAT THE LICENSED PATENT RIGHTS ARE SUITABLE FOR LICENSEE'S PURPOSES.

10.2 Limitation on Damages. EXCEPT FOR LICENSEE'S INDEMNITY OBLIGATIONS UNDER SECTION 9.1, IN NO EVENT SHALL EITHER PARTY BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, EXEMPLARY, PUNITIVE OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS OR EXPECTED SAVINGS OR OTHER ECONOMIC LOSSES, OR FOR INJURY TO PERSONS OR PROPERTY) ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ITS SUBJECT MATTER. TSRI'S AGGREGATE LIABILITY, IF ANY, FOR ALL DAMAGES OF ANY KIND RELATING TO THIS AGREEMENT OR ITS SUBJECT MATTER SHALL NOT EXCEED THE AMOUNT PAID BY LICENSEE TO TSRI UNDER THIS AGREEMENT. THE FOREGOING EXCLUSIONS AND LIMITATIONS SHALL APPLY TO ALL CLAIMS AND ACTIONS OF ANY KIND AND ON ANY THEORY OF LIABILITY, WHETHER BASED ON CONTRACT, TORT (INCLUDING, BUT NOT LIMITED TO NEGLIGENCE OR STRICT LIABILITY), OR ANY OTHER GROUNDS, AND REGARDLESS OF WHETHER SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. THE PARTIES FURTHER AGREE THAT EACH WARRANTY DISCLAIMER, EXCLUSION OF DAMAGES OR OTHER LIMITATION OF LIABILITY HEREIN IS INTENDED TO BE SEVERABLE AND INDEPENDENT OF THE OTHER PROVISIONS SINCE THEY EACH REPRESENT SEPARATE ELEMENTS OF RISK ALLOCATION BETWEEN THE PARTIES.

11. **Confidentiality and Publication**.

11.1 Treatment of Confidential Information. The parties agree that during the term of this Agreement, and for a period of five (5) years after this Agreement terminates, a party receiving Confidential Information of the other party will (a) maintain in confidence such Confidential Information to the same extent such party maintains its own proprietary information, provided that such standard shall be not less than reasonable care; (b) not disclose such Confidential Information to any third party without the prior written consent of the other party; and (c) not use such Confidential Information for any purpose, except those permitted by this Agreement.

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11.2 Publications. Licensee acknowledges that it is the general policy of TSRI to publish research results in technical or scientific journals. Licensee agrees that, subject to this Section 11, TSRI shall have a right to publish in accordance with its general policy. For the avoidance of doubt, this Section 11.2 applies only to the Technology subject to this Agreement, and nothing herein is intended to limit TSRI's obligations with respect to other information, results and data generated by TSRI and its employees or agents under the Research Agreement.

11.3 Publicity. Except as otherwise provided herein, each party agrees not to disclose any terms of this Agreement to any third party, without the prior written consent of the other party, except (i) as required by securities or other applicable laws and regulations, (ii) to existing and prospective investors, (iii) to existing or potential business partners or acquirers, (iv) to agencies of the government or private foundations for purposes of obtaining grants or other funding or providing reports to such agencies or foundations, and (v) to accountants, attorneys and other professional advisors of such party, provided that except for subclause (i), (ii) and (iii) above, such third parties have signed written confidentiality agreements at least as restrictive as the confidentiality obligations herein, or such third parties are under a duty of confidentiality, before any such disclosures, and, with respect to subclause (i) above, the disclosing party uses reasonable efforts to seek confidential treatment for the disclosure of any terms of this Agreement that the disclosing party reasonably believes are likely to cause substantial competitive harm to the parties if disclosed. Scientific publications published in accordance with Section 11.2 of this Agreement shall not be construed as publicity governed by this Section 11.3.

12. **Term and Termination**.

12.1 Term. Unless terminated sooner in accordance with the terms set forth herein, this Agreement, and the licenses granted hereunder, shall terminate as provided in Section 3.4 hereof.

12.2 Termination Upon Mutual Agreement. This Agreement may be terminated by mutual written agreement of the parties.

12.3 Termination by TSRI. TSRI may terminate this Agreement as follows:

(a) If Licensee does not make a payment due hereunder and fails to cure such non-payment (including the payment of interest in accordance with Section 15.2) within thirty (30) days after the delivery to Licensee of a written notice of such non-payment by TSRI;

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(b) If Licensee defaults in its indemnification and insurance obligations under Section 9 and fails to cure such default within thirty (30) days after delivery to Licensee of a written notice of such default by TSRI;

(c) If, at any time after [***] from the date of this Agreement, TSRI determines in good faith that the Agreement should be terminated pursuant to Section 6.3;

(d) If Licensee becomes insolvent, makes an assignment for the benefit of creditors, or has a petition in bankruptcy filed for or against it which petition is not challenged or dismissed with prejudice within ninety (90) days after filing, then such termination shall be effective immediately upon TSRI giving written notice to Licensee;

(e) If an examination by TSRI's accountant pursuant to Section 7 shows an underreporting or underpayment by Licensee in excess of [***] in any calendar year, and a subsequent audit shows a similar under reporting of underpayment by Licensee in excess of [***] in any subsequent calendar year, in each case if either Licensee does not dispute the result of such examinations or such examinations are determined to be accurate in accordance with Section 7.3 hereof;

(f) If Licensee is convicted of a felony relating to the manufacture, use or sale of Licensed Products, Licensed Services or Licensed Processes, which conviction is upheld after final appeal;

(g) If Licensee institutes or makes any Challenges, then TSRI has the right to immediately terminate this Agreement without any liability and without any opportunity to cure by Licensee upon written notice to Licensee; or

(h) Except as provided in subparagraphs (a)—(e) above, if Licensee defaults in the performance of any material obligation under this Agreement and the default has not been remedied within sixty (60) days after the delivery to Licensee of a written notice of such default by TSRI.

12.4 Termination by Licensee. Licensee may terminate this Agreement in its entirety, or on a jurisdiction-by-jurisdiction and patent-by-patent basis, by giving ninety (90) days advance written notice of termination to TSRI.

12.5 Rights Upon Expiration. Neither party shall have any further rights or obligations upon the expiration of this Agreement upon its regularly scheduled expiration date other than the obligation of Licensee to make any and all reports and payments for the final quarterly period; provided, however, that upon such expiration, each party shall be required to continue to abide by its non-disclosure obligations as described in Section 11, which shall survive such expiration. Sections 2.6, 2.7, 7, 8.3, 8.4, 9, 10, 12 and 15 shall also survive the expiration of this Agreement.

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12.6 Rights Upon Termination. Notwithstanding any other provision of this Agreement, upon any termination of this Agreement prior to the regularly scheduled expiration date of this Agreement, the licenses granted hereunder shall terminate and revert to TSRI, and all sublicenses granted by Licensee shall terminate automatically. Except as otherwise provided in Section 12.7 of this Agreement with respect to work-in-progress, upon such termination, Licensee shall have no further right to develop, manufacture or market any Licensed Product, Licensed Service or Licensed Process or to otherwise use any Licensed Patent Rights, which are owned solely by TSRI. Upon any such termination, Licensee shall promptly return all materials, samples, documents, information and other materials, which embody or disclose Licensed Patent Rights owned solely by TSRI; provided, however, that Licensee shall not be obligated to provide TSRI with proprietary information, which Licensee can show that it independently developed. Any such termination shall not relieve either party from any obligations accrued to the date of such termination. Upon such termination, each party shall be required to abide by its non-disclosure obligations as described in Section 11, which shall survive such termination. Sections 2.6, 2.7, 7, 8.3, 8.4, 9, 10, 12 and 15 shall also survive the termination of this Agreement.

12.7 Work-in-Progress. Upon any such early termination of the license granted hereunder in accordance with this Agreement, Licensee shall be entitled to finish any work-in-progress and to sell any completed inventory of a Licensed Product covered by such license, which remain on hand as of the date of the termination, so long as Licensee sells such inventory in the normal course of business and at regular selling prices and pays to TSRI the royalties applicable to such subsequent sales in accordance with the terms and conditions set forth in this Agreement, provided that no such sales shall be permitted after the expiration of six (6) months after the date of termination.

12.8 Final Royalty Report. Upon termination or expiration of this Agreement, Licensee shall submit a final report to TSRI, and any payments due TSRI and unreimbursed patent expenses invoiced by TSRI shall become immediately payable.

13. **Assignment; Successors**. This Agreement may not be assigned or otherwise transferred by either party without the prior written consent of the other party, which consent shall not be unreasonably withheld; provided, however, that a party may, without such consent, assign this Agreement and its rights and obligations hereunder (i) to an Affiliate, (ii) in connection with a merger, acquisition, consolidation or a sale involving all or substantially all of the assets of such party. Any attempted assignment or transfer in violation of this Section 13 shall be void.

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14. **Binding Upon Successors and Assigns**. Subject to the limitations on assignment set forth herein, this Agreement shall be binding upon and inure to the benefit of any successors in interest and assigns of TSRI and Licensee. Any such successor to or assignee of a party's interest shall expressly assume in writing the performance of all of the terms and conditions of this Agreement to be performed by such party and such written assumption shall be delivered to the other party.

15. **General Provisions.**

15.1 Independent Contractors. The relationship between TSRI and Licensee is that of independent contractors. TSRI and Licensee are not joint venturers, partners, principal and agent, master and servant, employer or employee, and have no other relationship other than independent contracting parties. TSRI and Licensee shall have no power to bind or obligate each other in any manner, other than as is expressly set forth in this Agreement.

15.2 Late Payments. Except as otherwise set forth in Section 7 hereof, late payments of any and all payments due hereunder shall be subject to a charge of one and one-half percent (1.5%) per month.

15.3 Governmental Approvals and Marketing of Licensed Products. Licensee shall be responsible for obtaining all necessary governmental approvals for the development, production, distribution, performance, sale and use of any Licensed Product, Licensed Services or Licensed Process, at Licensee's expense, including, without limitation, any safety studies. Licensee shall have sole responsibility for any warning labels, packaging and instructions as to the use of Licensed Products and for the quality control for any Licensed Products.

15.4 Patent Marking. To the extent required by applicable law, Licensee shall mark all Licensed Products or their containers in accordance with the applicable patent marking laws.

15.5 No Use of Name. The use of the name "The Scripps Research Institute", "Scripps", "TSRI" or any variation thereof in connection with the advertising, sale or performance of Licensed Products, Licensed Processes or Licensed Services is expressly prohibited. For the avoidance of doubt, nothing in this Section 15.5 shall prevent Licensee from identifying TSRI as a contracting partner in connection with any disclosure permitted under Section 11.3 hereof.

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15.6 U.S. Manufacture. To the extent applicable, Licensee agrees to abide by the Preference for United States Industry as set forth in 37 CFR 401.14 (I).

15.7 Foreign Registration. Licensee agrees to register this Agreement with any foreign governmental agency, which requires such registration, and Licensee shall pay all costs and legal fees in connection therewith. In addition, Licensee shall ensure that all foreign laws affecting this Agreement or the sale of Licensed Products, Licensed Processes and Licensed Services are fully satisfied.

15.8 Arbitration. Any controversy or claim arising out of or relating to this Agreement, or the breach thereof, including, without limitation, any and all Challenges, shall be settled by binding confidential arbitration in accordance with the then-current Commercial Arbitration Rules of the American Arbitration Association ("AAA"), and the procedures set forth below. In the event of any inconsistency between the Commercial Arbitration Rules and the procedures set forth below, the procedures set forth below shall control. Judgment upon the award rendered by the arbitrators may be enforced in any court having jurisdiction thereof.

(a) Location. The location of the arbitration shall be in the County of San Diego. TSRI and Licensee hereby irrevocably submit to the exclusive personal jurisdiction and venue of the American Arbitration Association arbitration panel selected by the parties and located in San Diego County, California for any dispute regarding this Agreement, including, without limitation, any Challenges, and to the exclusive personal jurisdiction and venue of the federal and state courts located in San Diego County, California for any action or proceeding to enforce an arbitration award or as otherwise provided in Section 15.8(e) below, and waive any right to contest or otherwise object to such jurisdiction or venue.

(b) Selection of Arbitrators. The arbitration shall be conducted by a panel of three neutral arbitrators who are independent and disinterested with respect to the parties, this Agreement and the outcome of the arbitration. Each party shall appoint one neutral arbitrator, and these two arbitrators so selected by the parties shall then select the third arbitrator, and all arbitrators must have at least ten (10) years' experience in mediating or arbitrating cases regarding the same or substantially similar subject matter as the dispute between Licensee and TSRI. If one party has given written notice to the other party as to the identity of the arbitrator appointed by the party, and the party thereafter makes a written demand on the other party to appoint its designated arbitrator within the next ten days, and the other party fails to appoint its designated arbitrator within ten days after receiving such written demand, then the arbitrator who has already been designated shall appoint the other two arbitrators.

(c) Discovery. The arbitrators shall decide any disputes and shall control the process concerning these pre-hearing discovery matters. Pursuant to the Commercial Arbitration Rules, the parties may subpoena witnesses and documents for presentation at the hearing.

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(d) Case Management. Prompt resolution of any dispute is important to both parties. The parties agree that the arbitration of any dispute shall be conducted expeditiously. The arbitrators are instructed and directed to assume case management initiative and control over the arbitration process (including scheduling of events, pre-hearing discovery and activities, and the conduct of the hearing), in order to complete the arbitration as expeditiously as is reasonably practical for obtaining a just resolution of the dispute.

(e) Remedies. The arbitrators may grant any legal or equitable remedy or relief that the arbitrators deem just and equitable, to the same extent that remedies or relief could be granted by a state or federal court; provided, however, that no punitive damages may be awarded. No court action shall be maintained seeking punitive damages. The decision of any two of the three arbitrators appointed shall be binding upon the parties. Notwithstanding anything to the contrary in this Agreement, prior to or while an arbitration proceeding is pending, either party has the right to seek and obtain injunctive and other equitable relief from a court of competent jurisdiction to enforce that party's rights hereunder.

(f) Expenses. The expenses of the arbitration, including the arbitrators' fees, expert witness fees and attorney's fees, may be awarded to the prevailing party, in the discretion of the arbitrators, or may be apportioned between the parties in any manner deemed appropriate by the arbitrators. Unless and until the arbitrators decide that one party is to pay for all (or a share) of such expenses, both parties shall share equally in the payment of the arbitrators' fees as and when billed by the arbitrators.

(g) Confidentiality. Except as set forth below, and as necessary to obtain or enforce a judgment upon any arbitration award, the parties shall keep confidential the fact of the arbitration, the dispute being arbitrated, and the decision of the arbitrators. Notwithstanding the foregoing, the parties may disclose information about the arbitration to persons who have a need to know, such as directors, trustees, management employees, witnesses, experts, investors, attorneys, lenders, insurers and others who may be directly affected. Additionally, if a party has stock, which is publicly traded, then such party may make such disclosures as are required by applicable securities laws, but will use commercially reasonable efforts to seek confidential treatment for such disclosure.

15.9 Entire Agreement; Modification. This Agreement and all of the attached Exhibits set forth the entire agreement and understanding between the parties as to the subject matter hereof, and supersede all prior or contemporaneous agreements or understandings, whether oral or written. There shall be no amendments or modifications to this Agreement, except by a written document, which is signed by both parties. In the event of a conflict between this Agreement and the Research Agreement with respect to the subject matter hereof, the terms and conditions of this Agreement shall control.

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15.10 California Law. This Agreement shall be construed and enforced in accordance with the laws of the State of California, without regard to its conflicts or choice of laws principles thereof.

15.11 Headings. The headings for each article and section in this Agreement have been inserted for convenience of reference only and are not intended to limit or expand on the meaning of the language contained in the particular article or section.

15.12 Severability. If one or more of the provisions of this Agreement is held invalid or unenforceable by a court of competent jurisdiction, then it shall be considered severed from this Agreement and shall not serve to invalidate the remaining provisions thereof. The parties shall make a good faith effort to replace any invalid or unenforceable provision with a valid and enforceable one such that the objectives contemplated by the parties when entering this Agreement may be realized.

15.13 No Waiver. Any delay in enforcing a party's rights under this Agreement or any waiver as to a particular default or other matter shall not constitute a waiver of such party's rights to the future enforcement of its rights under this Agreement, except only as to an express written and signed waiver as to a particular matter for a particular period of time.

15.14 Name. Whenever there has been an assignment by Licensee as permitted by this Agreement, the term "Licensee" as used in this Agreement shall also include and refer to, if appropriate, such assignee.

15.15 Attorneys' Fees. In the event of a dispute between the parties hereto or in the event of any default hereunder, the party prevailing in the resolution of any such dispute or default shall be entitled to recover its reasonable attorneys' fees and other costs incurred in connection with resolving such dispute or default. Notwithstanding anything to the contrary herein, the parties agree that this Section 15.15 shall not apply and attorney's fees and costs shall not be awarded to either party with respect to any Challenge or any action where Licensee alleges that it is not required to comply with or perform some or all of the provisions of this Agreement based upon a good faith claim that any of the Licensed Patent Rights are invalid or unenforceable. TSRI and Licensee each represent that it has been represented by its own counsel in the negotiation and execution of this Agreement. Each party further represents that it has relied solely on the advice and representation of its respective counsel in agreeing to this Section 15.15 and all of the other provisions of this Agreement.

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15.16 Notices. Any notices required by this Agreement shall be in writing, shall specifically refer to this Agreement and shall be sent by registered or certified mail, postage prepaid, or by facsimile, or by overnight courier, postage prepaid and shall be forwarded to the respective addresses set forth below unless subsequently changed by written notice to the other party:

For TSRI:	The Scripps Research Institute 10550 North Torrey Pines Road, TPC-9 La Jolla, California 92037 Attention: Senior Director, Business and Technology Development Fax No.: (858)784-9910
with a copy to:	The Scripps Research Institute 10550 North Torrey Pines Road, TPC-8 La Jolla, California 92037 Attention: Chief Business Counsel Fax No.: (858)784-9399
For Licensee:	aTyr Pharma, Inc. 3545 John Hopkins Court, Suite #250 San Diego, California 92121 Attention: Chief Executive Officer Fax No.: (858) 731-8394
with a copy to:	Goodwin Procter LLP Exchange Place, 53 State Street Boston, MA 02109 Attn: Kingsley L. Taft, Esq. Fax No. (617) 801-8857

Notices shall be deemed delivered upon the earlier of (a) when received; (b) three (3) days after deposit into the U.S. mail; (c) the date notice is sent via facsimile; or (d) the day immediately following delivery to an overnight courier guaranteeing next-day delivery (except Sundays and holidays).

15.17 Compliance with U.S. Laws. Nothing contained in this Agreement shall require or permit TSRI or Licensee to do any act inconsistent with the requirements of any United States law, regulation or executive order as the same may be in effect from time to time.

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IN WITNESS WHEREOF, the parties have executed this Agreement by their duly authorized representatives as of the date set forth above.

TSRI:	LICENSEE:
THE SCRIPPS RESEARCH INSTITUTE	aTYR PHARMA, INC.
By: _____	By: _____
Name:	Name:
Its:	Its:

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EXHIBIT A

LICENSED PATENT RIGHTS

EXHIBIT B

COMMERCIAL DEVELOPMENT PLAN

65

EXHIBIT C

BENCHMARKS

EXHIBIT F

FORM OF COMMON STOCK PURCHASE AGREEMENT

THIS COMMON STOCK PURCHASE AGREEMENT (this "**Agreement**") is made and entered into as of _____, 2015 by and between aTyr Pharma, Inc., a Delaware corporation (the "**Company**"), and The Scripps Research Institute, a California nonprofit public benefit corporation (the "**Purchaser**").

WHEREAS, on January 19, 2015, the Company and the Purchaser entered into that certain Amended and Restated Research Funding and Option Agreement (as amended through the date hereof, the "**Research Agreement**"), which amended, restated and superseded the Research Funding and Option Agreement by and between the Company and the Purchaser, dated October 31, 2007, as amended by the First Amendment dated May 7, 2010, the Second Amendment dated May 27, 2011 and the Third Amendment dated June 1, 2011 (the "**Prior Research Agreement**") in its entirety;

WHEREAS, on January 19, 2015, the Company and the Purchaser entered into an Assignment Agreement with respect to certain patent applications relating to Structures of Human Histidyl-tRNA Synthetase and Methods of Use (the "**Assignment Agreement**") and terminated that certain License Agreement, dated March 26, 2013, by and between the Company and the Purchaser (the "**Prior License Agreement**");

WHEREAS, the Company has agreed to issue and sell to the Purchaser an aggregate of Nine Hundred Fifty Three Thousand Two Hundred Twenty Eight (953,228) shares of the Company's Common Stock, $0.001 par value per share (the "**Stock**"), in accordance with the terms and conditions of this Agreement, in consideration for (i) certain of the rights granted by the Purchaser to the Company under the Research Agreement and (ii) certain of the rights granted by the Purchaser to the Company under the Assignment Agreement and the Purchaser's agreement to terminate the Prior License Agreement.

NOW, THEREFORE, in consideration for the mutual promises and covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto hereby agree as follows:

1. Number of Shares and Price Per Share. The Purchaser hereby agrees to purchase from the Company and the Company agrees to sell to Purchaser the Stock, for an aggregate purchase price of $953.23, in consideration for (i) certain of the rights granted by the Purchaser to the Company under the Research Agreement and (ii) certain of the rights granted by the Purchaser to the Company under the Assignment Agreement and the Purchaser's agreement to terminate the Prior License Agreement. The closing of the sale and purchase of the Stock shall occur immediately upon execution of this Agreement.

2. Right of First Refusal.

(a) Notice of Transfer. In the event that the Purchaser proposes to sell, assign, pledge, encumber, transfer or otherwise dispose of ("**Transfer**") any of Purchaser's Stock, Purchaser shall give the Company written notice of Purchaser's intention ("**Transfer Notice**"), describing the number of shares of Stock offered ("**Offered Shares**"), the identity of the prospective transferee and the consideration and the material terms and conditions upon which the proposed Transfer is to be made. The Transfer Notice shall certify that the Purchaser has received a firm offer from the prospective transferee and in good faith believes a binding agreement for Transfer is obtainable on the terms set forth, and shall also include a copy of any written proposal or letter of intent or other agreement relating to the proposed Transfer.

(b) Right of First Refusal. With respect to any proposed Transfer, the Company shall have an option to purchase all or none of the Offered Shares (the "**Right of First Refusal**"). To exercise such option, the Company must notify the Purchaser in writing before the expiration of the thirty (30) day period following the delivery of the Transfer Notice to the Company. If the Company elects to purchase the Offered Shares, it shall pay consideration for the Offered Shares no less favorable in price and material terms and conditions than are described in the Transfer Notice.

(c) Closing Procedures; Subsequent Transfers. If the Company exercises the Right of First Refusal, the Company and the Purchaser shall consummate the sale of the Offered Shares on the terms set forth in the Transfer Notice by the date sixty (60) days after the delivery of the Transfer Notice to the Company; provided, however, that, in the event the Transfer Notice provides for the payment for the shares of Stock other than in cash, the Company shall have the option to pay for the shares of Stock by the discounted cash equivalent of the consideration described in the Transfer Notice as reasonably determined by the Company. If the Company fails to exercise in full the Right of First Refusal on a timely basis, then the Purchaser may, not later than one hundred twenty (120) days following delivery to the Company of the Transfer Notice, conclude the Transfer subject to the Transfer Notice on the terms and conditions described in such notice. Any proposed transfer on terms and conditions different from those described in the Transfer Notice, as well as any proposed transfer by the Purchaser more than one hundred twenty (120) days following delivery of the Transfer Notice, shall again be subject to the Right of First Refusal and shall require the Purchaser to deliver a new Transfer Notice to the Company and to comply with the procedures described in this Section 2 with respect to such different or new Transfer.

(d) Condition to Transfer. All transferees of shares of Stock or any interest therein other than the Company shall be required as a condition of such transfer to agree in writing (in a form satisfactory to the Company) that they will receive and hold such shares of Stock or interest subject to the provisions of this Agreement, including the Right of First Refusal.

(e) Consent to Purchase. The Purchaser hereby consents to the purchase by the Company of less than all of the Offered Shares in connection with the exercise of the Right of First Refusal.

(f) Termination of Right. The Right of First Refusal shall terminate at such time as a public market exists for the Company's Common Stock (or any other stock issued by the Company, or any successor, in exchange for the Stock). For the purpose of this Agreement, a

"public market" shall be deemed to exist if (i) such stock is listed on a national securities exchange or (ii) such stock is traded on the over-the-counter market and prices therefor are published daily on business days in a recognized financial journal.

(g) Limitation on Right. Notwithstanding the provisions of this Section 2, the Right of First Refusal set forth in this Section 2 shall not apply to:

(i) any sale or transfer of the Stock in a public offering of securities of the Company registered under the Securities Act of 1933, as amended (the "**Securities Act**");

(ii) any sale or transfer of the Stock in connection with or pursuant to (i) a merger or consolidation or the sale, or exchange by the stockholders of the Company of all or substantially all of the capital stock of the Company, where the stockholders of the Company immediately before such transaction do not obtain or retain, directly or indirectly, a majority of the beneficial interest in the voting stock or other voting equity of the surviving or acquiring corporation or other surviving or acquiring entity, in substantially the same proportion as before such transaction, or (ii) the sale or exchange of all or substantially all of the Company's assets (other than a sale or transfer to a subsidiary of the Company as defined in section 424(f) of the Internal Revenue Code of 1986, as amended (the "**Code**")) where the stockholders of the Company immediately before such sale or exchange do not obtain or retain, directly or indirectly, a majority of the beneficial interest in the voting stock or other voting equity of the corporation or other entity acquiring the Company's assets, in substantially the same proportion as before such transaction; and

(iii) any transfer of the Stock to employees of the Purchaser who were inventors of technology subject to the TSRI Agreements; provided that in each case the transferee first agrees in writing, pursuant to an agreement in a form reasonably requested by the Company, to be subject to and bound by the terms of this Agreement to the same extent as if such transferee were the original Purchaser hereunder.

3. Assignment of Purchase Rights. The Company shall have the right to assign the Right of First Refusal to such person or persons as it may select.

4. Stock Dividends, Etc. If, from time to time, there is any stock dividend, stock split or other change in the character or amount of any of the outstanding stock of the Company, then in such event any and all new substituted or additional securities to which the Purchaser is entitled by reason of the Purchaser's ownership of the Stock acquired pursuant to this Agreement shall be considered Stock and shall be immediately subject to the Right of First Refusal and all other terms of this Agreement to the same extent as the Stock owned by the Purchaser immediately before such event.

5. Legends. All certificates representing any shares of Stock subject to the provisions of this Agreement shall have endorsed thereon the following legends:

(a) "THE TRANSFER OF THE SHARES REPRESENTED BY THIS CERTIFICATE ARE RESTRICTED PURSUANT TO AN AGREEMENT BETWEEN THE COMPANY AND THE HOLDER OF THESE SHARES, OR HIS OR HER PREDECESSOR IN INTEREST, A COPY OF WHICH IS ON FILE AT THE PRINCIPAL OFFICE OF THIS COMPANY."

(b) "THE SECURITIES EVIDENCED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, AND MAY NOT BE SOLD, TRANSFERRED, ASSIGNED OR HYPOTHECATED UNLESS THERE IS AN EFFECTIVE REGISTRATION STATEMENT UNDER SUCH ACT COVERING SUCH SECURITIES, THE SALE IS MADE IN ACCORDANCE WITH RULE 144 UNDER THE ACT, OR THE COMPANY RECEIVES AN OPINION OF COUNSEL FOR THE HOLDER OF THESE SECURITIES REASONABLY SATISFACTORY TO THE COMPANY, STATING THAT SUCH SALE, TRANSFER, ASSIGNMENT OR HYPOTHECATION IS EXEMPT FROM THE REGISTRATION AND PROSPECTUS DELIVERY REQUIREMENTS OF SUCH ACT."

(c) Any legend required to be placed thereon under applicable state securities laws.

6. Representations and Warranties. In connection with the proposed purchase of the Stock, the Purchaser hereby agrees, represents and warrants as follows:

(a) The Purchaser is purchasing the Stock solely for the Purchaser's own account for investment and not with a view to, or for resale in connection with, any distribution thereof within the meaning of the Securities Act.

(b) The Purchaser realizes that Purchaser's purchase of the Stock will be a highly speculative investment, and Purchaser is able, without impairing Purchaser's financial condition, to hold the Stock for an indefinite period of time and to suffer a complete loss of Purchaser's investment.

(c) The Company has disclosed to the Purchaser that:

(i) The sale of the Stock has not been registered under the Securities Act, and the Stock must be held indefinitely unless a transfer of it is subsequently registered under the Securities Act or an exemption from such registration is available, and that the Company is under no obligation to register the Stock; and

(ii) The Company will make a notation in its records of the aforementioned restrictions on transfer and legends.

(d) The Purchaser is aware of the provisions of Rule 144, promulgated under the Securities Act, which, in substance, permits limited public resale of "restricted securities" acquired, directly or indirectly, from the issuer thereof (or an affiliate of such issuer), in a non-public offering subject to the satisfaction of certain conditions, including among other things: the resale occurring not less than six months from the date the Purchaser has purchased and paid for the Stock and the availability of certain public information concerning the Company. The Purchaser further represents that Purchaser understands that at the time

Purchaser wishes to sell the Stock there may be no public market upon which to make such a sale, and that, even if such a public market then exists, the Company may not be satisfying the current public information requirements of Rule 144, and that, in such event, the Purchaser would be precluded from selling the Stock under Rule 144 even if the six-month minimum holding period had been satisfied.

(e) The Purchaser is an accredited investor as defined in Rule 501(a) of Regulation D promulgated under the Securities Act.

(f) Without in any way limiting the Purchaser's representations and warranties set forth above, the Purchaser further agrees that the Purchaser shall in no event make any disposition of all or any portion of the Stock which the Purchaser is purchasing unless and until:

(i) There is then in effect a Registration Statement under the Securities Act covering such proposed disposition and such disposition is made in accordance with said Registration Statement; or

(ii) The Purchaser shall have (1) notified the Company of the proposed disposition and furnished the Company with a detailed statement of the circumstances surrounding the proposed disposition, and (2) if reasonably requested by the Company, furnished the Company with an opinion of the Purchaser's own counsel to the effect that such disposition will not require registration of such shares under the Securities Act, and such opinion of the Purchaser's counsel shall have been concurred in by counsel for the Company, and the Company shall have advised the Purchaser of such concurrence.

7. "Market Stand-Off" Agreement. Purchaser shall not sell, dispose of, transfer, make any short sale of, grant any option for the purchase of, or enter into any hedging or similar transaction with the same economic effect as a sale, any Common Stock or other securities of the Company held by Purchaser (other than those included in the registration), including the Stock (the "**Restricted Securities**"), during the 180-day period following the effective date of the Company's first firm commitment underwritten public offering of its Common Stock (or such longer period, not to exceed 34 days after the expiration of the 180-day period, as the underwriters or the Company shall request in order to facilitate compliance with NASD Rule 2711 or NYSE Member Rule 472 or any successor or similar rule or regulation). Purchaser agrees to execute and deliver such other agreements as may be reasonably requested by the Company and/or the managing underwriters which are consistent with the foregoing or which are necessary to give further effect thereto. In order to enforce the foregoing covenant, the Company may impose stop transfer instructions with respect to Purchaser's Restricted Securities until the end of such period. The underwriters of the Company's stock are intended third party beneficiaries of this Section 7 and shall have the right, power and authority to enforce the provisions hereof as though they were a party hereto.

8. Transfers in Violation of Agreement. The Company shall not be required (i) to transfer on its books any shares of Stock of the Company which shall have been sold or transferred in violation of any of the provisions set forth in this Agreement or (ii) to treat as owner of such shares or to accord the right to vote as such owner or to pay dividends to any transferee to whom such shares shall have been so transferred.

9. Miscellaneous.

(a) Further Instruments. The parties agree to execute such further instruments and to take such further action as may reasonably be necessary to carry out the intent of this Agreement.

(b) Notice. All notices required or permitted hereunder shall be in writing and shall be deemed effectively given (i) upon personal delivery, (ii) when sent by confirmed facsimile, if sent during normal business hours of recipient, or if not, then on the next business day, or (iii) one (1) day after deposit with a nationally recognized overnight courier, specifying next day delivery, with written verification of receipt. All communications shall be sent to the party to be notified at the address as set forth on the signature pages hereof or at such other address as such party may designate by ten (10) days advance written notice to the other parties hereto.

(c) Successors and Assigns. This Agreement shall inure to the benefit of the successors and assigns of the Company and, subject to the restrictions on transfer herein set forth, be binding upon the Purchaser, the Purchaser's heirs, executors, administrators, successors and assigns.

(d) Applicable Law; Entire Agreement; Amendments. This Agreement shall be governed by and construed in accordance with the laws of the State of California as it applies to agreements between California residents, entered into and to be performed entirely within California and constitutes the entire agreement of the parties with respect to the subject matter hereof superseding all prior written or oral agreements, and no amendment or addition hereto shall be deemed effective unless agreed to in writing by the parties hereto.

(e) Right to Specific Performance. The Purchaser agrees that the Company shall be entitled to a decree of specific performance of the terms hereof or an injunction restraining violation of this Agreement, said right to be in addition to any other remedies available to the Company.

(f) Severability. If any provision of this Agreement is held by a court to be invalid, void or unenforceable, the remaining provisions shall nevertheless continue in full force and effect without being impaired or invalidated in any way and shall be construed in accordance with the purposes and tenor and effect of this Agreement.

(g) Arbitration. Any dispute or claim arising out of this agreement will be subject to final and binding arbitration. One arbitrator who is a member of the American Arbitration Association ("**AAA**"), and will be governed by the Commercial Arbitration Rules of the AAA will conduct the arbitration. The arbitration will be held in San Diego, California, and the arbitrator will apply California substantive law in all respects. The arbitrator shall have all authority to determine the arbitrability of any claim and enter a final, binding judgment at the conclusion of any proceedings. Any final judgment only may be appealed on the grounds of improper bias or improper conduct of the arbitrator. The party prevailing in the resolution of any

claim will be entitled, in addition to such other relief as may be granted, to an award of all attorneys' fees and costs incurred in the claim, without regard to any statute, schedule, or rule of court purported to restrict such award.

(h) Counterparts; Facsimiles. This Agreement may be executed in counterparts, each of which shall be an original, but all of which together shall constitute one instrument and such counterparts may be delivered via facsimile.

(i) California Corporate Securities Law. THE SALE OF THE SECURITIES THAT ARE THE SUBJECT OF THIS AGREEMENT HAS NOT BEEN QUALIFIED WITH THE COMMISSIONER OF CORPORATIONS OF THE STATE OF CALIFORNIA AND THE ISSUANCE OF SUCH SECURITIES OR THE PAYMENT OR RECEIPT OF ANY PART OF THE CONSIDERATION THEREFOR PRIOR TO THE QUALIFICATION IS UNLAWFUL, UNLESS THE SALE OF SECURITIES IS EXEMPT FROM THE QUALIFICATION BY SECTIONS 25100, 25102, OR 25105 OF THE CALIFORNIA CORPORATIONS CODE. THE RIGHTS OF ALL PARTIES TO THIS AGREEMENT ARE EXPRESSLY CONDITIONED UPON THE QUALIFICATION BEING OBTAINED, UNLESS THE SALE IS SO EXEMPT.

[REMAINDER OF PAGE LEFT INTENTIONALLY BLANK]

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first above written.

"PURCHASER"	"COMPANY"
THE SCRIPPS RESEARCH INSTITUTE	aTYR PHARMA, INC.
By: _____	By: _____
Name: _____	Name: _____
Title _____	Title: _____
Address: 10550 North Torrey Pines Road, TPL-9 La Jolla, California 92037	Address: 3545 John Hopkins Court, #250 San Diego, California 92121

[SIGNATURE PAGE TO COMMON STOCK PURCHASE AGREEMENT]

Exhibit 10.8

MASTER SERVICES AGREEMENT

BETWEEN

ATYR PHARMA, INC.

AND

SYNGENE INTERNATIONAL LIMITED

Master Services Agreement

This Agreement is executed on this 5th day of November 2012 between

aTyr Pharma, Inc.

A company organized under the laws of Delaware and having its place of business 3545 John Hopkins Court, Suite 250, San Diego, CA 92121, USA
(hereinafter referred to as **'aTyr'** which expression shall include its successors and assigns)

and

Syngene International Limited
a Company incorporated under the laws of India and having its principal place of business at Biocon Special Economic Zone, Biocon Park, Plot No. 2 & 3,
Bommasandra Industrial Area IV Phase, Bomtnasandra - Jigani Link Road
Bangalore 560 099, India
(hereinafter referred to as **'Syngene'** which expression shall include its successors and assigns)

Recitals

Whereas, Syngene is an integrated research service provider in the fields of biology and chemistry from early discovery stages through process development and custom manufacturing;

Whereas, aTyr is engaged in research and development of novel protein therapeutics; and

Whereas, aTyr wishes to retain Syngene to perform certain services under this Master Services Agreement for which aTyr and Syngene shall execute one or more Work Orders describing the responsibilities and obligations specific to the applicable services, as set forth on each Work Order.

NOW, THEREFORE, in consideration of the foregoing and the mutual promises made herein and the mutual benefits to be derived therefrom, and for other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the Parties hereto, intending to be legally bound, agree as follows:

Article 1. Definitions & Interpretation

1.1 As used anywhere in this Agreement, the following terms shall mean and be interpreted to convey the meanings ascribed thereto in this Article 1.

1.1a "**Affiliates**" means, in relation to aTyr, any corporation, association or other business entity which directly or indirectly controls, is controlled by or is under common control with such Party and "Control" shall mean the legal power to direct or cause the direction of the

general management and policies of such entity whether through the ownership of at least 50% of voting securities or capital stock of such business entity or any other comparable equity or ownership interest with respect to a business entity other than a corporation.

1.1b "**Agreement**" means this Master Services Agreement, including "Work Orders executed between the Parties.

1.1c "**Batch**" or "**Batches**" means a specific quantity of Product that has uniform character and quality, within limits set forth in the Product Specifications, and that is produced according to a single manufacturing order during the same cycle of manufacture.

1.1d "**BMR**" or "**Batch Manufacturing Record**" means the document that sets out in detail the master production instructions and Batch production records as defined in (a) applicable laws and regulations in the United States, including section 211.188 of Tide 21 of the United States Code of Federal Regulations; and (b) Sections 6.4 and 6.5 of the Rules and Guidance for Pharmaceutical Manufacturers and Distributors Part II: Basic Requirements for Active Substances Used as Starting Materials.

1.1e "**cGMP**" means Current Good Manufacturing Practice as defined in (a) the United States Federal Food, Drug, and Cosmetic Act as amended (21 USC 301 et seq.); (b) relevant United States regulations found in Title 21 of the United States Code of Federal Regulations (including Parts 11, 210, 211, 600 and 610); and (c) all applicable principles and guidelines of Current Good Manufacturing Practices for Active Pharmaceutical Ingredients, as such principles and guidelines are amended, implemented and supplemented from time to time, including those set out in the International Conference on Harmonization Of Technical Requirements For Registration Of Pharmaceuticals For Human Use (ICH) Guideline Q7 Good Manufacturing Practice for Active Pharmaceutical Ingredients.

1.1f "**Completion**" is defined in Section 2.5.

1.1g "**Confidential Information**" is defined in Section 7.1.

1.1h "**Conforming Batch**" means a cGMP Batch which (a) has been produced in accordance with cGMP; and (b) meets the Final Product Specifications in the applicable Work Order and/or QC Document.

1.1i "**Defect**" or "**Deficiency**" means any one or more of the following with respect to a Product: any damage, non-conformance, or defect, including any impurity, contamination, misbranding or non-conformity in or relating to the Product caused by non-conformance to cGMPs or the Final Product Specifications. Product that is subject to a Defect maybe referred to herein as "**Defective**".

1.1j "**Deficiency Notice**" means a written notice from aTyr identifying one or more Defects with respect to the Product.

1.1k "**Disclosing Party**" is defined in Section 7.1.

1.1l "**Disposition**" means the Stage during which all documentation related to cGMP manufacture of each Batch is reviewed and approved by aTyr.

1.1m "**Drug Product**" means the final dosage form which contains Product in association with other active or inactive ingredients.

1.1n "**Effective Date**" of this Agreement shall be the date on which the Agreement is fully executed and delivered by both the Parties.

1.1o "**Facility**" means Syngene's manufacturing facility located at Biocon Park, Plot No. 2 & 3, Bommasandra Industrial Area IV Phase Jigani Link Road, Bangalore 560 099, India.

1.1p "**Final Product Specifications**" means the final specifications for any Product to be manufactured by Syngene in accordance with cGMP, as set forth in the applicable Work Order and/ or QC Document.

1.1q "**GMP Batch**" means a Batch identified in a Work Order to be manufactured in accordance with cGMP and subject to Disposition in accordance with cGMP.

1.1r "**GMP Stages**" means the Stages identified in the applicable Work Order during which activity associated with cGMP manufacture of Product is intended to take place, including cGMP preparation stages, the Manufacturing Stage, Disposition and reporting.

1.1s "**Intellectual Property**" means discoveries and inventions (whether patentable or not), copyrights (including copyrights in software), trademarks, neighbouring rights and database rights, trade secrets, Know-How, and any other rights of similar kind as any of the foregoing, whether registered or not, including applications for the registration of such rights.

1.1t "**Know-How**" means information, data, know-how or experience, including, but not limited to, methods, manufacturing techniques, processes, operating instructions, machinery designs, Product Specifications and formulas, drawings, data, ideas, concepts or any other information relating to research, development and manufacture.

1.1u "**Non-Conforming Batch**" means (a) for any Batch that is to be manufactured in accordance with cGMP, such Batch has not been produced in accordance with cGMP or the Quality Agreement or does not meet the Final Product Specifications as described in the applicable Work Order and/or QC Document; and/or (b) for any Batch that is not to be manufactured in

accordance with cGMP, such Batch does not meet the Final Product Specifications as described in the applicable Work Order and/or QC Document.

1.1v "**Non-GMP Stages**" means all Stages identified in the applicable Work Order, other than the GMP Stages.

1.1w "**Party**" or "**Parties**" means and refers to Syngene and/or aTyr as referred to individually or collectively, as the context permits.

1.1x "**Person**" means any natural person, firm, company, corporation, trust, government, state or agency of a government or state (including any statutory/public body/authority) or any association or partnership (whether or not having separate legal personality) of two or more of the foregoing.

1.1y "**Process**" or "**Processing**" means the manufacture of any Product in accordance with the Final Product Specifications and the terms and conditions set forth in this Agreement, the Quality Agreement, the applicable Work Order and technology transfer documents.

1.1z "**Process Specifications**" means the document, which defines the Process, including any critical processing parameters, as agreed between the Parties pursuant to the applicable Work Order.

1.1aa "**Product**" means the protein or molecule identified in the applicable Work Order.

1.1bb "**Product Specifications**" means the specifications for any Product to be manufactured by Syngene, as set forth in the applicable Work Order.

1.1cc "**Quality Agreement**" means the document agreed to by the Parties prior to commencement of any cGMP activities, which sets out (a) the mutually agreed quality standards applicable for the manufacture of Product in accordance with cGMP; and (b) the roles and responsibilities of each Party's personnel in relation to quality matters.

1.1dd "**QC Document"** means the document that sets forth the Final Product Specifications for any Product, the schedule for the taking of samples for quality control purposes, details of any subcontract laboratories to be utilized and the final Product label.

1.1ee "**Receiving Party**" is defined in Section 7.1.

1.1ff "**Regulatory Authorities**" means the U.S. Food and Drug Administration, the European Medicines Agency, or any equivalent governmental regulatory body which the parties agree in writing, or any successor entity thereto.

1.1gg "**Results**" is defined in Section 5.2.

1.1hh "**Services**" is defined in Section 2.8.

1.1ii "**Stage**" means a stage as described in the applicable Work Order.

1.1jj "**Term**" means the period as specified in Section 9.1.

1.1kk "**Terminating Party**" is defined in Section 9.2.

1.1ll "**Third Party**" means any Person other than Syngene and aTyr.

1.1mm "**Timeline**" means, with respect to a Service, a timeline within which the project or Services shall be performed and which shall be included in individual Work Orders or as mutually agreed upon from time to time in writing by authorized representatives of each Party.

1.1nn "**Work Order**" is defined in Section 2.2.

1.2 In this Agreement, while interpreting the terms hereof, amongst others, the following rules of interpretation shall apply:

1.2a references to Recitals, Articles, Addenda and Exhibits are to Recitals and Articles of and Exhibits to this Agreement and all Recitals and Exhibits shall always be read together with and as integral part of this Agreement; and

1.2b the headings are for convenience only and shall not affect its interpretation.

1.3 All terms as defined in this Article 1 or elsewhere in this Agreement shall be identified by capitalized first alphabet, if intended to convey the meaning ascribed anywhere in this Agreement.

Article 2. Scope of the Agreement

2.1 MASTER SERVICES AGREEMENT. As a "Master Services Agreement", this Agreement allows the Parties to contract for multiple services through the issuance of multiple Work Orders as discussed in Section 2.2 below, without having to re-negotiate the basic terms and conditions contained herein. This Agreement covers, the provision of Services by Syngene. Accordingly, this Agreement represents a vehicle by which aTyr can efficiently contract with Syngene for a broad range of Services contemplated under this Agreement, including services like development and manufacturing services.

2.2 WORK ORDERS. The specific details of each Service under this Agreement shall be separately negotiated and specified in writing on terms and in a form acceptable to both Parties (each such writing, a "**Work Order**"). Each Work Order will include, as appropriate, the scope of

work, Timeline, consideration/compensation, payment schedule and other relevant technical and commercial terms. Each Work Order shall expressly reference and be subject to all of the terms and conditions of this Agreement, in addition to the specific details set forth in the Work Order. To the extent any terms or provisions of a Work Order conflict with the terms and provisions of this Agreement, the terms and provisions of this Agreement shall control, except to the extent the Work Order expressly and specifically states the intent to supersede the Agreement on a specific matter. All Work Orders and other exhibits thereto shall be incorporated herein by reference.

2.3 CONDUCT OF WORK ORDERS. Syngene shall manufacture Products in strict compliance with the Process Specifications, the Final Product Specifications, the Quality Agreement and all applicable laws and regulations, including, without limitation, cGMP, and in accordance with the requirements of the applicable Work Order, including quantities and delivery schedules set forth therein.

2.4 SUBCONTRACTORS. Syngene shall not use any Third Party to perform the Services or any part thereof without the prior written consent of an authorized representative of aTyr. Notwithstanding the foregoing, Syngene shall remain responsible and liable for all conduct of any Third Party in connection with the Services.

2.5 WORK ORDER COMPLETION. A Work Order shall be complete when (i) all Stages have been completed under such Work Order and any and all Batches have been manufactured and delivered to, and accepted by, aTyr in accordance with the terms and conditions of such Work Order, the Quality Agreement and this Agreement, and (ii) Syngene has delivered a written notice to aTyr stating that Syngene believes that such Work Order has been completed ("**Completion**").

2.6 CANCELLATION OF BATCHES. Unless otherwise stated in the applicable Work Order, aTyr shall have the right to cancel any Batch upon delivery of written notice to Syngene prior to the commencement of such Batch.

2.7 CHANGE ORDERS. Any (a) change in the details of a Work Order, (b) change in the assumptions upon which the Work Order is based (including, but not limited to, changes in an agreed starting date for Services or suspension of the Services by the Parties) may require changes in the budget and/or Timelines, and shall require a written amendment to the Work Order (a "**Change Order**"). Each Change Order shall, detail the requested changes to the applicable task, responsibility, duty, budget, Timeline or other matter. The Change Order will become effective upon the execution of the Change Order by both Parties, and will include a specified period of time (as agreed upon by the Parties) within which Syngene will implement the changes. Both Parties agree to act in good faith and promptly when considering a Change Order requested by the other Party. Syngene will not give effect to material changes in the scope of Service until such time that both Parties agree to and execute the corresponding Change Order.

2.8 NATURE OF SERVICES. The Services covered under this Agreement may include manufacturing and development services in the field of chemistry, biology, preclinical, biologics, formulation development, clinical material supply, analytical, stability studies, toxicology, process development, DMPK & bioanalytical, regulatory, cGMP manufacturing and other related services as requested by aTyr and agreed to by Syngene and set forth in the relevant Work Order (collectively, the "**Services**").

2.9 REGULATORY ASSISTANCE. During each Work Order and for a period of seven (7) years following Completion, Syngene will provide all necessary assistance to aTyr and its Affiliates and the licensees and sublicensees of either Party (each, an "**aTyr-Related Party**"), with respect to the regulatory filing activities of any aTyr-Related Party for the applicable Drug Product or Process. Depending on the nature and extent of assistance required by aTyr, the Parties shall agree upon the terms and conditions for such assistance. Syngene will provide copies of any documents, which may be required by any aTyr-Related Party in support of such regulatory filing activities. aTyr shall have the sole right and responsibility for determining regulatory strategy, decisions and actions relating to each Work Order and any Product and/or Drug Product.

2.10 QUALITY MATTERS. As soon as possible following execution of this Agreement and in any case prior to commencement of cGMP activity, the Parties shall execute the Quality Agreement. Each Party shall fulfill its responsibilities as set forth in the Quality Agreement.

2.10a Non-Conforming Batches: If during Disposition, it is ascertained that Syngene has manufactured a GMP Batch that is a Non-Conforming Batch then (i) Syngene shall notify aTyr promptly in writing, but in no event later than five (5) calendar days, after Syngene's discovery of a Non-Conforming Batch ("**Non-Conforming Batch Notice**"); (ii) the Non-Conforming Batch shall not be delivered to aTyr, unless aTyr requests it in writing, provided that in the event aTyr requires delivery of the Non-Conforming Batch, Syngene will be entitled to claim the actual cost for the materials used in manufacturing such Non-Conforming Batch; (iii) if aTyr does not wish to take delivery of the Non-Conforming Batch, and aTyr wishes to continue the applicable Work Order, Syngene shall either: (1) rework or reprocess the Non-Conforming Batch in accordance with cGMP, provided that aTyr consents to such rework or reprocessing in writing in advance without any additional cost to aTyr; or (2) if aTyr does not consent to rework or reprocess the Non-Conforming Batch in accordance with cGMP, then to manufacture an additional GMP Batch at Syngene's expense.

2.10b Determining if any Product is Deficient: aTyr shall send to Syngene any Deficiency Notice within forty-five (45) calendar days after aTyr's receipt of the Product. Upon receipt of a Deficiency Notice, Syngene shall have ten (10) calendar days to notify aTyr in writing as to whether it agrees that the subject Product is Defective. If aTyr and Syngene fail to agree within ten (10) business days following Syngene's notice to aTyr regarding whether the Product is Defective or the

cause of the Deficiency or both, the Parties shall resolve the dispute pursuant to Third Party testing. In the event that Syngene or an independent laboratory determines that a Defect resulted, Syngene shall, at its sole cost and expense, replace the rejected Product with Product that is not Defective as soon as reasonably practicable, but in no event longer than forty five (45) calendar days after Syngene or an independent laboratory determines that such Defect existed. If both Parties decide that the Defective Product cannot be reworked or used, Syngene shall arrange, at its sole cost and expense, for all such Defective Product to be destroyed in accordance with all applicable laws and regulations and shall deliver to aTyr a certificate of destruction signed by an authorized representative of Syngene.

2.11 MANUFACTURE OF PRODUCT. aTyr will provide appropriate technical assistance, as appropriate, for Syngene to manufacture and deliver the Product. Syngene shall be responsible for all failures, Defects and delays in performing the Services, except as follows: (i) Syngene shall not be liable for failures or Defects solely to the extent such failures or Defects are caused by Syngene's reasonable reliance on material and information provided by aTyr, or for delays in performing the Services solely to the extent such delays arise from delays caused by aTyr in providing information or technical assistance to Syngene as required under this Agreement (if applicable); provided, however, that if Syngene believes that any material or information provided (or required to be provided) by aTyr under this Agreement is deficient or delayed and that such deficiency or delay may impact Syngene's performance of its obligations under this Agreement, then Syngene shall promptly notify aTyr in writing of such belief, including in such notice a detailed description of the material or information that Syngene believes is deficient or delayed; and (ii) Syngene shall not be liable for any delay in obtaining project-specific approvals, licenses and permits from government authorities, provided that Syngene has made the required applications in a timely manner for obtaining such approvals, licenses and permits to the appropriate government authorities. All costs associated with obtaining information and/or materials from aTyr shall be borne by aTyr.

2.12 DELIVERY AND STORAGE. Delivery of all material, including any quantity of Product manufactured, will be made Ex Works, the Facility (Incoterms 2010) when Syngene notifies aTyr that such material is available for collection or, in the case of any Batch produced during the cGMP manufacturing stage, five (5) Business Days following notification by Syngene that Syngene has completed Disposition with respect to such Batch or collection of such Batch by or on behalf of aTyr, whichever occurs, first. Risk in and title to all material shall pass on delivery. aTyr shall have an option to request that Syngene store Product and, during such storage, to carry out stability testing on Product, subject to written agreement between the Parties with respect to the terms and conditions therefor and the duration of storage, testing intervals and price payable.

2.13 AUDIT. During the Term and during the period in which Syngene is performing the Services, aTyr or its authorized representatives for the purposes of audit may visit the Facility where the Services are being performed, during normal business hours. The detailed scope of audit and

the terms of audit shall be communicated to Syngene at least fifteen (15) days prior to the date of audit. Notwithstanding the foregoing, aTyr may carry out an audit of Syngene upon five (5) business days notice in the event of any Non-Conforming Batch (a "for cause" audit).

2.14 RECORDS RETENTION. On completion of the Services, in accordance with aTyr's written instructions, Syngene shall either provide aTyr with all records pertaining to the Services or maintain the records in accordance with the request made by aTyr. In the event Syngene is required to maintain records pertaining to the Services for a period beyond seven (7) years from the date of completion of such Service, the Parties shall mutually agree in writing upon the terms and conditions for such maintenance of records.

Article 3. Regulatory Inspections

3.1 Syngene shall notify aTyr in writing within twenty-four (24) hours of receipt of any notice of any government or regulatory authority inspection, investigation or other inquiry, or other notice or communication of any type, involving the Services, Products, Processes or other materials or records.

3.2 Syngene and aTyr shall cooperate with each other during any such inspection, investigation or other inquiry, including allowing, upon reasonable request, a representative of aTyr to participate during such inspection, investigation or other inquiry, and providing copies of all documents related thereto.

Article 4. Representations and Warranties

4.1 Both Syngene and aTyr hereby represent and warrant that they have all the corporate, regulatory, legal and other authorizations and licenses to carry out and conduct their respective activities and to execute this Agreement in accordance with all applicable legal and regulatory guidelines and that execution of this Agreement and performance of this Agreement does not and will not breach or cause conflict with any other obligations of Syngene and aTyr, respectively.

4.2 Syngene represents and warrants to aTyr as follows: (i) all Products manufactured by Syngene shall, at the date delivered to aTyr (1) conform to the Final Product Specifications and have been manufactured in compliance with cGMP and the terms of this Agreement, the applicable Work Order and the Quality Agreement, (2) not be adulterated or misbranded, and (3) not be Defective; (ii) Syngene possesses, and shall at all times during the Term of this Agreement possess, all licenses necessary to perform Syngene's obligations under this Agreement; and (iii) as of the Effective Date, Syngene has not received any warning letters or other similar communication related to the Facility and all deficiencies noted in any Form FDA-483 have been corrected before the Effective Date.

4.3 Syngene warrants that the sale, use or incorporation into manufactured products of all

Products and Services furnished by Syngene hereunder that are either (a) not of aTyr's design or composition, or (b) not as specified in the Final Product Specifications, will not, except to the extent expressly approved in writing by aTyr in advance, infringe upon any Third Party patent, copyright, trademark, service mark, trade name or other Third Party intellectual property right, and will not misappropriate any trade secret of any Third Party. For clarity, Syngene will not be in breach of this Section 4.3 to the extent such Third Party intellectual property rights are part of Syngene Technical Know-How that is licensed to aTyr under Section 5.2.

4.4 Syngene represents and warrants that: (a) it is familiar with, and has reviewed and understands, the provisions of the United States Foreign Corrupt Practices Act of 1977, as amended (the "FCPA"); (b) it has not made nor will it make, directly or indirectly, in connection with its activities on behalf of aTyr, any offer, payment, promise to pay, loan or gift of anything of value to a Government Official, to an immediate relative of a Government Official, or to any other person while knowing or having reasons to suspect that any part of such offer, payment, loan or gift will be given or promised to a Government Official to obtain or retain business or where the offer, payment, loan or gift would (1) violate any applicable law, (2) be contrary to or in violation of the principles set forth in the United Nations Convention Against Corruption that entered into force on December 14, 2005, (3) violate the FCPA, or (4) cause aTyr or any of its parent or affiliated companies (or any of their officers, directors, employees or agents) to be in violation of the FCPA. As used in this Agreement, "**Government Official**" means: (x) any official, employee, agent, advisor or consultant of a non-U.S. government or any federal, regional or local department, agency, state-owned enterprise or corporation or any other instrumentality thereof, (y) any official or employee or agent of a public international organization, or (z) any official or employee or agent of a political party or candidate for political office. In addition, Syngene shall on each anniversary of the Commencement Date, deliver to aTyr an annual certification of Anti-Bribery and Corruption compliance in a form reasonably acceptable to aTyr.

4.5 Syngene represents and warrants that neither it nor any of its employees nor any of its subcontractors is, or is reasonably likely to become (based on a conviction by the courts or a finding of fault by any applicable regulatory authority): (a) debarred pursuant to the United States *Generic Drug Enforcement Act of 1992 (21 U.S.C § 335a)*, as amended from time to time; (b) disqualified from participating in clinical trials pursuant to *21 C.F.R. § 312.70*, as amended from time to time; (c) disqualified as a testing facility under *21 C.F.R. Part58, Subpart K*, as amended from time to time; (d) excluded, debarred or suspended from or otherwise ineligible to participate in a "Federal Health Care Program" as defined in *42 U.S.C. 1320a-7b(f)*, as amended from time to time, or any other governmental payment, procurement or non-procurement program; or (e) included on the HHS/OIG List of Excluded Individuals/Entities, the General Services Administration's List of Parties Excluded from Federal Programs, or the FDA Debarment List. Syngene shall notify aTyr immediately if any of the foregoing is not true for any reason at any time.

4.6 Syngene covenants that it shall not knowingly hire or retain as an officer or employee any person who has been convicted of a misdemeanor or felony under the laws of the United States relating to the regulation of any drug product by the United States Food, Drug, and Cosmetic Act or relating to the regulation of any federal healthcare program by the U.S. Department of Health and Human Services. If at any time a representation and warranty in this Section 4.6 is no longer accurate, Syngene shall immediately notify aTyr of such fact.

4.7 EXCEPT AS SET FORTH IN ARTICLE 4, ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT, HEREBY ARE DISCLAIMED BY SYNGENE AND ATYR.

4.8 Each Party shall secure and maintain in full force and effect during the Term of this Agreement policies of insurance having policy limits, deductibles and other terms appropriate to the conduct of that Party's business. Evidence of such insurance in the form of a broker's letter will be made available for examination upon request of the other Party.

Article 5. Intellectual Property Rights

5.1 All Intellectual Property owned by aTyr prior to the Effective Date and throughout the Term of this Agreement shall at all times be the exclusive property of aTyr and nothing in this Agreement or in the Work Orders to be agreed upon between the Parties shall constitute or be construed as a transfer of ownership of such Intellectual Property to Syngene.

5.2 All results, findings and improvements (including all Intellectual Property) arising out of or relating to the performance of Services under the Agreement (the "**Results**") shall be the sole and exclusive property of aTyr, including the right to amend and alter the Results and to assign and sublicense rights to the Results. Syngene hereby assigns all right, tide and interest in and to the Results to aTyr. However, any results, findings and improvements independently generated by Syngene relating to the general process or analytical aspects generally applicable to protein expression, production, formulation and analytical processes ("**Technical Know-How**") shall be exclusively owned by Syngene; provided, however, that, notwithstanding the foregoing, all discoveries or inventions related to the composition or use of any Product or derivative or progeny thereof, and any process, related specifically to the manufacture of any of the foregoing, shall be deemed Results and owned solely by aTyr. Syngene hereby grants to aTyr a non-exclusive, irrevocable, perpetual, royalty-free, fully-paid-up, worldwide license, with the right to grant sublicenses, under the Technical Know-How to use and practice the Technical Know-How to the extent useful or necessary to make, have made, use, sell, offer for sale and import any Product and/or Drug Product Syngene undertakes to take all reasonable measures requested by aTyr, including executing relevant documents/forms in order to have the rights to the Results vested in aTyr, as well as documents necessary for seeking or maintaining protection for its rights.

5.3 Subject to the terms and conditions of this Agreement, aTyr grants to Syngene a non-exclusive, license, without the right to grant sublicenses, to use the Results and aTyr's Intellectual Property during the Term of this Agreement for the sole purpose of carrying out the Services. Syngene shall not use or practice aTyr's Intellectual Property for any purpose, other than performing Syngene's obligations under this Agreement.

5.4 If following Completion or following termination of this Agreement for any reason, aTyr requires Syngene's technical assistance, then such assistance shall be provided to aTyr by Syngene, The terms under which such technical assistance will be provided shall be agreed upon by the Parties in writing.

5.5 Syngene shall ensure that the Services shall only be undertaken by persons who are either employed by Syngene under an employment contract or who are consultants under a consultancy contract, which provides for the assignment to Syngene of all Results created by them in relation to the performance of the Services, including the right to amend and alter the Results and to assign and sublicense rights to the Results, in order to ascertain that the rights to the Results are vested in aTyr in accordance with Section 5.2 hereinabove.

5.6 The provisions of this Article 5 shall survive any termination of this Agreement.

Article 6. Consideration

6.1 In consideration for Syngene providing the Services, aTyr shall pay Syngene the fees and expenses as set forth in each Work Order and in accordance with the terms of this Article 6. During the three (3) year period following the Effective Date, the prices for similar services will remain the same in all WOs, with adjustments to reflect only inflation, changes in currency exchange rates and input costs and changes in scope of Services.

6.2 Syngene shall invoice aTyr in accordance with the payment schedule agreed under the specific Work Order and aTyr shall make payment within thirty (30) days from the date of invoice, unless otherwise agreed by the Parties in the specific Work Order. All payments required to be made by aTyr to Syngene shall be made in United States Dollars (USD $).

6.3 All taxes, including import duties, excise duties, VAT, sales tax, and service tax, levied under applicable law that are directly related to the Services shall be borne by aTyr. Syngene shall be responsible for any income related taxes levied under applicable law for the Services governed by this Agreement. At present there are no taxes payable on these services.

Article 7. Confidentiality

7.1 During the Term, either Party (the "**Disclosing Party**") may disclose to the other Party (the "**Receiving Party**") (i) proprietary information, (ii) non-public and/or un-published information,

(iii) Know-How, (iv) information related to Intellectual Property Rights, (v) commercial, financial information and business plans, forecasts, marketing plans, (vi) any materials transferred by the Disclosing Party, (vii) software, algorithms, formulae, (viii) information received under obligations of confidentiality, (ix) information relating to Disclosing Party's experimental work, research, development, purchasing, customer list, vendors, investors, employees, business and contractual relationships, and (x) any other information, including information disclosed prior to and/or after the Effective Date ("**Confidential Information**"). Without prejudice to the above, the Disclosing Party may designate the Confidential Information as "Confidential" by an appropriate legend.

7.2 Confidential Information shall be deemed to be the confidential information of the Disclosing Party; provided, however, that notwithstanding the forgoing, all Results and all data and information generated as a result of the Services and related to any Product or Process shall be deemed to be the Confidential Information of aTyr. However, Confidential Information shall not include any information which:

7.2.1. is now in or hereafter comes into the public domain without breach of this Agreement and through no fault of the Receiving Party and can be so demonstrated by the Receiving Party; or

7.2.2. is properly and lawfully known to the Receiving Party prior to the date of this Agreement and can be so demonstrated by the Receiving Party;

7.2.3. subsequent to disclosure hereunder, is lawfully received by the Receiving Party from a third party whose rights therein are not subject to any restriction to disseminate the Confidential Information and can be so demonstrated by the Receiving Party; or

7.2.4. is independently developed by the Receiving Party, without reference to or reliance on any Confidential Information of the Disclosing Party, and can be so demonstrated with contemporaneous written evidence.

7.3 Each Party hereby agrees that the Confidential Information of the other Party shall be used only during the Term of this Agreement and only for the limited purpose of discharging its obligations or exercising its rights under this Agreement.

7.4 Each Party further agrees to accept and keep the Confidential Information of the other Party confidential and to employ the same degree of care as it would employ to protect its own confidential and proprietary formation, which will in any case not be less than reasonable degree of care.

7.5 Nothing in this Article 7 shall preclude disclosure of any Confidential Information of the other Party that is (a) required to be disclosed by any court of competent jurisdiction, or (b) which is required by law to be disclosed (including, without limitation, to a Regulatory Authority, in

connection with freedom of information legislation or regulations, or in relation to filings with any recognized stock exchange). If a Party is required to make a disclosure of any Confidential Information of the other Party in accordance with this Section 7.5, it shall only make a disclosure to the extent to which it is required by applicable law or regulation to do so. Notwithstanding the foregoing, such Party shall in each case promptly notify the other Party when any requirement to disclose has arisen, to enable such other Party to seek an appropriate protective order and to make known to the intended recipient the proprietary nature of the Confidential Information and to make any applicable claim of confidentiality in respect thereof. The Party that is required to disclose such Confidential Information shall co-operate in any action which the other Party may in its reasonable discretion decide to take.

Except as expressly stated in this Agreement, nothing in this Agreement or any disclosure of any Confidential Information of the Disclosing Party pursuant to this Agreement shall operate to and/or be deemed to confer, by implication or otherwise, any right, title or interest in or to such Confidential Information unto the Receiving Party or be deemed to grant any license to such Confidential Information to the Receiving Party.

Article 8. Indemnity

8.1 aTyr shall indemnify, defend and hold harmless Syngene against all Third Party claims, suits, actions, demands, liabilities, expenses and/or losses including reasonable legal fees) (collectively, "**Claims**") brought against or suffered by Syngene or its Affiliates or its or their directors, officers, shareholders or employees, and against all reasonable costs incurred in connection therewith, arising out of or resulting from (i) Syngene's use of aTyr's materials or Process in its performance of the Services in accordance with applicable laws and regulations, and the terms and conditions of this Agreement, the applicable Work Order and the Quality Agreement, or (ii) aTyr's use of Product following delivery to aTyr or use of Drug Product, except to the extent such Claims result from (a) Syngene's breach of this Agreement, the applicable Work Order or the Quality Agreement, including, without limitation, supplying Product that fails to comply with the Final Product Specifications or was not made in compliance with cGMP, (b) any breach of Syngene's representations, warranties or covenants, or (c) any violation of applicable laws or regulation by Syngene or any of its personnel or contractors.

8.2 Syngene shall indemnify, defend and hold harmless aTyr, its Affiliates and the directors, officers, shareholders, employees and agents of the foregoing (the "**aTyr Indemnitees**"), against all Claims brought against or suffered by any aTyr Indemnitee and against all costs incurred in connection therewith arising out of, resulting from or related to (a) Syngene's breach of this Agreement, the applicable Work Order or the Quality Agreement, including, without limitation, supplying Product that fails to comply with the Final Product Specifications or was not made in compliance with cGMP (if applicable), (b) any breach of Syngene's representations, warranties or covenants, or (c) any violation by Syngene or any of its personnel or contractors of applicable laws or regulation.

8.3 EXCEPT FOR A PARTY'S OBLIGATIONS UNDER THIS AGREEMENT TO DEFEND AND INDEMNIFY THE OTHER PARTY, NEITHER PARTY WILL BE LIABLE TO THE OTHER PARTY, IN ANY EVENT FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL OR INDIRECT DAMAGES OR ANY PUNITIVE OR EXEMPLARY DAMAGES, ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT. Irrespective of the cause or form of action, Syngene's aggregate liability to indemnify aTyr and/or any third party for any claims, losses or damages arising out of any act or omission of Syngene directly attributable to a particular Work Order shall in no circumstances exceed two (2) times the aggregate consideration paid by aTyr to Syngene under such Work Order, and if the term of the Work Order is beyond one (1) year, then two (2) times the aggregate consideration paid by aTyr to Syngene in the preceding 12-month period.

Article 9. Term & Termination

9.1 This Agreement shall commence on the Effective Date and shall continue for a period of three (3) years, or until terminated by a Party in accordance with the provisions of this Article 9 ("**Term**"). The Agreement will automatically renew each year thereafter for a period of one (1) year, unless either Party notifies the other Party in writing at least thirty (30) days prior to the renewal date that it does not want to renew the Agreement.

9.2 Notwithstanding the foregoing, either Party (the "**Terminating Party**") shall be entitled to terminate this Agreement or any specific Work Order, immediately and forthwith by written notice to the other Party if:

9.2.1. the other Party commits a breach of any material provision of this Agreement and fails to remedy such breach within thirty (30) days after receipt of written notice from the Terminating Party identifying the breach and requiring it to be remedied; or

9.2.2. the other Party makes an assignment for the benefit of creditors, voluntary arrangement with its creditors or becomes subject to an administration order; or

9.2.3. the other Party goes into liquidation, except for the purpose of amalgamation, reconstruction, merger or other reorganization and in such manner that the entity resulting from the reorganization agrees to be bound by or assume the obligations imposed on that other Party under this Agreement; or

9.2.4. the other Party faces bankruptcy or the other Party receives a notice for winding up from any of its creditors and is unable to pay the amounts demanded or reply to the same.

9.3 aTyr may terminate this Agreement or any Work Order by giving forty (45) days written

notice to Syngene at any time. Such termination maybe effective upon such notice or on such later date specified by aTyr in such notice.

Notwithstanding anything contained in this Article 9, no right or obligation of the Parties shall be affected during the notice period as stated in this Article 9 hereinabove and no termination of this Agreement will affect any rights and obligations of the Parties incurred prior to such termination.

9.4 Sections 2.9, 2.14, 9.4, 9.6 and 9.7 and Articles 1, 5, 7, 8, 10 and 11 shall survive the expiration or earlier termination of this Agreement.

9.5 Termination of any specific Work Order under this Agreement shall not affect the Services being performed under any other Work Orders under this Agreement.

9.6 Upon the expiration or earlier termination of this Agreement, for whatever reason, Syngene shall cease all Services being provided under this Agreement, unless otherwise agreed by the Parties in writing, and aTyr shall make payments under any Work Order executed for any Services that have commenced on/before the effective date of termination or such other date as may be mutually agreed. aTyr shall be liable to pay Syngene for all work completed, work in progress, all materials purchased and all non-cancelable orders placed for providing Services.

9.7 Upon the expiration or earlier termination of this Agreement, the Receiving Party shall return all Confidential Information of the Disclosing Party in its possession. Thereafter, all rights of Receiving Party to use Confidential Information of the Disclosing Party will cease with immediate effect. The Receiving Party shall be entitled to retain one copy of the Confidential Information of the Disclosing Party solely for archival purposes, for regulatory compliance and for enforcing its rights under this Agreement,

Article 10. Governing Law and Dispute Resolution

10.1 The Parties agree that they shall in good faith work towards implementation of this Agreement and any dispute arising out of or in relation to this Agreement shall be first attempted to be resolved amicably by mutual negotiations, failing which such dispute shall be referred to final and binding arbitration in accordance with the then-current Commercial Arbitration Rules of the American Arbitration Association's International Center for Dispute Resolution (the "**Rules**"). The sole venue of arbitration shall be New York, USA The arbitration shall be conducted in the English language. Unless otherwise agreed by the Parties, such arbitration shall be decided by a single arbitrator who is knowledgeable in the subject matter at issue in the dispute. The Parties shall attempt jointly to select such arbitrator within thirty (30) days after notice of arbitration is given. If the Parties cannot reach an agreement regarding the sole arbitrator within that time, then the arbitrator shall be appointed pursuant to the Rules. The arbitrator shall prepare and deliver to the Patties a written, reasoned opinion conferring the decision of the arbitrator. The decision of such

arbitrator shall be final, binding and conclusive on the Parties, and judgment thereon maybe entered in any court of competent jurisdiction. This Agreement shall be governed by and interpreted in accordance with the laws of New York, USA, without reference to conflict of law provisions. Each Party agrees that a decision from such an arbitration proceeding may be enforced in any court of competent jurisdiction. Each Party shall also be entitled to injunctive or other equitable relief from any court of competent jurisdiction for a breach of this Agreement where money damages are not an adequate remedy, and the parties agree that an action for such injunctive or other equitable relief maybe maintained in any forum which has jurisdiction over the defendant in such action.

Article 11. Miscellaneous

11.1 Notwithstanding anything stated elsewhere in this Agreement, neither Party shall be liable to the other Party for any delay in performance of its obligations if, and to the extent, that the performance or delay in performance of any of its obligations under this Agreement is prevented, restricted, delayed or interfered with due to circumstances beyond the reasonable control of such Party, including, but not limited to, acts of government, fires, floods, epidemics, accidents, wars, acts of terrorism, riots, casualty, earthquake, destruction of production and research facilities, strikes, lockouts work slowdowns, sick-outs or other labor unrest.

11.2 Syngene shall not assign to any other Person the whole or any part of its obligations under this Agreement, without the prior written consent of aTyr. aTyr may assign this Agreement to any Person without the prior consent of Syngene.

11.3 Any notice or other communication required or permitted under this Agreement will be in writing, and will be deemed given as of the date it is: (a) delivered by hand; or (b) mailed, postage prepaid, first class, certified mail, return receipt requested, to the party at the address listed below, or subsequently specified in writing; (c) registered post with acknowledgement due or (d) sent, shipping prepaid, return receipt requested, by national courier service, to the Party at the address listed below or subsequently specified in writing:

If to Syngene:

Syngene International Limited.
Biocon Special Economic Zone, Biocon Park
Plot No. 2 & 3, Bommasandra IV Phase, Jigani Link Road,
Bangalore 560 009, INDIA
Atten: Chief Operating Officer
Ph No. 91-80-4014 3150
Attention to: M.B. Chinappa
Title: President - Finance
Email: mb.chinappa@syngeneintl.com

With a copy to:	
Title:	Legal Counsel Syngene International Limited
If to aTyr:	aTyr Pharma, Inc. 3545 John Hopkins Court, Suite 250 San Diego, CA 92121 United States Attn: Vice President, Intellectual Property Facsimile: +1-858-731-8394 Email: acubitt@atyrpharma.com
With a copy to:	DLA Piper LLP 4365 Executive Drive Suite 1100 San Diego, CA 92121-2133 United States Attn: Randy Socol Facsimile: +1-(858) 677-4401

11.4 The failure, with or without intent, of either Party to insist upon the performance (in strict conformity with the literal requirements) by the other Party, of any term or condition of this Agreement, shall not be treated as, or be deemed to constitute, a modification of any terms or conditions of this Agreement, nor shall such failure or election be deemed to constitute a waiver of any right of such Party, at any time whatsoever thereafter, to insist upon performance of that particular or any other obligation by the other Party, strictly in accordance with any and all terms and conditions hereof.

11.5 Both Syngene and aTyr agree and undertake, during the Term and for a period of two (2) years thereafter, to forbid themselves or any of their Affiliates, representatives, successors or permitted assigns to solicit for employment or otherwise attempt to engage the services, directly or indirectly, in any capacity whatsoever, of any employee of the other Party or of their respective affiliates, successors or permitted assigns. This section shall not prohibit the right to hire any person who responds to a general solicitation for employment.

11.6 All terms, conditions and obligations under this Agreement shall remain in full force and effect at all times during the subsistence of this Agreement, except where otherwise amended or modified by the Parties by mutual written agreement.

11.7 Neither Party to this Agreement is authorized to incur any obligation or liability for or on

behalf of the other Party. Neither Party shall be liable for any obligation and or liability incurred by me other Party.

11.8 If any part of this Agreement is declared illegal or unenforceable, the Parties will cooperate in all ways open to them to obtain substantially the same result or as much thereof as may be possible, including taking appropriate steps to amend, modify or alter this Agreement. If any term or provision of this Agreement shall be hereafter declared by a final adjudication of any tribunal or court of competent jurisdiction to be illegal, such adjudication shall not alter the validity or enforceability of any other term or provision of this Agreement, unless the terms and provisions so declared are expressly defined as a conditions precedent or as of the essence of this Agreement, or comprising an integral part of, or inseparable from the remainder of this Agreement.

11.9 The relationship hereby established between the Parties is solely that of independent contractors. This Agreement shall not create an agency, partnership, joint venture or employer/employee relationship.

11.10 This Agreement will be executed in two original counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same instrument.

11.11 Neither Party makes any indemnity, representation or warranty, either express or implied, except for the indemnities, representations and warranties expressly set forth in this Agreement.

11.12 This Agreement, including all Work Orders entered hereunder, together with the Quality Agreement contains the entire understanding between the Parties and supersedes all previous and contemporaneous agreements or understandings with respect to the subject matter of this Agreement.

The Parties have hereunto set their hands hereon this day month and year first hereinabove mentioned.

Executed for and on behalf of **aTyr Pharma, Inc.**	Executed for and on behalf of **Syngene International Limited**
Signature /s/ John Mendlein	Signature /s/ Dhananjay Patankar
Name: John Mendlein	Name: Dhananjay Patankar
Title: CEO	Title: November 5, 2012

APPENDIX A

Work Order No.

Exhibit 10.9

LEASE

by and between

BMR-John Hopkins Court LLC,
a Delaware limited liability company

and

aTyr Pharma, Inc.,
a Delaware corporation

LEASE

THIS LEASE (this "**Lease**") is entered into as of this 22nd day of December, 2011 (the "**Execution Date**"), by and between BMR-John Hopkins Court LLC, a Delaware limited liability company ("**Landlord**"), and aTyr Pharma, Inc., a Delaware corporation ("**Tenant**").

RECITALS

A. WHEREAS, Landlord owns certain real property (the "**Property**") and the improvements on the Property located at 3545-3575 John Hopkins Court, San Diego, California, including the building located thereon;

B. WHEREAS, Landlord wishes to lease to Tenant, and Tenant desires to lease from Landlord, certain premises (the "**Premises**") located on the second (2nd) floor of the building in which the Premises are located (the "**Building**"), pursuant to the terms and conditions of this Lease, as detailed below; and

C. WHEREAS, the parties anticipate that a portion of the Premises shown as "Phase 1" on the diagram of the Premises attached hereto as Exhibit A ("**Phase 1**") will be ready for occupancy by Tenant prior to the portion of the Premises shown as "Phase 2" on the diagram of the Premises attached hereto as Exhibit A ("**Phase 2**"), and that Landlord will deliver possession of Phase 1 prior to the delivery of Phase 2.

AGREEMENT

NOW, THEREFORE, Landlord and Tenant, in consideration of the mutual promises contained herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and intending to be legally bound, agree as follows:

1. Lease of Premises. Effective on the Phase 1 Term Commencement Date with respect to Phase 1 of the Premises and the Phase 2 Term Commencement Date with respect to Phase 2 of the Premises, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, Phase 1 and Phase 2 of the Premises, as shown on Exhibit A attached hereto, for use by Tenant in accordance with the Permitted Use (as defined below) and no other uses. The Property and all landscaping, parking facilities, private drives and other improvements and appurtenances related thereto, including the Building, are hereinafter collectively referred to as the "**Project**." All portions of the Project that are for the non-exclusive use of tenants of the Building, including driveways, sidewalks, parking areas, landscaped areas, service corridors, stairways, elevators, public restrooms and public lobbies, are hereinafter referred to as "**Common Area**."

2. Basic Lease Provisions. For convenience of the parties, certain basic provisions of this Lease are set forth herein. The provisions set forth herein are subject to the remaining terms and conditions of this Lease and are to be interpreted in light of such remaining terms and conditions.

2.1 This Lease shall take effect upon the Execution Date and, except as specifically otherwise provided within this Lease, each of the provisions hereof shall be binding upon and

inure to the benefit of Landlord and Tenant from the date of execution and delivery hereof by all parties hereto.

2.2 In the definitions below, each current Rentable Area (as defined below) is expressed in rentable square footage. Rentable Area and "**Tenant's Pro Rata Shares**" are all subject to adjustment as provided in this Lease.

Definition or Provision	Means the Following
Approximate Rentable Area of Phase 1	12,431 square feet
Approximate Rentable Area of Phase 2	4,652 square feet
Approximate Rentable Area of Premises	17,083 square feet
Approximate Rentable Area of Building	72,192 square feet
Approximate Rentable Area of Project	72,192 square feet
Tenant's Pro Rata Share of Building	17.22% with respect to Phase 1 6.44% with respect to Phase 2 23.66% with respect to the Premises
Tenant's Pro Rata Share of Project	17.22% with respect to Phase 1 6.44% with respect to Phase 2 23.66% with respect to the Premises

2.3 Initial monthly and annual installments of Base Rent for the Premises ("**Base Rent**") as of the applicable Term Commencement Date, subject to adjustment under this Lease:

Dates	Square Feet of Rentable Area	Base Rent per Square Foot of Rentable Area	Monthly Base Rent	Annual Base Rent
Phase 1 Term Commencement Date - Phase 2 Term Commencement Date	12,431	$3.00 monthly	$37,293	N/A

Phase 2 Term Commencement Date - Month* 12	17,083	$3.00 monthly	$51,249	N/A
Months* 13-24	17,083	$3.09 monthly	$52,786	$633,432
Months* 25-36	17,083	$3.18 monthly	$54,370	$652,441
Months* 37-48	17,083	$3.28 monthly	$56,001	$672,014
Months* 49-60	17,083	$3.38 monthly	$57,681	$692,174

* Note: Months are determined based on the Phase 1 Term Commencement Date.

2.4 Estimated Term Commencement Dates:

(a) With respect to Phase 1: May 1, 2012.

(b) With respect to Phase 2: June 1, 2012.

2.5 Estimated Term Expiration Date: April 30, 2017.

2.6 Security Deposit: $51,249.

2.7 Permitted Use: Office, laboratory and vivarium use in conformity with all federal, state, municipal and local laws, codes, ordinances, rules and regulations of Governmental Authorities (as defined below), committees, associations, or other regulatory committees, agencies or governing bodies having jurisdiction over the Premises, the Building, the Property, the Project, Landlord or Tenant, including both statutory and common law and hazardous waste rules and regulations ("**Applicable Laws**")

2.8 Address for Rent Payment:
BMR-John Hopkins Court LLC
P.O. Box 511269
Los Angeles, California 90051-7824

2.9 Address for Notices to Landlord:
BMR-John Hopkins Court LLC
17190 Bernardo Center Drive
San Diego, California 92128
Attn: Vice President, Real Estate Counsel

2.10 Address for Notices to Tenant:
Prior to Commencement Date

aTyr Pharma, Inc.
3565 General Atomics Court, Suite #103
San Diego, California 92121
Attn: Vice President, Operations

On and After Commencement Date

aTyr Pharma, Inc.
3545 John Hopkins Court
San Diego, California 92121
Attn: Vice President, Operations

2.11 Address for Invoices to Tenant: Same as Address for Notices

2.12 The following Exhibits are attached hereto and incorporated herein by reference:

Exhibit A	Premises
Exhibit B	Work Letter
Exhibit C	Acknowledgement of Term Commencement Date and Term Expiration Date
Exhibit D	Form of Additional TI Allowance Acceptance Letter
Exhibit E	Form of Letter of Credit
Exhibit F	Rules and Regulations
Exhibit G	Form of Estoppel Certificate
Exhibit H	Form of Convertible Unsecured Promissory Note

3. Term. The actual term of this Lease (as the same may be extended pursuant to Article 42 hereof, and as the same may be earlier terminated in accordance with this Lease, the "Term") shall commence on the actual Phase 1 Term Commencement Date (as defined in Article 4) for Phase 1 and the actual Phase 2 Term Commencement Date (as defined in Article 4) for Phase 2 and end on the date that is sixty (60) months after the actual Phase 1 Term Commencement Date (such date, the "Term Expiration Date"), subject to earlier termination of this Lease as provided herein. TENANT HEREBY WAIVES THE REQUIREMENTS OF SECTION 1933 OF THE CALIFORNIA CIVIL CODE, AS THE SAME MAY BE AMENDED FROM TIME TO TIME.

4. Possession and Commencement Date.

4.1 Landlord shall use commercially reasonable efforts to tender possession of Phase 1 to Tenant on the Estimated Phase 1 Term Commencement Date, with the Phase 1 work (the "Phase 1 Tenant Improvements") required of Landlord described in the Work Letter attached hereto as Exhibit B (the "Work Letter") Substantially Complete (as defined below). Landlord shall provide Tenant with access to Phase 1 at least thirty (30) days prior to the estimated Phase 1 Term Commencement Date for the installation and set-up of Tenant's furniture, fixtures and equipment*; provided* that such access does not interfere with the construction of the Phase 2 Tenant Improvements (as defined below); and *provided, further*, that, if the Phase 1 Tenant Improvements are Substantially Complete before the date that is thirty (30) days prior to the Estimated Phase 1 Term Commencement Date, Landlord shall tender possession of Phase 1 to the Tenant on such earlier date and Tenant shall be allowed to start conducting business in Phase 1 (so long as Tenant has obtained all necessary permits and approvals required to conduct business in Phase 1 and Tenant's activities in Phase 1 do not interfere with the construction of the Phase 2 Tenant Improvements), but not earlier than sixty (60) days prior to the Estimated Phase 1 Term Commencement Date. Tenant agrees that in the

event such work is not Substantially Complete on or before the Estimated Phase 1 Term Commencement Date for any reason, then (a) this Lease shall not be void or voidable, (b) Landlord shall not be liable to Tenant for any loss or damage resulting therefrom (except that, if Landlord does not deliver possession of Phase 1 to Tenant with the Tenant Improvements Substantially Complete by May 1, 2012, Tenant shall be entitled to rental abatement following the Phase 1 Term Commencement Date equal to one (1) day for each day of such delay beyond such date that Landlord fails to deliver possession of Phase 1 to Tenant), (c) the Term Expiration Date shall be extended accordingly and (d) Tenant shall not be responsible for the payment of any Base Rent or Tenant's Share of Operating Expenses (as defined below) until the actual Phase 1 Term Commencement Date as described in Section 4.2 occurs. Landlord shall use commercially reasonable efforts to tender possession of Phase 2 to Tenant on the Estimated Phase 2 Term Commencement Date, with the Phase 2 work (the "Phase 2 Tenant Improvements" and, together with the Phase 1 Tenant Improvements, the "Tenant Improvements") required of Landlord described in the Work Letter Substantially Complete by the Estimated Phase 2 Term Commencement Date*; provided* that, if the Phase 2 Tenant Improvements are Substantially Complete before the Estimated Phase 2 Term Commencement Date, Landlord shall tender possession of Phase 2 to the Tenant on such earlier date and Tenant shall be allowed to start conducting business in Phase 2 (so long as Tenant has obtained all necessary permits and approvals required to conduct business in Phase 2). The term "Substantially Complete" or "Substantial Completion" means that the Tenant Improvements (or applicable portion thereof) are substantially complete in accordance with the Approved Plans (as defined in the Work Letter), except for minor punch list items brought to Landlord's attention by Tenant within thirty (30) days after Substantial Completion of the Tenant Improvements (or applicable portion thereof), which items Landlord shall promptly correct and/or repair upon receipt of notice from Tenant. Notwithstanding anything in this Lease (including the Work Letter) to the contrary, Landlord's obligation to timely achieve Substantial Completion shall be subject to extension on a day-for-day basis as a result of Force Majeure (as defined below).

4.2 The "Phase 1 Term Commencement Date" shall be the latest of (a) the Estimated Phase 1 Term Commencement Date, (b) the day Landlord tenders possession of Phase 1 to Tenant with the Phase 1 Tenant Improvements Substantially Complete and (c) the day that is thirty (30) days after Tenant is provided access to Phase 1 for the installation and set up of Tenant's furniture, fixtures and equipment, as described in Section 4.1. The "Phase 2 Term Commencement Date" shall be the later of (y) the Estimated Phase 2 Term Commencement Date and (z) the day on which Landlord tenders possession of Phase 2 to Tenant with the Phase 2 Tenant Improvements Substantially Complete. The Phase 1 Term Commencement Date and the Phase 2 Term Commencement Date shall be referred to herein, collectively, as the "Term Commencement Dates," or individually as a "Term Commencement Date." If possession is delayed by action of Tenant, then the applicable Term Commencement Date shall be the date that such Term Commencement Date would have occurred but for such delay. Tenant shall execute and deliver to Landlord written acknowledgment of the Phase 1 Term Commencement Date and the Term Expiration Date within ten (10) days after Tenant takes occupancy of Phase 1, in the form attached as Exhibit C hereto. Tenant shall execute and deliver to Landlord written acknowledgment of the Phase 2 Term Commencement Date within ten (10) days after Tenant takes occupancy of Phase 2, in the form attached as Exhibit C hereto. Failure to execute and deliver such acknowledgments, however, shall not affect the Term Commencement Dates or

Landlord's or Tenant's liability hereunder. Failure by Tenant to obtain validation by any medical review board or other similar governmental licensing of the Premises required for the Permitted Use by Tenant shall not serve to extend the Term Commencement Dates.

4.3 Before Tenant enters upon any portion of the Premises prior to a Term Commencement Date as provided in Section 4.1 for the purpose of installing improvements or the placement of personal property, Tenant shall furnish to Landlord evidence satisfactory to Landlord that insurance coverages required of Tenant under the provisions of Article 23 are in effect, and such entry shall be subject to all the terms and conditions of this Lease other than the payment of Base Rent or Tenant's Share of Operating Expenses (as defined below); *provided* that, if Tenant enters upon Phase 1 before the date that is thirty (30) days prior to the Estimated Phase 1 Term Commencement Date as provided in Section 4.1, Tenant shall pay the cost for all utilities used by Tenant in the Premises during such period prior to the Phase 1 Term Commencement Date; and *provided, further*, that, if a Term Commencement Date is delayed due to any early access by Tenant on the Premises, then such Term Commencement Date shall be the date that such Term Commencement Date would have occurred but for such delay.

4.4 Landlord shall cause the Tenant Improvements to be constructed in the Premises pursuant to the Work Letter at a cost to Landlord not to exceed (a) One Million Two Hundred Eighty-One Thousand Two Hundred Twenty-Five Dollars ($1,281,225) (based upon Seventy-Five Dollars ($75) per square foot of Rentable Area (as defined below)) (the "**Base TI Allowance**") plus (b) if properly requested by Tenant pursuant to this Section, up to an additional Four Hundred Twenty-Seven Thousand Seventy-Five Dollars ($427,075) (based upon Twenty-Five Dollars ($25) per square foot of Rentable Area) (the "**Additional TI Allowance**"), for a total of up to One Million Seven Hundred Eight Thousand Three Hundred Dollars ($1,708,300) (based upon One Hundred Dollars ($100) per square foot of Rentable Area). The Base TI Allowance, together with Additional TI Allowance (if properly requested by Tenant pursuant to this Article), shall be referred to herein as the "**TI Allowance**." The TI Allowance may be applied to the costs of (1) construction, (m) project management by Landlord (which fee shall equal three percent (3%) of the cost of the Tenant Improvements, including the Base TI Allowance and, if used by Tenant, the Additional TI Allowance), (n) space planning, architect, engineering and other related services performed by third parties unaffiliated with Tenant, (o) building permits and other taxes, fees, charges and levies by Governmental Authorities (as defined below) for permits or for inspections of the Tenant Improvements, (p) labor and materials, (q) equipment, furniture and fixtures, (r) commercially reasonable costs for the installation of data cabling and wiring in or to the Premises, (s) Tenant Signage (as defined below) in conformance with the requirements of Section 12.7, (t) Tenant's actual third party costs and expenses incurred in connection with relocating to the Premises and (u) the cost of Tenant's third party project manager hired to oversee the construction of the Tenant Improvements. In no event shall (x) the TI Allowance be used for (i) payments to Tenant or any affiliates of Tenant, (ii) the purchase of any furniture, personal property or other non-building system equipment, (iii) costs resulting from any default by Tenant of its obligations under this Lease or (iv) costs that are recoverable by Tenant from a third party (*e.g.*, insurers, warrantors, or tortfeasors), or (y) more than ten percent (10%) of the TI Allowance be used for costs and expenses described in clause (q) above and other personal property.

4.5 Base Rent shall be increased to include the amount of the Additional TI Allowance disbursed by Landlord in accordance with this Lease amortized over the initial Term at a rate of eight percent (8%) annually. Tenant shall have until the date that is nine (9) months after the Phase 1 Term Commencement Date (the "**TI Deadline**") to expend the unused portion of the TI Allowance, after which date Landlord's obligation to fund such costs shall expire. The amount by which Base Rent shall be increased shall be determined (and Base Rent shall be increased accordingly) as of the Phase 1 Term Commencement Date and, if such determination does not reflect use by Tenant of all of the Additional TI Allowance, shall be determined again as of the TI Deadline, with Tenant paying (on the next succeeding day that Base Rent is due under this Lease (the "**TI True-Up Date**")) any underpayment of the further adjusted Base Rent for the period beginning on the Phase 1 Term Commencement Date and ending on the TI True-Up Date. For purposes of illustration only, if Tenant properly requests and utilizes all of the Additional TI Allowance, the monthly Base Rent shall be increased to Three Dollars and Fifty-One Cents ($3.51) per square foot during the first twelve (12) months of the initial Term.

4.6 Landlord shall not be obligated to expend any portion of the Additional TI Allowance until Landlord shall have received from Tenant a letter in the form attached as Exhibit D hereto executed by an authorized officer of Tenant. In no event shall any unused TI Allowance entitle Tenant to a credit against Rent payable under this Lease.

5. Condition of Premises. On the date of Landlord's delivery of possession of the Premises to Tenant, the HVAC, electrical, plumbing, mechanical and sprinkler systems of the Premises shall be in good working order and repair. Except as provided in the previous sentence, Tenant acknowledges that neither Landlord nor any agent of Landlord has made any representation or warranty with respect to the condition of the Premises, the Building or the Project, or with respect to the suitability of the Premises, the Building or the Project for the conduct of Tenant's business. Except as provided in the first sentence of this Article 5, Tenant acknowledges that (a) it is fully familiar with the condition of the Premises and agrees to take the same in its condition "as is" as of the applicable Term Commencement Date and (b) Landlord shall have no obligation to alter, repair or otherwise prepare the Premises for Tenant's occupancy or to pay for or construct any improvements to the Premises, except with respect to the Base TI Allowance and, if properly requested by Tenant pursuant to the terms of die Lease, the Additional TI Allowance.

6. Rentable Area.

6.1 The term "**Rentable Area**" shall reflect such areas as reasonably calculated by Landlord's architect, as the same may be reasonably adjusted from time to time by Landlord in consultation with Landlord's architect but only to reflect actual physical changes to the Premises, the Building or the Project, as applicable.

6.2 The Rentable Area of the Building is generally determined by making separate calculations of Rentable Area applicable to each floor within the Building and totaling the Rentable Area of all floors within the Building. The Rentable Area of a floor is computed by measuring to the outside finished surface of the permanent outer Building walls. The full area calculated as previously set forth is included as Rental Area, without deduction for columns and

projections or vertical penetrations, including stairs, elevator shafts, flues, pipe shafts, vertical ducts and the like, as well as such items' enclosing walls.

6.3 The term "**Rentable Area**," when applied to the Premises, is that area equal to the usable area of the Premises, plus an equitable allocation of Rentable Area within the Building that is not then utilized or expected to be utilized as usable area (but specifically excluding any vacant space in the Building that Landlord reasonably deems to be leasable), including that portion of the Building devoted to corridors, equipment rooms, restrooms, elevator lobby, atrium and mailroom.

7. Rent.

7.1 Tenant shall pay to Landlord as Base Rent for Phase 1, commencing on the Phase 1 Term Commencement Date, the applicable portion of the sums set forth in Section 2.3, and as Base Rent for the entire Premises, commencing on the Phase 2 Term Commencement Date, the sums set forth in Section 2.3, subject to the rental adjustments provided in Article 8 hereof. Base Rent shall be paid in equal monthly installments as set forth in Section 2.3, subject to the rental adjustments provided in Article 8 hereof, each in advance on the first day of each and every calendar month during the Term. On the Execution Date, Tenant shall execute and deliver to BioMed Realty, L.P., the sole member of the Landlord, that certain Subordinated Convertible Unsecured Promissory Note of Tenant in the form attached hereto as Exhibit H (the "**Convertible Promissory Note**"), a portion of which Convertible Promissory Note represents Tenant's payment of (a) one hundred percent (100%) of the Base Rent during the first (1st) twelve (12) months of the initial Term beginning on the Phase 1 Term Commencement Date and (b) a portion of Base Rent for each remaining month of the initial Term equal to the quotient of (m) the positive difference between (i) One Million Dollars ($1,000,000) and (ii) the sum of all Base Rent during the first (1st) twelve (12) months of the initial Term beginning on the Phase 1 Term Commencement Date, divided by (n) forty-eight (48).

7.2 In addition to Base Rent, Tenant shall pay to Landlord as additional rent ("**Additional Rent**") at times hereinafter specified in this Lease (a) Tenant's Share (as defined below) of Operating Expenses (as defined below), (b) the Property Management Fee (as defined below) and (c) any other amounts that Tenant assumes or agrees to pay under the provisions of this Lease that are owed to Landlord, including any and all other sums that may become due by reason of any default of Tenant or failure on Tenant's part to comply with the agreements, terms, covenants and conditions of this Lease to be performed by Tenant, after notice and the lapse of any applicable cure periods.

7.3 Base Rent and Additional Rent shall together be denominated "**Rent**." Rent shall be paid to Landlord, without abatement, deduction or offset (except as otherwise provided in this Lease), in lawful money of the United States of America at the office of Landlord as set forth in Section 2.8 or to such other person or at such other place as Landlord may from time designate in writing. In the event the Term commences or ends on a day other than the first day of a calendar month, then the Rent for such fraction of a month shall be prorated for such period on the basis of a thirty (30) day month and shall be paid at the then-current rate for such fractional month.

8. Rent Adjustments. Base Rent shall be subject to an annual upward adjustment of three percent (3%) of the then-current Base Rent during the initial Term, as set forth in the chart for Base Rent in Section 2.3. The first such adjustment shall become effective commencing on the first (1st) annual anniversary of the Phase 1 Term Commencement Date, and subsequent adjustments shall become effective on every successive annual anniversary during the initial Term.

9. Operating Expenses.

9.1 As used herein, the term "**Operating Expenses**" shall include:

(a) Government impositions including property tax costs consisting of real and personal property taxes and assessments, including amounts due under any improvement bond upon the Building or the Project, including die parcel or parcels of real property upon which the Building and areas serving the Building are located or assessments in lieu thereof imposed by any federal, state, regional, local or municipal governmental authority, agency or subdivision (each, a "**Governmental Authority**") are levied; taxes on or measured by gross rentals received from the rental of space in the Project; taxes based on the square footage of the Premises, the Building or the Project, as well as any parking charges, utilities surcharges or any other costs levied, assessed or imposed by, or at the direction of, or resulting from Applicable Laws or interpretations thereof, promulgated by any Governmental Authority in connection with the use or occupancy of the Project or the parking facilities serving the Project; taxes on this transaction or any document to which Tenant is a party creating or transferring an interest in the Premises; any fee for a business license to operate an office building; and any expenses, including the reasonable cost of attorneys or experts, reasonably incurred by Landlord in seeking reduction by the taxing authority of the applicable taxes, less tax refunds obtained as a result of an application for review thereof (i.e., any such tax refunds obtained as a result of such expenditures will be credited against Operating Expenses for the applicable year(s)). Notwithstanding anything to the contrary in this Lease, Operating Expenses shall not include any net income, franchise, capital stock, estate or inheritance taxes, or taxes that are the personal obligation of Tenant or of another tenant of the Project; Landlord's general income taxes, transfer taxes (except as set forth above); gift taxes; any excise taxes imposed upon Landlord based upon rentals or income received by it (except if levied in lieu of real property taxes); taxes attributable to any period outside of the Term (*provided* that any holdover by Tenant shall be considered within the Term for purposes of this provision); any assessments, charges, taxes, rents, fees, rates, levies, excises, license fees, permit fees, inspection fees, impact fees, concurrency fees or other fees or charges to the extent allocable to or caused by the development or installation of on- or off-site improvements or utilities (including street and intersection improvements, roads, rights of way, lighting and signalization) related solely to any future expansion of the Building, or any allocations, reserves or sinking fund relating to such expansion, unless the same are contained in the property tax bills for the Project; and

(b) All other costs of any kind paid or incurred by Landlord in connection with the operation or maintenance of the Building and the Project (*provided* that any costs for services, maintenance, repairs and the like provided directly by Landlord or affiliates of Landlord shall be at commercially reasonable prices), including costs of repairs and

replacements to non-structural improvements within the Project as appropriate to maintain the Project as required hereunder, costs of utilities furnished to the Common Areas; sewer fees; cable television; trash collection; cleaning, including windows; heating; ventilation; air-conditioning; maintenance of landscaping and grounds; maintenance of drives and parking areas; maintenance of the roof (not including replacement of any structural components thereof); security services and devices; building supplies; maintenance or replacement of equipment utilized for operation and maintenance of the Project, provided if the cost of replacing any equipment is a capital expenditure, such cost shall be amortized as set forth below; license, permit and inspection fees; sales, use and excise taxes on goods and services purchased by Landlord in connection with the operation, maintenance or repair of the Building or Project systems and equipment; telephone, postage, stationery supplies and other expenses incurred in connection with the operation, maintenance or repair of the Project; accounting, legal and other professional fees and expenses incurred in connection with the Project; costs of furniture, draperies, carpeting, landscaping and other customary and ordinary items of personal property provided by Landlord for use in Common Areas; the cost of capital repairs, replacements or other improvements or other costs incurred in connection with the Project (A) which are intended to reduce current or future Operating Expenses to the extent of cost savings reasonably anticipated by Landlord (based upon reasonable supporting documentation) at the time of such expenditure to be incurred in connection therewith, (B) that are required under any Applicable Laws (except to the extent such costs are incurred to remedy non-compliance as of the Commencement Date with Applicable Laws), and (C) the cost of replacing any systems and equipment or major components of any systems and equipment that cannot be repaired for a commercially reasonable price or that is beyond its useful life (*provided* such capital expenditures shall be amortized over their useful life in accordance with generally accepted accounting principles as applied by Landlord); costs of complying with Applicable Laws (except to the extent such costs are incurred to remedy non-compliance as of the Commencement Date with Applicable Laws); costs to keep the Project in compliance with, or fees otherwise required under, any CC&Rs (as defined below); insurance premiums, including premiums for public liability, property casualty, earthquake, terrorism and environmental coverages; portions of insured losses paid by Landlord as part of the deductible portion of a loss pursuant to the terms of insurance policies (*provided*, *however*, that if and to the extent Landlord incurs a deductible payment in excess of Fifty Thousand Dollars ($50,000) (such excess, the "**Excess Deductible Amount**"), any such Excess Deductible Amount shall be amortized over a reasonable period of time in accordance with generally accepted accounting principles as applied by Landlord, together with interest at the rate paid by Landlord on any funds borrowed for such expenditures from an unaffiliated third-party financial institution, but in no event in excess of the market rate of interest customarily paid on such borrowed funds for such purposes); service contracts; costs of services of independent contractors retained to do work of a nature referenced above; and costs of compensation (including employment taxes and fringe benefits) of all persons who perform regular and recurring duties connected with the day-to-day operation and maintenance of the Project, its equipment, the adjacent walks, landscaped areas, drives and parking areas, including janitors, floor waxers, window washers, watchmen, gardeners, sweepers and handymen.

Notwithstanding the foregoing, Operating Expenses shall not include any leasing commissions or other costs incurred in procuring tenants, or any fee in lieu of commissions;

expenses that relate to preparation of rental space for a tenant; expenses of initial development and construction, including grading, paving, landscaping and decorating (as distinguished from maintenance, repair and replacement of the foregoing); legal expenses relating to other tenants; costs of any nature to the extent reimbursed by condemnation awards, another tenant of the Building (except as part of such tenant's operating expenses) or otherwise or payment of insurance proceeds received by Landlord; interest upon loans to Landlord or secured by a mortgage or deed of trust covering the Project or a portion thereof (*provided* that interest upon a government assessment or improvement bond payable in installments shall constitute an Operating Expense under Subsection 9.1(a)); salaries of executive officers of Landlord; depreciation claimed by Landlord for tax purposes (*provided* that this exclusion of depreciation is not intended to delete from Operating Expenses actual costs of repairs and replacements in regard thereto that are provided for in Subsection 9.1(b)); and taxes that are excluded from Operating Expenses by the last sentence of Subsection 9.1(a); the cost of providing any service directly to and paid directly by any tenant (outside of such tenant's operating expense payments); ground lease payments (if any); Landlord's general corporate overhead; any compensation paid to clerks, attendants or other persons in commercial concessions operated by Landlord (other than in the parking facility for the Project); marketing costs, including attorneys' fees in connection with the negotiation and preparation of letters, deal memos, letters of intent, leases, subleases or assignments, space planning costs, and other costs and expenses incurred in connection with lease, sublease or assignment negotiations and transactions with present or prospective tenants or other occupants of the Building; expenses in connection with services or other benefits that are not offered to Tenant or for which Tenant is charged directly but that are provided to another tenant or occupant of the Building, without charge; electric power costs or other utility costs for which any tenant directly contracts with the local public service company; costs of correcting defects in or inadequacy of the initial design or construction of the Building or any future expansion of the Building; costs incurred to comply with Applicable Laws relating to the removal of Hazardous Materials (as defined in Article 21 below) or to remove, remedy, treat or contain any Hazardous Material, *provided* this exclusion from Operating Expenses shall not affect Tenant's obligations relating to Hazardous Materials in Article 21; costs of upgrades to the Building effectuated solely for the purpose of obtaining or upgrading a LEED certification or similar rating; reserves for future Operating Expenses; replacements of structural components of the Building and Building foundation; costs arising from the gross negligence or willful misconduct of Landlord or its agents, employees, vendors, contractors, or providers of materials or services; capital expenditures not otherwise permitted hereunder; and any property management fee, since Tenant pays the Property Management Fee separately pursuant to Section 9.2. To the extent that Tenant uses more than Tenant's Pro Rata Share of any item of Operating Expenses, Tenant shall pay Landlord for such excess in addition to Tenant's obligation to pay Tenant's Pro Rata Share of Operating Expenses (such excess, together with Tenant's Pro Rata Share, "**Tenant's Share**").

9.2 Tenant shall pay to Landlord on the first day of each calendar month of the Term, as Additional Rent, (a) the Property Management Fee (as defined below) and (b) Landlord's estimate of Tenant's Share of Operating Expenses with respect to the Building and the Project, as applicable, for such month.

(x) The "**Property Management Fee**" shall equal three percent (3%) of Base Rent due from Tenant. Tenant shall pay the Property Management Fee in accordance with Section 9.2 with respect to the entire Term, including any extensions thereof or any holdover periods, regardless of whether Tenant is obligated to pay Base Rent, Operating Expenses or any other Rent with respect to any such period or portion thereof.

(y) Within ninety (90) days after the conclusion of each calendar year (or such longer period as may be reasonably required by Landlord), Landlord shall furnish to Tenant a statement showing in reasonable detail the actual Operating Expenses and Tenant's Share of Operating Expenses for the previous calendar year. Any additional sum due from Tenant to Landlord shall be immediately due and payable. If the amounts paid by Tenant pursuant to this Section exceed Tenant's Share of Operating Expenses for the previous calendar year, then Landlord shall credit the difference against the Rent next due and owing from Tenant; provided that, if the Lease term has expired, Landlord shall accompany said statement with payment for the amount of such difference.

(z) Any amount due under this Section for any period that is less than a full month shall be prorated (based on a thirty (30)-day month) for such fractional month.

9.3 Landlord may, from time to time, modify Landlord's calculation and allocation procedures for Operating Expenses, so long as such modifications produce Dollar results substantially consistent with Landlord's then-current practice at the Project.

9.4 Landlord's annual statement shall be final and binding upon Tenant unless Tenant, within sixty (60) days after Tenant's receipt thereof, shall contest any item therein by giving written notice to Landlord, specifying each item contested and the reasons therefore*; provided* that Tenant shall in all events pay the amount specified in Landlord's annual statement, pending the results of the Independent Review and determination of the Accountant(s), as applicable and as each such term is defined below. If during such sixty (60)-day period, Tenant reasonably and in good faith questions or contests the correctness of Landlord's statement of Tenant's Share (as defined in Section 9.1) of Operating Expenses, Landlord shall provide Tenant with reasonable access to Landlord's books and records to the extent relevant to determination of Operating Expenses, and such information as Landlord reasonably determines to be responsive to Tenant's written inquiries. In the event that, after Tenant's review of such information, Landlord and Tenant cannot agree upon the amount of Tenant's Share of Operating Expenses, then Tenant shall have the right to have an independent public accounting firm hired by Tenant on an hourly basis and not on a contingent-fee basis (at Tenant's sole cost and expense) and approved by Landlord (which approval Landlord shall not unreasonably withhold or delay) audit and review such of Landlord's books and records for the year in question as directly relate to the determination of Operating Expenses for such year (the "**Independent Review**"). Landlord shall make such books and records available at the location where Landlord maintains them in the ordinary course of its business. Landlord need not provide copies of any books or records. Tenant shall commence the Independent Review within fifteen (15) days after the date Landlord has given Tenant access to Landlord's books and records for the Independent Review. Tenant shall complete the Independent Review and notify Landlord in writing of Tenant's specific objections to Landlord's calculation of Operating Expenses (including Tenant's accounting

firm's written statement of the basis, nature and amount of each proposed adjustment) no later than sixty (60) days after Landlord has first given Tenant access to Landlord's books and records for the Independent Review. Landlord shall review the results of any such Independent Review. The parties shall endeavor to agree promptly and reasonably upon Operating Expenses taking into account the results of such Independent Review. If, as of sixty (60) days after Tenant has submitted the Independent Review to Landlord, the parties have not agreed on the appropriate adjustments to Operating Expenses, then the parties shall engage a mutually agreeable independent third party accountant with at least ten (10) years' experience in commercial real estate accounting in the San Diego, California, area (the "**Accountant**"). If the parties cannot agree on the Accountant, each shall within ten (10) days after such impasse appoint an Accountant (different from the accountant and accounting firm that conducted the Independent Review) and, within ten (10) days after the appointment of both such Accountants, those two Accountants shall select a third (which cannot be the accountant and accounting firm that conducted the Independent Review). If either party fails to timely appoint an Accountant, then the Accountant the other party appoints shall be the sole Accountant. Within ten (10) days after appointment of the Accountant(s), Landlord and Tenant shall each simultaneously give the Accountants (with a copy to the other party) its determination of Operating Expenses, with such supporting data or information as each submitting party determines appropriate. Within ten (10) days after such submissions, the Accountants shall by majority vote select either Landlord's or Tenant's determination of Operating Expenses. The Accountants may not select or designate any other determination of Operating Expenses. The determination of the Accountant(s) shall bind the parties. If the parties agree or the Accountant(s) determine that the Operating Expenses actually paid by Tenant for the calendar year in question exceeded Tenant's obligations for such calendar year, then Landlord shall, at Tenant's option, either (a) credit the excess to the next succeeding installments of estimated Additional Rent or (b) pay the excess to Tenant within thirty (30) days after delivery of such results. If the parties agree or the Accountant(s) determine that Tenant's payments of Operating Expenses for such calendar year were less than Tenant's obligation for the calendar year, then Tenant shall pay the deficiency to Landlord within thirty (30) days after delivery of such results. If the Independent Review reveals or the Accountant(s) determine that the Operating Expenses billed to Tenant by Landlord and actually paid by Tenant to Landlord for the applicable calendar year in question exceeded by more than five percent (5%) what Tenant should have been billed during such calendar year, then Landlord shall pay the reasonable cost of the Accountant(s) and the Independent Review. In all other cases Tenant shall pay the cost of the Independent Review and the Accountant(s).

9.5 Except as provided in Section 4.3, Tenant shall not be responsible for Operating Expenses attributable to the time period prior to the applicable Term Commencement Date. Tenant's responsibility for Tenant's Share of Operating Expenses shall continue to the latest of (a) the date of termination of the Lease, and (b) the date Tenant has fully vacated the Premises.

9.6 Operating Expenses for the calendar year in which Tenant's obligation to share therein commences and for the calendar year in which such obligation ceases shall be prorated on a basis reasonably determined by Landlord. Expenses such as taxes, assessments and insurance premiums that are incurred for an extended time period shall be prorated based upon the time periods to which they apply so that the amounts attributed to the Premises relate in a

reasonable manner to the time period wherein Tenant has an obligation to share in Operating Expenses.

9.7 Within ten (10) business days after the end of each calendar month, Tenant shall submit to Landlord an invoice, or, in the event an invoice is not available, an itemized list, of all costs and expenses that (a) Tenant has incurred (either internally or by employing third parties) during the prior month and (b) for which Tenant reasonably believes it is entitled to reimbursements from Landlord pursuant to the terms of this Lease or that Tenant reasonably believes is the responsibility of Landlord pursuant to this Lease or the Work Letter*; provided* that, for the avoidance of doubt, the parties acknowledge that Tenant's obligations to notify Landlord if Tenant believes that the estimated Operating Expenses paid by Tenant are higher than the actual Operating Expenses incurred by Landlord shall be governed by Section 9.4.

9.8 In the event that the Building or Project is less than fully occupied, Tenant acknowledges that Landlord may extrapolate Operating Expenses that vary depending on the occupancy of the Building or Project, including utilities, water, sewer, trash removal, janitorial service and supplies and floor cleaning and repairs (collectively, "**Variable Operating Expenses**"), as applicable, by dividing (a) the total cost of Variable Operating Expenses by (b) the Rentable Area of the Building or Project (as applicable) that is occupied, then multiplying (y) the resulting quotient by (z) one hundred percent (100%) of the total Rentable Area of the Building or Project (as applicable). Tenant shall pay Tenant's Share of the product of (y) and (z), subject to adjustment as reasonably determined by Landlord*; provided, however,* that Landlord shall not recover more than one hundred percent (100%) of Variable Operating Expenses.

10. Taxes on Tenant's Property.

10.1 Tenant shall pay prior to delinquency any and all taxes levied against any personal property or trade fixtures placed by Tenant in or about the Premises.

10.2 If any such taxes on Tenant's personal property or trade fixtures are levied against Landlord or Landlord's property or, if the assessed valuation of the Building, the Property or the Project is increased by inclusion therein of a value attributable to Tenant's personal property or trade fixtures, and if Landlord, after written notice to Tenant, pays the taxes based upon any such increase in the assessed value of the Building, the Property or the Project, then Tenant shall, upon demand, repay to Landlord the taxes so paid by Landlord.

10.3 If any improvements in or alterations to the Premises, whether owned by Landlord or Tenant and whether or not affixed to the real property so as to become a part thereof, are assessed for real property tax purposes at a valuation higher than the valuation at which improvements conforming to Landlord's building standards (the "**Building Standar**d") in other spaces in the Building are assessed, then the real property taxes and assessments levied against Landlord or the Building, the Property or the Project by reason of such excess assessed valuation shall be deemed to be taxes levied against personal property of Tenant and shall be governed by the provisions of Section 10.2. Any such excess assessed valuation due to improvements in or alterations to space in the Project leased by other tenants at the Project shall not be included in Operating Expenses. If the records of the County Assessor are available and

sufficiently detailed to serve as a basis for determining whether said Tenant improvements or alterations are assessed at a higher valuation than the Building Standard, then such records shall be binding on both Landlord and Tenant.

11. Security Deposit.

11.1 Tenant shall deposit with Landlord on or before the Execution Date the sum set forth in Section 2.6 (the "**Security Deposit**"), which sum shall be held by Landlord as security for the faithful performance by Tenant of all of the terms, covenants and conditions of this Lease to be kept and performed by Tenant during the period commencing on the Execution Date and ending upon the expiration or termination of Tenant's obligations under this Lease. If Tenant Defaults with respect to any provision of this Lease, including any provision relating to the payment of Rent, then Landlord may (but shall not be required to) use, apply or retain all or any part of the Security Deposit for the payment of any Rent or any other sum in Default, or to compensate Landlord for any other loss or damage that Landlord may suffer by reason of Tenant's Default. If any portion of the Security Deposit is so used or applied, then Tenant shall, within ten (10) days following demand therefor, deposit cash with Landlord in an amount sufficient to restore the Security Deposit to its original amount, and Tenant's failure to do so shall be a material breach of this Lease. The provisions of this Article shall survive the expiration or earlier termination of this Lease. TENANT HEREBY WAIVES THE REQUIREMENTS OF SECTION 1950.7 OF THE CALIFORNIA CIVIL CODE, AS THE SAME MAY BE AMENDED FROM TIME TO TIME.

11.2 In the event of bankruptcy or other debtor-creditor proceedings against Tenant, the Security Deposit shall be deemed to be applied first to the payment of Rent and other charges due Landlord for all periods prior to the filing of such proceedings.

11.3 Landlord may deliver to any purchaser of Landlord's interest in the Premises the funds deposited hereunder by Tenant, and thereupon Landlord shall be discharged from any further liability with respect to such deposit. This provision shall also apply to any subsequent transfers.

11.4 If Tenant shall fully and faithfully perform every provision of this Lease to be performed by it, then the Security Deposit, or any balance thereof, shall be returned to Tenant (or, at Landlord's option, to the last assignee of Tenant's interest hereunder) within thirty (30) days after the expiration or earlier termination of this Lease.

11.5 [Intentionally omitted.]

11.6 If the Security Deposit shall he in cash, Landlord shall hold the Security Deposit in an account at a banking organization selected by Landlord; *provided, however*, that Landlord shall not be required to maintain a separate account for the Security Deposit, but may intermingle it with other funds of Landlord. Landlord shall be entitled to all interest and/or dividends, if any, accruing on the Security Deposit. Landlord shall not be required to credit Tenant with any interest for any period during which Landlord does not receive interest on the Security Deposit.

11.7 The Security Deposit may be in the form of cash, a letter of credit or any other security instrument acceptable to Landlord in its sole discretion. Tenant may at any time, except when Tenant is in Default (as defined below), deliver a letter of credit (the "**L/C Security**") as the entire Security Deposit, as follows:

(a) If Tenant elects to deliver L/C Security, then Tenant shall provide Landlord, and maintain in full force and effect throughout the Term and until the date that is six (6) months after the then-current Term Expiration Date, a letter of credit in the form of Exhibit E issued by an issuer reasonably satisfactory to Landlord, in the amount of the Security Deposit, with an initial term of at least one year. Landlord may require the L/C Security to be re-issued by a different issuer at any time during the Term if Landlord reasonably believes that the issuing bank of the L/C Security is or may soon become insolvent; *provided*, *however*, Landlord shall return the existing L/C Security to the existing issuer immediately upon receipt of the substitute L/C Security. If any issuer of the L/C Security shall become insolvent or placed into FDIC receivership, then Tenant shall immediately deliver to Landlord (without the requirement of notice from Landlord) substitute L/C Security issued by an issuer reasonably satisfactory to Landlord, and otherwise conforming to the requirements set forth in this Article. As used herein with respect to the issuer of the L/C Security, "insolvent" shall mean the determination of insolvency as made by such issuer's primary bank regulator (*i.e*., the state bank supervisor for state chartered banks; the OCC or OTS, respectively, for federally chartered banks or thrifts; or the Federal Reserve for its member banks). If, at the Term Expiration Date, any Rent remains uncalculated or unpaid, then: (i) Landlord shall with reasonable diligence complete any necessary calculations; (ii) Tenant shall extend the expiry date of such L/C Security from time to time as Landlord reasonably requires; and (iii) in such extended period, Landlord shall not unreasonably refuse to consent to an appropriate reduction of the L/C Security. Tenant shall reimburse Landlord's legal costs (as estimated by Landlord's counsel) in handling Landlord's acceptance of L/C Security or its replacement or extension.

(b) If Tenant delivers to Landlord satisfactory L/C Security in place of the entire Security Deposit, Landlord shall remit to Tenant any cash Security Deposit Landlord previously held.

(c) Landlord may draw upon the L/C Security, and hold and apply the proceeds in the same manner and for the same purposes as the Security Deposit, if: (i) an uncured Default (as defined below) exists; (ii) as of the date forty-five (45) days before any L/C Security expires (even if such scheduled expiry date is after the Term Expiration Date) Tenant has not delivered to Landlord an amendment or replacement for such L/C Security, reasonably satisfactory to Landlord, extending the expiry date to the earlier of (1) six (6) months after the then-current Term Expiration Date or (2) the date one year after the then-current expiry date of the L/C Security; (iii) the L/C Security provides for automatic renewals, Landlord asks the issuer to confirm the current L/C Security expiry date, and the issuer fails to do so within ten (10) business days; (iv) Tenant fails to pay (when and as Landlord reasonably requires) any bank charges for Landlord's transfer of the L/C Security; or (v) the issuer of the L/C Security ceases, or announces that it will cease, to maintain an office in the city where Landlord may present drafts under the L/C Security (and fails to permit drawing upon the L/C Security by overnight

courier or facsimile). This Section does not limit any other provisions of this Lease allowing Landlord to draw the L/C Security under specified circumstances.

(d) Tenant shall not seek to enjoin, prevent, or otherwise interfere with Landlord's draw under L/C Security, even if it violates this Lease. Tenant acknowledges that the only effect of a wrongful draw would be to substitute a cash Security Deposit for L/C Security, causing Tenant no legally recognizable damage. Landlord shall hold the proceeds of any draw in the same manner and for the same purposes as a cash Security Deposit. In the event of a wrongful draw, the parties shall cooperate to allow Tenant to post replacement L/C Security simultaneously with the return to Tenant of the wrongfully drawn sums, and Landlord shall upon request confirm in writing to the issuer of the L/C Security that Landlord's draw was erroneous.

(e) If Landlord transfers its interest in the Premises, then Tenant shall at Tenant's expense, within five (5) business days after receiving a request from Landlord, deliver (and, if the issuer requires, Landlord shall consent to) an amendment to the L/C Security naming Landlord's grantee as substitute beneficiary. If the required Security Deposit changes while L/C Security is in force, then Tenant shall deliver (and, if the issuer requires, Landlord shall consent to) a corresponding amendment to the L/C Security.

12. Use.

12.1 Tenant shall use the Premises for the purpose set forth in Section 2.7, and shall not use the Premises, or permit or suffer the Premises to be used, for any other purpose without Landlord's prior written consent, which consent Landlord may withhold in its sole and absolute discretion.

12.2 Tenant shall not use or occupy the Premises in violation of Applicable Laws; zoning ordinances; or the certificate of occupancy issued for the Building or the Project, and shall, upon five (5) days' written notice from Landlord, discontinue any use of the Premises that is declared or claimed by any Governmental Authority having jurisdiction to be a violation of any of the above, or that in Landlord's reasonable opinion violates any of the above. Tenant shall comply with any direction of any Governmental Authority having jurisdiction that shall, by reason of the nature of Tenant's use or occupancy of the Premises, impose any duty upon Tenant or Landlord with respect to the Premises or with respect to the use or occupation thereof.

12.3 Tenant shall not do or permit to be done anything that will invalidate or increase the cost of any fire, environmental, extended coverage or any other insurance policy covering the Building or the Project, and shall comply with all rules, orders, regulations and requirements of the insurers of the Building and the Project, and Tenant shall promptly, upon demand, reimburse Landlord for any additional premium charged for such policy by reason of Tenant's failure to comply with the provisions of this Article.

12.4 Tenant shall keep all doors opening onto public corridors closed, except when in use for ingress and egress.

12.5 No additional locks or bolts of any kind shall be placed upon any of the doors or windows by Tenant, nor shall any changes be made to existing locks or the mechanisms thereof

without Landlord's prior written consent, which consent shall not be unreasonably withheld. Tenant shall, upon termination of this Lease, return to Landlord all keys to offices and restrooms either furnished to or otherwise procured by Tenant. In the event any key so furnished to Tenant is lost, Tenant shall pay to Landlord the cost of replacing the same or of changing the lock or locks opened by such lost key if Landlord shall deem it necessary to make such change.

12.6 No awnings or other projections shall be attached to any outside wall of the Building, No curtains, blinds, shades or screens shall be attached to or hung in, or used in connection with, any window or door of the Premises other than Landlord's standard window coverings. Neither the interior nor exterior of any windows shall be coated or otherwise sunscreened without Landlord's prior written consent, nor shall any bottles, parcels or other articles be placed on the windowsills. No equipment, furniture or other items of personal property shall be placed on any exterior balcony without Landlord's prior written consent.

12.7 No sign, advertisement or notice ("**Signage**") shall be exhibited, painted or affixed by Tenant on any party of the Premises or the Building without Landlord's prior written consent (which consent shall not be unreasonably withheld). Subject to the preceding sentence and at Tenant's election, Tenant shall be entitled to the following Signage to the extent permitted by Applicable Laws and to the extent it does not prevent another tenant of the Building from receiving its pro rata share of the Building Signage: (i) Building-top Signage, (ii) monument Signage, and (iii) Signage in the main lobby on the glass walls near the entry, all of which Signage shall conform to Landlord's design criteria and standards for the Project. For any Signage, Tenant shall, at Tenant's own cost and expense (subject to the availability of the TI Allowance as provided in Section 4.4), (a) acquire all permits for such Signage in compliance with Applicable Laws and (b) design, fabricate, install and maintain such Signage in a first-class condition. Tenant shall be responsible for reimbursing Landlord for costs incurred by Landlord in removing any of Tenant's Signage upon the expiration or earlier termination of the Lease. Interior signs on doors and the directory tablet shall be inscribed, painted or affixed for Tenant by Landlord at Tenant's sole cost and expense, and shall be of a size, color and type and be located in a place acceptable to Landlord. The directory tablet shall be provided exclusively for the display of the name and location of tenants only. Tenant shall not place anything on the exterior of the corridor walls or corridor doors other than Landlord's standard lettering. At Landlord's option subject to Tenant's reasonable approval, Landlord may install any Tenant Signage, and Tenant shall pay all costs associated with such installation within thirty (30) days after demand therefor.

12.8 Tenant shall only place equipment within the Premises with floor loading consistent with the Building's structural design without Landlord's prior written approval, and such equipment shall be placed in a location designed to carry the weight of such equipment.

12.9 Tenant shall cause any equipment or machinery to be installed in the Premises so as to reasonably prevent sounds or vibrations therefrom from extending into the Common Areas or other offices in the Project.

12.10 Tenant shall not (a) do or permit anything to be done in or about the Premises that shall in any way unreasonably obstruct or interfere with the rights of other tenants or occupants of the Project, or injure or annoy them, (b) use or allow the Premises to be used for unlawful

purposes, (c) cause, maintain or permit any nuisance or waste in, on or about the Project or (d) take any other action that would in Landlord's reasonable determination in any manner adversely affect other tenants' quiet use and enjoyment of their space or adversely impact their ability to conduct business in a professional and suitable work environment for uses similar to those permitted under this Lease.

12.11 Notwithstanding any other provision herein to the contrary, Tenant shall be responsible for all liabilities, costs and expenses arising out of or in connection with the compliance of the Premises with the Americans with Disabilities Act, 42 U.S.C. § 12101, et seq., and any state and local accessibility laws, codes, ordinances and rules (collectively, and together with regulations promulgated pursuant thereto, the "**ADA**"), and Tenant shall indemnify, save, defend (at Landlord's option and with counsel reasonably acceptable to Landlord) and hold Landlord and its affiliates, employees, agents and contractors; and any lender, mortgagee or beneficiary (each, a "**Lender**" and, collectively with Landlord and its affiliates, employees, agents and contractors, the "**Landlord Indemnitees**") harmless from and against any demands, claims, liabilities, losses, costs, expenses, actions, causes of action, damages or judgments, and all reasonable expenses (including reasonable attorneys' fees, charges and disbursements) incurred in investigating or resisting the same (collectively, "**Claims**") arising out of any such failure of the Premises to comply with the ADA*; provided* Tenant shall not be required to indemnify Landlord or be responsible for the cost to remediate Hazardous Materials, except to the extent Tenant is responsible or liable for such remediation pursuant to Article 21. Tenant shall perform, at its sole cost and expense, any changes to the Premises required by the ADA after the Term Commencement Date (unless required due to non-compliance existing as of the Term Commencement Date)*; provided* that Landlord shall perform and pay for any such changes in the Premises that constitute a change to a Building system that extends into other tenants' premises (e.g., Building sprinkler systems). The provisions of this Section shall survive the expiration or earlier termination of this Lease.

12.12 Subject to all other provisions of this Lease, Tenant shall have the right to continuous access to the Premises twenty-four (24) hours per day, seven (7) days per week, except during reasonable closures for repairs or maintenance pursuant to the terms of this Lease, or as the result of casualty or other circumstances beyond Landlord's control.

13. Rules and Regulations, CC&Rs, Parking Facilities and Common Areas.

13.1 Tenant shall, at no additional cost during the Term, have the non-exclusive right, in common with others, to use the Common Areas, subject to the rules and regulations adopted by Landlord and attached hereto as Exhibit F. together with such other reasonable and nondiscriminatory rules and regulations as are hereafter promulgated by Landlord in its sole and absolute discretion (the "**Rules and Regulations**"). Tenant shall faithfully observe and comply with the Rules and Regulations. Landlord shall not be responsible to Tenant for the violation or non-performance by any other tenant or any agent, employee or invitee thereof of any of the Rules and Regulations.

13.2 This Lease is subject to any recorded covenants, conditions or restrictions on the Project or Property (the "**CC&Rs**"). as the same may be amended, amended and restated, supplemented or otherwise modified from time to time; *provided* that any such amendments,

restatements, supplements or modifications do not materially modify Tenant's rights or obligations hereunder. Tenant shall comply with the CC&Rs.

13.3 Tenant, at no additional cost during the Term, shall have a non-exclusive, irrevocable license to use Tenant's Pro Rata Share of parking facilities serving the Project in common on an unreserved basis with other tenants of the Project during the Term.

13.4 Tenant agrees not to unreasonably overburden the parking facilities and agrees to cooperate with Landlord and other tenants in the use of the parking facilities. Landlord reserves the right to determine that parking facilities are becoming overcrowded and to limit Tenant's use thereof (*provided* that in no event shall Tenant be limited to less than Tenant's Pro Rata Share of parking spaces). Upon such determination, Landlord may reasonably allocate parking spaces among Tenant and other tenants of the Building or the Project. Nothing in this Section, however, is intended to create an affirmative duty on Landlord's part to monitor parking.

13.5 Landlord reserves the right to modify the Common Areas, including the right to add or remove exterior and interior landscaping and to subdivide real property. Tenant acknowledges that Landlord specifically reserves the right to allow the exclusive use of corridors and restroom facilities located on specific floors to one or more tenants occupying such floors; *provided*, *however*, that Tenant shall not be deprived of the use of the corridors reasonably required to serve the Premises or of restroom facilities serving the floor upon which the Premises are located.

14. Project Control by Landlord.

14.1 Landlord reserves full control over the Building and the Project to the extent not inconsistent with Tenant's enjoyment of the Premises and does not diminish Tenant's parking rights in the Common Areas as provided by this Lease. This reservation includes Landlord's right to subdivide the Project; convert the Building to condominium units; change the size of the Project by selling all or a portion of the Project or adding real property and any improvements thereon to the Project; grant easements and licenses to third parties; maintain or establish ownership of the Building separate from fee title to the Property; make additions to or reconstruct portions of the Building and the Project; install, use, maintain, repair, replace and relocate for service to the Premises and other parts of the Building or the Project pipes, ducts, conduits, wires and appurtenant fixtures, wherever located in the Premises, the Building or elsewhere at the Project; and alter or relocate any other Common Area or facility, including private drives, lobbies and entrances.

14.2 Possession of areas of the Premises necessary for utilities, services, safety and operation of the Building is reserved to Landlord to the extent not inconsistent with Tenant's enjoyment of the Premises.

14.3 Tenant shall, at Landlord's request, promptly execute such further documents as may be reasonably appropriate to assist Landlord in the performance of its obligations hereunder; *provided* that Tenant need not execute any document that creates additional liability for Tenant or that deprives Tenant of the quiet enjoyment and use of the Premises or diminishes Tenant's parking rights in the Common Areas as provided for in this Lease.

14.4 Landlord may, at any and all reasonable times during non-business hours (or during business hours if Tenant so requests), and upon twenty-four (24) hours' prior notice (*provided* that no time restrictions shall apply or advance notice be required if an emergency necessitates immediate entry), enter the Premises to (a) inspect the same and to determine whether Tenant is in compliance with its obligations hereunder, (b) supply any service Landlord is required to provide hereunder, (c) show the Premises to prospective purchasers or tenants during the final year of the Term, (d) post notices of nonresponsibility, (e) access the telephone equipment, electrical substation and fire risers and (f) alter, improve or repair any portion of the Building other than the Premises for which access to the Premises is reasonably necessary. In connection with any such alteration, improvement or repair as described in Subsection 14.4(f). Landlord may erect in the Premises or elsewhere in the Project scaffolding and other structures reasonably required for the alteration, improvement or repair work to be performed. In no event shall Tenant's Rent abate as a result of Landlord's activities pursuant to this Section; *provided*, *however*, that all such activities shall be conducted in such a manner so as to cause as little interference to Tenant as is reasonably possible. Landlord shall at all times retain a key with which to unlock all of the doors in the Premises. If an emergency necessitates immediate access to the Premises, Landlord may use whatever force is necessary to enter the Premises, and any such entry to the Premises shall not constitute a forcible or unlawful entry to the Premises, a detainer of the Premises, or an eviction of Tenant from the Premises or any portion thereof.

15. Quiet Enjoyment. So long as Tenant is not in Default under this Lease, Landlord or anyone acting through or under Landlord shall not disturb Tenant's occupancy of the Premises, except as permitted by this Lease,

16. Utilities and Services.

16.1 Tenant shall pay for all water (including the cost to service, repair and replace reverse osmosis, de-ionized and other treated water), gas, heat, light, power, telephone, internet service, cable television, other telecommunications and other utilities supplied to the Premises, together with any fees, surcharges and taxes thereon. If any such utility is not separately metered to Tenant, Tenant shall pay Tenant's Share of all charges of such utility jointly metered with other premises as Additional Rent. To the extent that Tenant uses more than Tenant's Pro Rata Share of any utilities, then Tenant shall pay Landlord for Tenant's Share of such utilities to reflect such excess. In the event that the Building or Project is less than fully occupied, Tenant acknowledges that Landlord may extrapolate utility usage that vary depending on the occupancy of the Building or Project, as applicable, by dividing (a) the total cost of utility usage by (b) the Rentable Area of the Building or Project (as applicable) that is occupied, then multiplying (y) the resulting quotient by (z) one hundred percent (100%) of the total Rentable Area of the Building or Project (as applicable). Tenant shall pay Tenant's Share of the product of (y) and (z), subject to adjustment based on actual usage as reasonably determined by Landlord; *provided, however*, that Landlord shall not recover more than one hundred percent (100%) of such utility costs. Further, in calculating utilities pursuant to the foregoing adjustment, Landlord will endeavor to ensure that any vacant space is not being supplied with utilities, or if vacant space is being supplied with utilities, then such space will be deemed "occupied" for purposes of the foregoing calculation.

16.2 Except as provided in this Section, Landlord shall not be liable for, nor shall any eviction of Tenant result from, the failure to furnish any utility or service, whether or not such failure is caused by accident; breakage; repair; strike, lockout or other labor disturbance or labor dispute of any character; act of terrorism; shortage of materials, which shortage is not unique to Landlord or Tenant, as the case may be; governmental regulation, moratorium or other governmental action, inaction or delay; or other causes beyond Landlord's control (collectively, "**Force Majeure**") or Landlord's negligence. In the event of such failure, Tenant shall not be entitled to termination of this Lease or any abatement or reduction of Rent, nor shall Tenant be relieved from the operation of any covenant or agreement of this Lease, except as provided in Section 16.12.

16.3 Tenant shall pay for, prior to delinquency of payment therefor, any utilities and services that may be furnished to the Premises during or, if Tenant occupies the Premises after the expiration or earlier termination of the Term, after the Term, beyond those utilities provided by Landlord, including telephone, internet service, cable television and other telecommunications, together with any fees, surcharges and taxes thereon. Upon Landlord's demand, utilities and services provided to the Premises that are separately metered shall be paid by Tenant directly to the supplier of such utilities or services.

16.4 Tenant shall not, without Landlord's prior written consent, use any device in the Premises (including data processing machines) that will in any way (a) increase the amount of ventilation, air exchange, gas, steam, electricity or water required or consumed in the Premises based upon Tenant's Pro Rata Share of the Building or Project (as applicable) beyond the existing capacity of the Building or the Project usually furnished or supplied for the use set forth in Section 2.7 or (b) exceed Tenant's Pro Rata Share of the Building's or Project's (as applicable) capacity to provide such utilities or services. Nothing in this Section shall prohibit Tenant's right to use any device commonly used for the Permitted Use, *provided* that such use doesn't violate this Lease.

16.5 If Tenant shall require utilities or services in excess of those usually furnished or supplied for tenants in similar spaces in the Building or the Project by reason of Tenant's equipment or extended hours of business operations, then Tenant shall first procure Landlord's consent for the use thereof, which consent Landlord may condition upon the availability of such excess utilities or services, and Tenant shall pay as Additional Rent an amount equal to the cost of providing such excess utilities and services.

16.6 Upon Landlord's demand, utilities and services provided to the Premises that are separately metered shall be paid by Tenant directly to the supplier of such utility or service.

16.7 Landlord shall provide water in Common Areas for lavatory purposes only, which water shall be from the local municipal or similar source; *provided*, *however*, that if Landlord determines that Tenant requires, uses or consumes water for any purpose other than ordinary lavatory purposes, Landlord may install a water meter and thereby measure Tenant's water consumption for all purposes. Tenant shall pay Landlord for the costs of such meter and the installation thereof and, throughout the duration of Tenant's occupancy of the Premises, Tenant shall keep said meter and installation equipment in good working order and repair at Tenant's sole cost and expense. If Tenant fails to so maintain such meter and equipment, Landlord may

repair or replace the same and shall collect the costs therefor from Tenant. Tenant agrees to pay for water consumed, as shown on said meter, as and when bills are rendered. If Tenant fails to timely make such payments, Landlord may pay such charges and collect the same from Tenant. Any such costs or expenses incurred, or payments made by Landlord for any of the reasons or purposes hereinabove stated, shall be deemed to be Additional Rent payment by Tenant and collectible by Landlord as such.

16.8 Landlord reserves the right to stop service of the elevator, plumbing, ventilation, air conditioning and other utility systems, when Landlord deems necessary or desirable, due to accident, emergency or the need to make repairs, alterations or improvements, until such repairs, alterations or improvements shall have been completed, and (except as provided in Section 16.2). Landlord shall further have no responsibility or liability for failure to supply elevator facilities, plumbing, ventilation, air conditioning or other utility service when prevented from doing so by Force Majeure or Landlord's negligence; a failure by a third party to deliver gas, oil or another suitable fuel supply; or Landlord's inability by exercise of reasonable diligence to obtain gas, oil or another suitable fuel. Without limiting the foregoing, it is expressly understood and agreed that any covenants on Landlord's part to furnish any service pursuant to any of the terms, covenants, conditions, provisions or agreements of this Lease, or to perform any act or thing for the benefit of Tenant, shall not be deemed breached if Landlord is unable to furnish or perform the same by virtue of Force Majeure or Landlord's negligence. Landlord shall use commercially reasonable efforts (a) in exercising its rights pursuant to this Section in a manner so as to minimize or prevent interference with Tenant's use of or access to the Premises, (b) to perform such repairs outside of normal business hours and (c) except in accident or emergency situations, to provide Tenant with prior written notice (email shall be deemed sufficient) in the event Landlord intends to stop service pursuant to this Section.

16.9 Currently, there is a back-up generator located outside the northwest corner of the Building (the "**Generator**"). Landlord shall connect the Generator to the Premises' emergency electrical panel. Subject to power from the Generator dedicated to the Building, Tenant shall be entitled to use up to its proportionate share of the remaining power from the Generator on a non-exclusive basis with other tenants in the Building. The cost of maintaining, repairing and replacing the Generator shall constitute Operating Expenses. Landlord expressly disclaims any warranties with regard to the Generator or the installation thereof, including any warranty of merchantability or fitness for a particular purpose. Landlord shall maintain the Generator in good working condition, but shall not be liable for any failure to make any repairs or to perform any maintenance that is an obligation of Landlord unless such failure shall persist for an unreasonable time after Tenant provides Landlord with written notice of the need for such repairs or maintenance. The provisions of Section 16.2 shall apply to the Generator.

16.10 For the Premises, Landlord shall (a) maintain and operate the heating, ventilating and air conditioning systems used for the Permitted Use only ("**HVAC**") and (b) subject to clause (a) above, furnish HVAC as reasonably required (except as this Lease otherwise provides) for reasonably comfortable occupancy of the Premises twenty-four (24) hours a day, every day during the Term, subject to casualty, eminent domain or as otherwise specified in this Article. Notwithstanding anything to the contrary in this Section (except as provided in Section 16.2). Landlord shall have no liability, and Tenant shall have no right or remedy, on account of any

interruption or impairment in HVAC services*; provided* that Landlord diligently endeavors to cure any such interruption or impairment.

16.11 Tenant shall retain records of utility usage at the Premises, including invoices and statements from the utility provider, for at least twelve (12) months and, upon request by Landlord, shall furnish such invoices and statements to Landlord. Tenant acknowledges that any utility information for the Premises, the Building and the Project may be shared with third parties, including Landlord's consultants and Governmental Authorities. In the event that Tenant fails to comply with this Section, Tenant hereby authorizes Landlord, and shall also sign the appropriate documentation to allow Landlord, to collect utility usage information directly from the applicable utility providers.

16.12 In the event that Tenant is prevented from using, and does not use, the Premises or any material portion thereof for five (5) consecutive business days or after ten (10) non-consecutive business days within any twelve (12) month period during the Term (the "**Eligibility Period**") as a result of (a) any failure by Landlord to provide to the Premises any of the essential utilities and services required to be provided in this Article, or (b) any failure by Landlord to provide access to the Premises, or (c) any failure by Landlord to perform any repairs required to be performed by Landlord under Section 18.1 below, within a reasonable time after Landlord has received notice from Tenant of the need for such repairs, but in no event longer than thirty (30) days (or such longer period of time as is reasonably required for such repair work if Landlord diligently commences such repair work within such thirty (30) day period and thereafter diligently prosecutes same to completion), or (d) any renovations of the Building undertaken by Landlord pursuant to Section 14.1, then Tenant's obligation to pay Base Rent and Tenant's Pro Rata Share of Operating Expenses shall be abated or reduced, as the case may be, from and after the first (1st) day following the Eligibility Period and continuing until such time that Tenant continues to be so prevented from using, and does not use, the Premises or a portion thereof, in the proportion that the square feet of Rentable Area of the portion of the Premises that Tenant is prevented from using and does not use bears to the total square feet of Rentable Area of the Premises; *provided*, *however*, that Tenant shall only be entitled to such abatement to the extent that the matter described in clause (a), (b), (c) or (d) above arises out of or results from a matter within Landlord's reasonable control. To the extent Tenant shall be entitled to abatement because of damage or destruction pursuant to Article 24 or a taking pursuant to Article 25, then the terms of this Section 16.12 shall not be applicable thereto.

17. Alterations.

17.1 Tenant shall make no alterations, additions or improvements in or to the Premises or engage in any construction, demolition, reconstruction, renovation, or other work (whether major or minor) of any kind in, at, or serving the Premises ("**Alterations**") without Landlord's prior written approval, which approval Landlord shall not unreasonably withhold; *provided*, *however*, that in the event any proposed Alteration affects (a) any structural portions of the Building, including exterior walls, roof, foundation, foundation systems (including barriers and subslab systems), or core of the Building, (b) the exterior of the Building or (c) any Building systems, including elevator, plumbing, air conditioning, heating, electrical, security, life safety and power, then Landlord may withhold its approval with respect thereto in its sole and absolute

discretion. Tenant shall, in making any such Alterations, use only those architects, contractors, suppliers and mechanics of which Landlord has given prior written approval, which approval shall be in Landlord's sole and absolute discretion. In seeking Landlord's approval, Tenant shall provide Landlord, at least fourteen (14) days in advance of any proposed construction, with plans, specifications, bid proposals, certified stamped engineering drawings and calculations by Tenant's engineer of record or architect of record (including connections to the Building's structural system, modifications to the Building's envelope, non-structural penetrations in slabs or walls, and modifications or tie-ins to life safety systems), work contracts, requests for laydown areas and such other information concerning the nature and cost of the Alterations as Landlord may reasonably request. In no event shall Tenant use or Landlord be required to approve any architects, consultants, contractors, subcontractors or material suppliers that Landlord reasonably believes could cause labor disharmony. Notwithstanding the foregoing, Tenant may make strictly cosmetic changes to the Premises ("**Cosmetic Alterations**") without Landlord's consent*; provided* that (y) the cost of any Cosmetic Alterations does not exceed Fifty Thousand Dollars ($50,000) in any one instance or One Hundred Thousand Dollars ($100,000) annually, (z) such Cosmetic Alterations do not (i) require any structural or other substantial modifications to the Premises, (ii) require any changes to, or adversely affect, the Building systems, (iii) affect the exterior of the Building or (iv) trigger any requirement under Applicable Laws that would require Landlord to make any alteration or improvement to the Premises, the Building or the Project. Tenant shall give Landlord at least ten (10) days' prior written notice of any Cosmetic Alterations.

17.2 Tenant shall not construct or permit to be constructed partitions or other obstructions that might interfere with free access to mechanical installation or service facilities of the Building or with other tenants' components located within the Building, or interfere with the moving of Landlord's equipment to or from the enclosures containing such installations or facilities.

17.3 Tenant shall accomplish any work performed on the Premises or the Building in such a manner as to permit any life safety systems to remain fully operable at all times.

17.4 Any work performed on the Premises, the Building or the Project by Tenant or Tenant's contractors shall be done at such times and in such manner as Landlord may from time to time designate. Tenant covenants and agrees that all work done by Tenant or Tenant's contractors shall be performed in full compliance with Applicable Laws. Within thirty (30) days after completion of any Alterations, Tenant shall provide Landlord with complete "as-built" drawing print sets and electronic CADD files on disc (or files in such other current format in common use as Landlord reasonably approves or requires) showing any changes in the Premises.

17.5 Before commencing any Alterations, Tenant shall give Landlord at least fourteen (14) days' prior written notice of the proposed commencement of such work and if the cost of such Alterations is expected to exceed One Hundred Thousand Dollars ($100,000), Tenant shall, if required by Landlord, secure, at Tenant's own cost and expense, a completion and lien indemnity bond satisfactory to Landlord for said work.

17.6 All Alterations, attached equipment, decorations, fixtures, movable laboratory casework and related appliances, trade fixtures, additions and improvements attached to or built

into the Premises and paid for and installed by Tenant (collectively, "**Tenant Equipment**"), shall (unless, prior to such construction or installation, the parties agree otherwise) remain the property of Tenant upon the expiration or earlier termination of the Term, and Tenant shall remove such Tenant Equipment from the Premises and repair and restore the Premises to its original condition as of the applicable Term Commencement Date. The Premises shall at all times remain the property of Landlord and shall be surrendered to Landlord upon the expiration or earlier termination of this Lease. All Tenant Improvements, Alterations, attached equipment, decorations, fixtures, movable laboratory casework and related appliances, trade fixtures, additions and improvements attached to or built into the Premises, and paid for, or installed by, Landlord and any Signage shall be the property of Landlord, shall not be moved by Tenant at any time during the Term and shall be surrendered with the Premises as a part thereof.

17.7 Tenant shall repair any damage to the Premises caused by Tenant's removal of any property (including Tenant Equipment) from the Premises. During any such restoration period, Tenant shall pay Rent to Landlord as provided herein as if said space were otherwise occupied by Tenant. The provisions of this Section shall survive the expiration or earlier termination of this Lease.

17.8 If Tenant shall fail to remove any of its effects from the Premises prior to termination of this Lease, then Landlord may, at its option, remove the same in any manner that Landlord shall choose and store said effects without liability to Tenant for loss thereof or damage thereto, and Tenant shall pay Landlord, upon demand, any costs and expenses incurred due to such removal and storage or Landlord may, at its sole option and without notice to Tenant, sell such property or any portion thereof at private sale and without legal process for such price as Landlord may obtain and apply the proceeds of such sale against any (a) amounts due by Tenant to Landlord under this Lease and (b) any expenses incident to the removal, storage and sale of said personal property.

17.9 Notwithstanding any other provision of this Article to the contrary, in no event shall Tenant remove any improvement from the Premises as to which Landlord contributed payment, including the Tenant Improvements, without Landlord's prior written consent, which consent Landlord may withhold in its sole and absolute discretion.

17.10 To the extent Alterations require Landlord's plan review, coordination, scheduling or supervision thereof, Tenant shall pay to Landlord an amount equal to three percent (3%) of the cost to Tenant of all Alterations exceeding One Hundred Thousand Dollars ($100,000) per occurrence (but specifically excluding Cosmetic Alterations and any work related to installation of Tenant's equipment and trade fixtures) installed by Tenant or its contractors or agents to cover Landlord's overhead and expenses for plan review, coordination, scheduling and supervision thereof; *provided*, *however*, that, in the event Landlord (in its reasonable discretion) does not perform any plan review, coordination, scheduling or supervision of such Alterations, then Tenant shall not be required to pay such fee. For purposes of payment of such sum, Tenant shall submit to Landlord copies of all bills, invoices and statements covering the costs of such charges, accompanied by payment to Landlord of the fee set forth in this Section. Tenant shall reimburse Landlord for any extra expenses incurred by Landlord by reason of faulty work done

by Tenant or its contractors, or by reason of delays caused by such work, or by reason of inadequate clean-up.

17.11 Within sixty (60) days after final completion of the Tenant Improvements (or any other Alterations performed by Tenant with respect to the Premises), Tenant shall submit to Landlord documentation showing the amounts expended by Tenant with respect to such Tenant Improvements (or any other Alterations performed by Tenant with respect to the Premises), together with supporting documentation reasonably acceptable to Landlord.

17.12 Tenant shall take, and shall cause its contractors to take, commercially reasonable steps to protect the Premises during the performance of any Alterations, including covering or temporarily removing any window coverings so as to guard against dust, debris or damage.

17.13 Tenant shall require its contractors and subcontractors performing work on the Premises to name Landlord and its affiliates and Lenders as additional insureds on their respective insurance policies.

18. Repairs and Maintenance.

18.1 Landlord shall repair and maintain the structural and exterior portions and Common Areas of the Building and the Project, including roofing and covering materials; foundations; exterior walls; plumbing; fire sprinkler systems (if any); heating, ventilating, air conditioning systems; elevators; and electrical systems installed or furnished by Landlord.

18.2 Except for services of Landlord, if any, required by Section 18.1, Tenant shall at Tenant's sole cost and expense maintain and keep the Premises and every part thereof in good condition and repair, damage thereto from ordinary wear and tear excepted. Tenant shall, upon the expiration or sooner termination of the Term, surrender the Premises to Landlord in as good a condition as when received, ordinary wear and tear excepted; and shall, at Landlord's request, remove all telephone and data systems, wiring and equipment from the Premises which was installed by or on behalf of Tenant or at Tenant's request, including the Tenant Improvements, and repair any damage to the Premises caused thereby. Landlord shall have no obligation to alter, remodel, improve, repair, decorate or paint the Premises or any part thereof, other than pursuant to the terms and provisions of the Work Letter.

18.3 Except as provided in Section 16.2, Landlord shall not be liable for any failure to make any repairs or to perform any maintenance that is an obligation of Landlord unless such failure shall persist for an unreasonable time after Tenant provides Landlord with written notice of the need of such repairs or maintenance. Tenant waives its rights under Applicable Laws now or hereafter in effect to make repairs at Landlord's expense.

18.4 If any excavation shall be made upon land adjacent to or under the Building, or shall be authorized to be made, Tenant shall afford to the person causing or authorized to cause such excavation, license to enter the Premises for the purpose of performing such work as said person shall deem necessary or desirable to preserve and protect the Building from injury or damage and to support the same by proper foundations, without any claim for damages or liability against Landlord and without reducing or otherwise affecting Tenant's obligations under

this Lease. Landlord shall use commercially reasonable efforts in conducting any such work to minimize or prevent interference with Tenant's use of or access to the Premises.

18.5 This Article relates to repairs and maintenance arising in the ordinary course of operation of the Building and the Project. In the event of a casualty described in Article 24, Article 24 shall apply in lieu of this Article. In the event of eminent domain, Article 25 shall apply in lieu of this Article.

18.6 Costs incurred by Landlord pursuant to this Article shall constitute Operating Expenses (but only to the extent includable in the definition of Operating Expenses), unless such costs are incurred due in whole or in part to any act, neglect, fault or omissions of Tenant or its employees, agents, contractors or invitees, in which case Tenant shall pay to Landlord the cost of such repairs and maintenance.

19. Liens.

19.1 Subject to the immediately succeeding sentence, Tenant shall keep the Premises, the Building and the Project free from any liens arising out of work performed, materials furnished or obligations incurred by Tenant. Tenant further covenants and agrees that any mechanic's lien filed against the Premises, the Building or the Project for work claimed to have been done for, or materials claimed to have been furnished to, shall be discharged or bonded by Tenant within ten (10) days after the filing thereof, at Tenant's sole cost and expense; *provided* that Tenant shall not be responsible for any liens resulting from the Tenant Improvements installed by Landlord pursuant to the Work Letter.

19.2 Should Tenant fail to discharge or bond against any lien of the nature described in Section 19.1, Landlord may, at Landlord's election, pay such claim or post a bond or otherwise provide security to eliminate the lien as a claim against title, and Tenant shall immediately reimburse Landlord for the costs thereof as Additional Rent. Tenant shall indemnify, save, defend (at Landlord's option and with counsel reasonably acceptable to Landlord) and hold the Landlord Indemnitees harmless from and against any Claims arising from any such liens, including any administrative, court or other legal proceedings related to such liens.

19.3 In the event that Tenant leases or finances the acquisition of office equipment, furnishings or other personal property of a removable nature utilized by Tenant in the operation of Tenant's business, Tenant warrants that any Uniform Commercial Code financing statement shall, upon its face or by exhibit thereto, indicate that such financing statement is applicable only to removable personal property of Tenant located within the Premises. In no event shall the address of the Premises, the Building or the Project be furnished on a financing statement without qualifying language as to applicability of the lien only to removable personal property located in an identified suite leased by Tenant. Should any holder of a financing statement record or place of record a financing statement that appears to constitute a lien against any interest of Landlord or against equipment that may be located other than within an identified suite leased by Tenant, Tenant shall, within ten (10) days after filing such financing statement, cause (a) a copy of the Lender security agreement or other documents to which the financing statement pertains to be furnished to Landlord to facilitate Landlord's ability to demonstrate that the lien of such financing statement is not applicable to Landlord's interest and (b) Tenant's

Lender to amend such financing statement and any other documents of record to clarify that any liens imposed thereby are not applicable to any interest of Landlord in the Premises, the Building or the Project.

20. Estoppel Certificate. Tenant shall, within ten (10) days of receipt of written notice from Landlord, execute, acknowledge and deliver a statement in writing substantially in the form attached to this Lease as Exhibit G, or on any other form reasonably requested by a proposed Lender or purchaser, (a) certifying that this Lease is unmodified and in full force and effect (or, if modified, stating the nature of such modification and certifying that this Lease as so modified is in full force and effect) and the dates to which rental and other charges are paid in advance, if any, (b) acknowledging that there are not, to Tenant's knowledge, any uncured defaults on the part of Landlord hereunder, or specifying such defaults if any are claimed, and (c) setting forth such further information with respect to this Lease or the Premises as may be requested thereon. Any such statement may be relied upon by any prospective purchaser or encumbrancer of all or any portion of the real property of which the Premises are apart. Tenant's failure to deliver such statement within such the prescribed time shall, at Landlord's option, constitute a Default (as defined below) under this Lease, and, in any event, shall be binding upon Tenant that the Lease is in full force and effect and without modification except as may be represented by Landlord in any certificate prepared by Landlord and delivered to Tenant for execution.

21. Hazardous Materials.

21.1 Tenant shall not cause or permit any Hazardous Materials (as defined below) to be brought upon, kept or used in or about the Premises, the Building or the Project in violation of Applicable Laws by Tenant or its employees, agents, contractors or invitees. If Tenant breaches such obligation, or if the presence of Hazardous Materials as a result of such a breach results in contamination of the Project, any portion thereof, or any adjacent property, or if contamination of the Project, any portion thereof, or any adjacent property by Hazardous Materials otherwise occurs during the Term or any extension or renewal hereof or holding over hereunder (other than if such contamination results from (a) migration of Hazardous Materials from outside the Premises caused by Tenant or its employees, agents, contractors or invitees, or (b) to the extent such contamination is solely caused by Landlord's gross negligence or willful misconduct, then Tenant shall indemnify, save, defend (at Landlord's option and with counsel reasonably acceptable to Landlord) and hold the Landlord Indemnitees harmless from and against any and all Claims, including (a) diminution in value of the Project or any portion thereof, (b) damages for the loss or restriction on use of rentable or usable space or of any amenity of the Project, (c) damages arising from any adverse impact on marketing of space in the Project or any portion thereof and (d) sums paid in settlement of Claims that arise during or after the Term as a result of such breach or contamination. This indemnification by Tenant includes costs incurred in connection with any investigation of site conditions or any clean-up, remedial, removal or restoration work required by any Governmental Authority because of Hazardous Materials present in the air, soil or groundwater above, on or under or about the Project. Without limiting the foregoing, if the presence of any Hazardous Materials in, on, under or about the Project, any portion thereof or any adjacent property caused or permitted by Tenant results in any contamination of the Project, any portion thereof or any adjacent property, then Tenant shall promptly take all actions at its sole cost and expense as are necessary to return the Project, any

portion thereof or any adjacent property to its respective condition existing prior to the time of such contamination*; provided* that Landlord's written approval of such action shall first be obtained, which approval Landlord shall not unreasonably withhold; and *provided*, *further*, that it shall be reasonable for Landlord to withhold its consent if such actions could have a material adverse long-term or short-term effect on the Project, any portion thereof or any adjacent property. Notwithstanding the foregoing, Landlord shall indemnify, save, defend (at Tenant's option and with counsel reasonably acceptable to Tenant) and hold Tenant and its affiliates, employees, agents and contractors harmless from and against any and all Claims resulting from the presence of Hazardous Materials at the Project in violation of Applicable Laws as of the Execution Date, unless placed at the Project by Tenant or its affiliates, employees, agents or contractors.

21.2 Landlord acknowledges that it is not the intent of this Article to prohibit Tenant from operating its business for the Permitted Use. Tenant may operate its business according to the custom of Tenant's industry so long as the use or presence of Hazardous Materials is strictly and properly monitored in accordance with Applicable Laws. As a material inducement to Landlord to allow Tenant to use Hazardous Materials in connection with its business, Tenant agrees to deliver to Landlord prior to the applicable Term Commencement Date a list identifying each type of Hazardous Material to be present at the Project and setting forth any and all governmental approvals or permits required in connection with the presence of such Hazardous Material at the Project (the "**Hazardous Materials List**"). Tenant shall deliver to Landlord an updated Hazardous Materials List on or prior to each annual anniversary of the Phase 1 Term Commencement Date and shall also deliver an updated Hazardous Materials List before any new Hazardous Materials are brought to the Project. Tenant shall deliver to Landlord true and correct copies of the following documents (hereinafter referred to as the "**Documents**") relating to the handling, storage, disposal and emission of Hazardous Materials prior to the Phase 1 Term Commencement Date or, if unavailable at that time, concurrently with the receipt from or submission to any Governmental Authority: permits; approvals; reports and correspondence; storage and management plans; notices of violations of Applicable Laws; plans relating to the installation of any storage tanks to be installed in, on, under or about the Project (*provided* that installation of storage tanks shall only be permitted after Landlord has given Tenant its written consent to do so, which consent Landlord may withhold in its sole and absolute discretion); and all closure plans or any other documents required by any and all Governmental Authorities for any storage tanks installed in, on, under or about the Project for the closure of any such storage tanks. Tenant shall not be required, however, to provide Landlord with any portion of the Documents containing information of a proprietary nature, which Documents, in and of themselves, do not contain a reference to any Hazardous Materials or activities related to Hazardous Materials.

21.3 [Intentionally Omitted]

21.4 At any time, and from time to time, prior to the expiration of the Term, Landlord shall have the right to conduct appropriate tests of the Project or any portion thereof to demonstrate that Hazardous Materials are present or that contamination has occurred due to Tenant or Tenant's employees, agents, contractors or invitees. Tenant shall pay all reasonable

costs of such tests if such tests reveal that Hazardous Materials exist at the Project in violation of this Lease.

21.5 If underground or other storage tanks storing Hazardous Materials are located on the Premises or are hereafter placed on the Premises by any party, Tenant shall monitor the storage tanks, maintain appropriate records, implement reporting procedures, properly close any underground storage tanks, and take or cause to be taken all other steps necessary or required under the Applicable Laws.

21.6 Tenant shall promptly report to Landlord any actual or suspected presence of mold or water intrusion at the Premises.

21.7 Tenant's obligations under this Article shall survive the expiration or earlier termination of the Lease. During any period of time needed by Tenant or Landlord after the termination of this Lease to complete the removal from the Premises of any such Hazardous Materials, Tenant shall be deemed a holdover tenant and subject to the provisions of Article 27 below.

21.8 As used herein, the term "**Hazardous Material**" means any hazardous or toxic substance, material or waste that is or becomes regulated by any Governmental Authority.

21.9 Notwithstanding anything to the contrary in this Lease, Landlord shall have sole control over the equitable allocation of fire control areas (as defined in the Uniform Building Code as adopted by the city or municipality(ies) in which the Project is located (the "**UBC**")) within the Project for the storage of Hazardous Materials. Notwithstanding anything to the contrary in this Lease, the quantity of Hazardous Materials allowed by this Section 21.9 is specific to Tenant and shall not run with the Lease in the event of a Transfer (as defined in Article 29). In the event of a Transfer, if the use of Hazardous Materials by such new tenant ("**New Tenant**") is such that New Tenant utilizes fire control areas in the Project in excess of New Tenant's Pro Rata Share of the Building or the Project, as applicable, then New Tenant shall, at its sole cost and expense and upon Landlord's written request, establish and maintain a separate area of the Premises classified by the UBC as an "H" occupancy area for the use and storage of Hazardous Materials, or take such other action as is necessary to ensure that its share of the fire control areas of the Building and the Project is not greater than New Tenant's Pro Rata Share of the Building or the Project, as applicable.

22. Odors and Exhaust. Tenant acknowledges that Landlord would not enter into this Lease with Tenant unless Tenant assured Landlord that under no circumstances will any other occupants of the Building or the Project (including persons legally present in any outdoor areas of the Project) be subjected to odors or fumes (whether or not noxious), and that the Building and the Project will not be damaged by any exhaust, in each case from Tenant's operations, including in Tenant's vivarium. Landlord and Tenant therefore agree as follows:

22.1 Tenant shall not cause or permit (or conduct any activities that would cause) any release of any odors or fumes of any kind from the Premises.

22.2 If the Building has a ventilation system that, in Landlord's judgment, is adequate, suitable, and appropriate to vent the Premises in a manner that does not release odors affecting any indoor or outdoor part of the Project, Tenant shall vent the Premises through such system. If Landlord at any time determines that any existing ventilation system is inadequate, or if no ventilation system exists, Tenant shall in compliance with Applicable Laws vent all fumes and odors from the Premises (and remove odors from Tenant's exhaust stream) as Landlord reasonably requires. The placement and configuration of all ventilation exhaust pipes, louvers and other equipment shall be subject to Landlord's approval. Tenant acknowledges Landlord's legitimate desire to maintain the Project (indoor and outdoor areas) in an odor-free manner, and Landlord may require Tenant to abate and remove all odors in a manner that goes beyond the requirements of Applicable Laws.

22.3 Tenant shall, at Tenant's sole cost and expense, provide odor eliminators and other devices (such as filters, air cleaners, scrubbers and whatever other equipment may in Landlord's judgment be necessary or appropriate from time to time) to completely remove, eliminate and abate any odors, fumes or other substances in Tenant's exhaust stream that, in Landlord's judgment, emanate from Tenant's Premises. Any work Tenant performs under this Section shall constitute Alterations.

22.4 Tenant's responsibility to remove, eliminate and abate odors, fumes and exhaust shall continue throughout the Term. Landlord's approval of the Tenant Improvements shall not preclude Landlord from requiring additional measures to eliminate odors, fumes and other adverse impacts of Tenant's exhaust stream (as Landlord may designate in Landlord's discretion). Tenant shall install additional equipment as Landlord requires from time to time under the preceding sentence. Such installations shall constitute Alterations.

22.5 If Tenant fails to install satisfactory odor control equipment within ten (10) business days after Landlord's demand made at any time, then Landlord may, without limiting Landlord's other rights and remedies, require Tenant to cease and suspend any operations in the Premises that, in Landlord's determination, cause odors, fumes or exhaust. For example, if Landlord determines that Tenant's production of a certain type of product causes odors, fumes or exhaust, and Tenant does not install satisfactory odor control equipment within ten (10) business days after Landlord's request, then Landlord may require Tenant to stop producing such type of product in the Premises unless and until Tenant has installed odor control equipment satisfactory to Landlord.

23. Insurance; Waiver of Subrogation.

23.1 Landlord shall maintain insurance for the Building and the Project in amounts equal to full replacement cost (exclusive of the costs of excavation, foundations and footings, and without reference to depreciation taken by Landlord upon its books or tax returns) or such lesser coverage as Landlord may elect, *provided* that such coverage shall not be less than ninety percent (90%) of such full replacement cost or the amount of such insurance Landlord's Lender, if any, requires Landlord to maintain, providing protection against any peril generally included within the classification "Fire and Extended Coverage," together with insurance against sprinkler damage (if applicable), vandalism and malicious mischief. Landlord, subject to availability thereof, shall further insure, if Landlord deems it appropriate, coverage against flood,

environmental hazard, earthquake, loss or failure of building equipment, rental loss during the period of repairs or rebuilding, workmen's compensation insurance and fidelity bonds for employees employed to perform services. Notwithstanding the foregoing, Landlord may, but shall not be deemed required to, provide insurance for any improvements installed by Tenant or that are in addition to the standard improvements customarily furnished by Landlord, without regard to whether or not such are made a part of or are affixed to the Building.

23.2 In addition, Landlord shall carry public liability insurance with a single limit of not less than One Million Dollars ($1,000,000) for death or bodily injury, or property damage with respect to the Project.

23.3 Tenant shall, at its own cost and expense, procure and maintain in effect, beginning on the Phase 1 Term Commencement Date or the date of occupancy, whichever occurs first, and continuing throughout the Term (and occupancy by Tenant, if any, after termination of this Lease) comprehensive liability insurance with limits of not less than Two Million Dollars ($2,000,000) per occurrence for death or bodily injury and for property damage with respect to the Premises (including $ 100,000 fire legal liability (each loss)).

23.4 The insurance required to be purchased and maintained by Tenant pursuant to this Lease shall name Landlord, BioMed Realty, L.P., BioMed Realty Trust, Inc. and their respective officers, directors, employees, agents, general partners, members, subsidiaries, affiliates and Lenders ("**Landlord Parties**") as additional insureds. Said insurance shall be with companies authorized to do business in the state in which the Project is located and having a rating of not less than policyholder rating of A and financial category rating of at least Class XII in "Best's Insurance Guide." Tenant shall obtain for Landlord from the insurance companies or cause the insurance companies to furnish certificates of coverage to Landlord. No such policy shall be cancelled or suffer a reduction of coverage or other modification or cancellation except after thirty (30) days' prior written notice to Landlord (except in the event of non-payment of premium, in which case ten (10) days written notice shall be given). All such policies shall be written as primary policies, not contributing with and not in excess of the coverage that Landlord may carry. Tenant's policy may be a "blanket policy" that specifically provides that the amount of insurance shall not be prejudiced by other losses covered by the policy. Tenant shall, at least twenty (20) days prior to the expiration of such policies, furnish Landlord with renewals or binders. Tenant agrees that if Tenant does not take out and maintain such insurance, Landlord may (but shall not be required to) procure said insurance on Tenant's behalf and at its cost to be paid by Tenant as Additional Rent.

23.5 Tenant assumes the risk of damage to any fixtures, goods, inventory, merchandise, equipment and leasehold improvements, and Landlord shall not be liable for injury to Tenant's business or any loss of income therefrom, relative to such damage, all as more particularly set forth within this Lease. Tenant shall, at Tenant's sole cost and expense, carry such insurance as Tenant desires for Tenant's protection with respect to personal property of Tenant or business interruption.

23.6 In each instance where insurance is to name Landlord Parties as additional insureds, Tenant shall, upon Landlord's written request, also designate and furnish certificates evidencing such Landlord Parties as additional insureds to (a) any Lender of Landlord holding a

security interest in the Building, the Property or the Project, (b) the landlord under any lease whereunder Landlord is a tenant of the Property if the interest of Landlord is or shall become that of a tenant under a ground lease rather than that of a fee owner and (c) any management company retained by Landlord to manage the Project.

23.7 Landlord and Tenant each hereby waive any and all rights of recovery against the other or against the officers, directors, employees, agents, general partners, members, subsidiaries, affiliates and Lenders of the other on account of loss or damage occasioned by such waiving party or its property or the property of others under such waiving party's control, in each case to the extent that such loss or damage is insured against under any fire and extended coverage insurance policy that either Landlord or Tenant may have in force at the time of such loss or damage, or would be insured against under any fire and extended coverage insurance policy that either Landlord or Tenant is required to obtain under this Lease. Landlord and Tenant, upon obtaining the policies of insurance required or permitted under this Lease, shall give notice to the insurance carrier or carriers that the foregoing mutual waiver of subrogation is contained in this Lease. If the release of either Landlord or Tenant, as set forth in the first sentence of this Section, shall contravene Applicable Laws, then the liability of the party in question shall be deemed not released but shall be secondary to the other party's insurer.

23.8 Landlord may require insurance policy limits required under this Lease to be raised to conform with reasonable requirements of Landlord's Lender or to bring coverage limits to levels then being reasonably required of new tenants within the Project.

23.9 Any costs incurred by Landlord pursuant to this Article shall constitute a portion of Operating Expenses (but only to the extent includable in the definition of Operating Expenses).

24. Damage or Destruction.

24.1 In the event of a partial destruction of (a) the Premises or (b) Common Areas of the Building or the Project ((a) and (b) together, the "**Affected Areas**") by fire or other perils covered by extended coverage insurance not exceeding twenty-five percent (25%) of the full insurable value thereof, and *provided* that (x) the damage thereto is such that the Affected Areas may be repaired, reconstructed or restored within a period of six (6) months from the date of the happening of such casualty, (y) Landlord shall receive insurance proceeds sufficient to cover the cost of such repairs (except for any deductible amount provided by Landlord's policy, which deductible amount, if paid by Landlord, shall constitute an Operating Expense) and (z) such casualty was not intentionally caused by Tenant or its employees, agents or contractors, then Landlord shall commence and proceed diligently with the work of repair, reconstruction and restoration of the Affected Areas and this Lease shall continue in full force and effect.

24.2 In the event of any damage to or destruction of the Building or the Project other than as described in Section 24.1, Landlord may elect to repair, reconstruct and restore the Building or the Project, as applicable, in which case this Lease shall continue in full force and effect. If Landlord elects not to repair the Building or the Project, as applicable, then this Lease shall terminate as of the date of such damage or destruction.

24.3 Landlord shall give written notice to Tenant within sixty (60) days following the date of damage or destruction of its election either to repair or not to repair, reconstruct or restore the Building or the Project, as applicable; *provided*, *however*, that (a) if Landlord does not elect to terminate this Lease pursuant to Landlord's termination right as provided above, and (b) the repair of such damage to the Premises cannot, in the reasonable opinion of Landlord, be completed within nine (9) months after the date of the damage, then Tenant may elect to terminate this Lease by delivering written notice thereof to Landlord within fifteen (15) days after being notified by Landlord of the estimated length of time to repair the damage and destruction, which termination shall be effective as of the date of such termination notice thereof to Landlord.

24.4 Upon any termination of this Lease under any of the provisions of this Article, the parties shall be released thereby without further obligation to the other from the date possession of the Premises is surrendered to Landlord, except with regard to (a) items occurring prior to the damage or destruction and (b) provisions of this Lease that, by their express terms, survive the expiration or earlier termination hereof.

24.5 In the event of repair, reconstruction and restoration as provided in this Article, all Rent to be paid by Tenant under this Lease shall be abated proportionately based on the extent to which Tenant's use of the Premises is impaired during the period of such repair, reconstruction or restoration, unless Landlord provides Tenant with other space during the period of repair that, in Tenant's reasonable opinion, is suitable for the temporary conduct of Tenant's business; *provided*, *however*, that the amount of such abatement shall be reduced by the proceeds of business interruption or loss of rental income insurance actually received by Tenant with respect to the Premises.

24.6 Notwithstanding anything to the contrary contained in this Article, should Landlord be delayed or prevented from completing the repair, reconstruction or restoration of the damage or destruction to the Premises after the occurrence of such damage or destruction by Force Majeure, then the time for Landlord to commence or complete repairs shall be extended on a day-for-day basis.

24.7 If Landlord is obligated to or elects to repair, reconstruct or restore as herein provided, then Landlord shall be obligated to make such repair, reconstruction or restoration only with regard to (a) those portions of the Premises that were originally provided at Landlord's expense and (b) the Common Area portion of the Affected Areas. The repair, reconstruction or restoration of improvements not originally provided by Landlord or at Landlord's expense shall be the obligation of Tenant. In the event Tenant has elected to upgrade certain improvements from the Building Standard, Landlord shall, upon the need for replacement due to an insured loss, provide only the Building Standard, unless Tenant again elects to upgrade such improvements and pay any incremental costs related thereto, except to the extent that excess insurance proceeds, if received, are adequate to provide such upgrades, in addition to providing for basic repair, reconstruction and restoration of the Premises, the Building and the Project.

24.8 Notwithstanding anything to the contrary contained in this Article, Landlord shall not have any obligation whatsoever to repair, reconstruct or restore the Premises if the damage resulting from any casualty covered under this Article occurs during the last twenty-four (24)

months of the Term or any extension thereof and it is estimated that the repair of such casualty would take more than ninety (90) days, or to the extent that insurance proceeds are not available therefor. In addition, Tenant also shall have the right to terminate this Lease if the damage resulting from any casualty covered under this Article occurs during the last twenty-four (24) months of the Term or any extension thereof and it is estimated that the repair of such casualty would take more than ninety (90) days.

24.9 Landlord's obligation, should it elect or be obligated to repair or rebuild, shall be limited to the Affected Areas. Tenant shall, at its expense, replace or fully repair all of Tenant's personal property and any Alterations installed by Tenant existing at the time of such damage or destruction. If Affected Areas are to be repaired in accordance with the foregoing, Landlord shall, subject to the requirements of any Lender of Landlord, make available to Tenant any portion of insurance proceeds it receives that are allocable to the Alterations constructed by Tenant pursuant to this Lease; *provided* Landlord shall not make such proceeds available to Tenant during the continuance of any default by Tenant under this Lease.

25. Eminent Domain.

25.1 In the event (a) the whole of all Affected Areas or (b) such part thereof as shall substantially interfere with Tenant's use and occupancy of the Premises for the Permitted Use shall be taken for any public or quasi-public purpose by any lawful power or authority by exercise of the right of appropriation, condemnation or eminent domain, or sold to prevent such taking, Tenant or Landlord may terminate this Lease effective as of the date possession is required to be surrendered to said authority, except with regard to (y) items occurring prior to the damage or destruction and (z) provisions of this Lease that, by their express terms, survive the expiration or earlier termination hereof.

25.2 In the event of a partial taking of (a) the Building or the Project or (b) drives, walkways or parking areas serving the Building or the Project for any public or quasi-public purpose by any lawful power or authority by exercise of right of appropriation, condemnation, or eminent domain, or sold to prevent such taking, then, without regard to whether any portion of the Premises occupied by Tenant was so taken, Landlord may elect to terminate this Lease (except with regard to (a) items occurring prior to the damage or destruction and (b) provisions of this Lease that, by their express terms, survive the expiration or earlier termination hereof} as of such taking if such taking is, in Landlord's sole opinion, of a material nature such as to make it uneconomical to continue use of the unappropriated portion for purposes of renting office or laboratory space.

25.3 Tenant shall be entitled to any award that is specifically awarded as compensation for (a) the taking of Tenant's personal property that was installed at Tenant's expense and (b) the costs of Tenant moving to a new location. Except as set forth in the previous sentence, any award for such taking shall be the property of Landlord.

25.4 If, upon any taking of the nature described in this Article, this Lease continues in effect, then Landlord shall promptly proceed to restore the Affected Areas to substantially their same condition prior to such partial taking. To the extent such restoration is infeasible, as

determined by Landlord in its sole and absolute discretion, the Rent shall be decreased proportionately to reflect the loss of any portion of the Premises no longer available to Tenant.

26. Surrender.

26.1 At least ten (10) days prior to Tenant's surrender of possession of any part of the Premises, Tenant shall provide Landlord with (a) a facility decommissioning and Hazardous Materials closure plan for the Premises ("**Exit Survey**") prepared by an independent third party reasonably acceptable to Landlord, and (b) written evidence of all appropriate governmental releases obtained by Tenant in accordance with Applicable Laws, including laws pertaining to the surrender of the Premises. In addition, Tenant agrees to remain responsible after the surrender of the Premises for the remediation of any recognized environmental conditions set forth in the Exit Survey and compliance with any recommendations set forth in the Exit Survey, but only to the extent such conditions or recommendations are the responsibility of Tenant pursuant to this Lease. Tenant's obligations under this Section shall survive the expiration or earlier termination of the Lease.

26.2 No surrender of possession of any part of the Premises shall release Tenant from any of its obligations hereunder, unless such surrender is accepted in writing by Landlord.

26.3 The voluntary or other surrender of this Lease by Tenant shall not effect a merger with Landlord's fee title or leasehold interest in the Premises, the Building, the Property or the Project, unless Landlord consents in writing, and shall, at Landlord's option, operate as an assignment to Landlord of any or all subleases.

26.4 The voluntary or other surrender of any ground or other underlying lease that now exists or may hereafter be executed affecting the Building or the Project, or a mutual cancellation thereof or of Landlord's interest therein by Landlord and its lessor shall not effect a merger with Landlord's fee title or leasehold interest in the Premises, the Building or the Property and shall, at the option of the successor to Landlord's interest in the Building or the Project, as applicable, operate as an assignment of this Lease.

27. Holding Over.

27.1 If, with Landlord's prior written consent, Tenant holds possession of all or any part of the Premises after the Term, Tenant shall become a tenant from month to month after the expiration or earlier termination of the Term, and in such case Tenant shall continue to pay (a) Base Rent in accordance with Article 7, and (b) any amounts for which Tenant would otherwise be liable under this Lease if the Lease were still in effect, including payments for Tenant's Share of Operating Expenses. Any such month-to-month tenancy shall be subject to every other term, covenant and agreement contained herein.

27.2 Notwithstanding the foregoing, if Tenant remains in possession of the Premises after the expiration or earlier termination of the Term without Landlord's prior written consent, (a) Tenant shall become a tenant at sufferance subject to the terms and conditions of this Lease, except that the monthly rent shall be equal to one hundred fifty percent (150%) of the Rent in effect during the last thirty (30) days of the Term, and (b) Tenant shall be liable to Landlord for

any and all damages suffered by Landlord as a result of such holdover, including any lost rent or consequential, special and indirect damages.

27.3 Acceptance by Landlord of Rent after the expiration or earlier termination of the Term shall not result in an extension, renewal or reinstatement of this Lease.

27.4 The foregoing provisions of this Article are in addition to and do not affect Landlord's right of reentry or any other rights of Landlord hereunder or as otherwise provided by Applicable Laws.

28. Indemnification and Exculpation.

28.1 Tenant agrees to indemnify, save, defend (at Landlord's option and with counsel reasonably acceptable to Landlord) and hold the Landlord Indemnitees harmless from and against any and all Claims arising from injury or death to any person or damage to any property occurring within or about the Premises, the Building, the Property or the Project arising directly or indirectly out of Tenant's or Tenant's employees', agents', contractors' or invitees' use or occupancy of the Premises or a breach or default by Tenant in the performance of any of its obligations hereunder, except to the extent caused by Landlord's negligence or willful misconduct.

28.2 Notwithstanding any provision of Section 28.1 to the contrary, Landlord shall not be liable to Tenant for, and Tenant assumes all risk of, damage to personal property or scientific research, including loss of records kept by Tenant within the Premises and damage or losses caused by fire, electrical malfunction, gas explosion or water damage of any type (including broken water lines, malfunctioning fire sprinkler systems, roof leaks or stoppages of lines), unless any such loss is due to Landlord's willful disregard of written notice by Tenant of need for a repair that Landlord is responsible to make for an unreasonable period of time. Tenant further waives any claim for injury to Tenant's business or loss of income relating to any such damage or destruction of personal property as described in this Section.

28.3 Landlord shall not be liable for any damages arising from any act, omission or neglect of any other tenant in the Building or the Project, or of any other third party.

28.4 Tenant acknowledges that security devices and services, if any, while intended to deter crime, may not in given instances prevent theft or other criminal acts. Landlord shall not be liable for injuries or losses caused by criminal acts of third parties, and Tenant assumes the risk that any security device or service may malfunction or otherwise be circumvented by a criminal. If Tenant desires protection against such criminal acts, then Tenant shall, at Tenant's sole cost and expense, obtain appropriate insurance coverage.

28.5 The provisions of this Article shall survive the expiration or earlier termination of this Lease.

29. Assignment or Subletting.

29.1 Except as hereinafter expressly permitted, Tenant shall not, either voluntarily or by operation of Applicable Laws, directly or indirectly sell, hypothecate, assign, pledge, encumber or otherwise transfer this Lease, or sublet the Premises (each, a "**Transfer**"), without Landlord's prior written consent, which shall not be unreasonably withheld. Notwithstanding the foregoing, except during the continuance of any default by Tenant under this Lease and so long as Tenant has not been in Default more than once during the immediately preceding twelve (12) months and has not been in Default more than twice during the Term, (a) Tenant shall have the right to Transfer without Landlord's prior written consent the Premises or any part thereof to any person that as of the date of determination and at all times thereafter directly, or indirectly through one or more intermediaries, controls, is controlled by, or is under common control with Tenant or that becomes a parent or successor of Tenant by reason of merger, consolidation, public offering, reorganization, dissolution or sale of stock, membership or partnership interests or assets ("**Tenant's Affiliate**"), *provided* that Tenant shall notify Landlord in writing at least ten (10) days prior to the effectiveness of such Transfer (unless Tenant is restricted from notifying Landlord prior to the effectiveness of such Transfer because of confidentiality restrictions on Tenant, in which case Tenant shall notify Landlord within ten (10) days following the effectiveness of such Transfer) to Tenant's Affiliate (an "**Exempt Transfer**") and otherwise complies with the requirements of this Lease regarding such Transfer, and *provided* further that Tenant may not Transfer all or any portion of the Premises to any Tenant Affiliate more than once during any twelve (12) month period or twice during the Term without Landlord's prior written consent, and (b) Tenant shall have the right to sublease a portion of the Premises of approximately three thousand (3,000) square feet to Abide Therapeutics for a portion of the Term, *provided* that Tenant shall notify Landlord in writing at least ten (10) days prior to the effectiveness of such Transfer to Abide Therapeutics and otherwise complies with the requirements of this Lease regarding such Transfer. For purposes of Exempt Transfers, "control" requires both (x) owning (directly or indirectly) more than fifty percent (50%) of the stock or other equity interests of another person and (y) possessing, directly or indirectly, the power to direct or cause the direction of the management and policies of such person. Notwithstanding the foregoing, the raising of capital by an offering of stock or ownership interest in Tenant shall not be deemed a Transfer for purposes of this Lease and shall not require Landlord's consent. Except for an Exempt Transfer, Tenant shall not perform a Transfer to or with an entity that is a tenant at the Project or that is in discussions or negotiations with Landlord or an affiliate of Landlord to lease premises at the Project or a property owned by Landlord or an affiliate of Landlord.

29.2 In the event Tenant desires to effect a Transfer, then, at least twenty-five (25) but not more than ninety (90) days prior to the date when Tenant desires the assignment or sublease to be effective (the "**Transfer Date**"). Tenant shall provide written notice to Landlord (the "**Transfer Notice**") containing information (including references) concerning the character of the proposed transferee, assignee or sublessee; the Transfer Date; any ownership or commercial relationship between Tenant and the proposed transferee, assignee or sublessee; and the consideration and all other material terms and conditions of the proposed Transfer, all in such detail as Landlord shall reasonably require.

29.3 Landlord, in determining whether consent should be given to a proposed Transfer, may give consideration to (a) the financial strength of such transferee, assignee or sublessee (notwithstanding Tenant remaining liable for Tenant's performance), (b) any change in use that such transferee, assignee or sublessee proposes to make in the use of the Premises and (c) Landlord's desire to exercise its rights under Section 29.8 to cancel this Lease. In no event shall Landlord be deemed to be unreasonable for declining to consent to a Transfer to a transferee, assignee or sublessee of poor reputation, lacking financial qualifications or seeking a change in the Permitted Use, or jeopardizing directly or indirectly the status of Landlord or any of Landlord's affiliates as a Real Estate Investment Trust under the Internal Revenue Code of 1986 (as the same may be amended from time to time, the "**Revenue Code**"). Notwithstanding anything contained in this Lease to the contrary, (w) no Transfer shall be consummated on any basis such that the rental or other amounts to be paid by the occupant, assignee, manager or other transferee thereunder would be based, in whole or in part, on the income or profits derived by the business activities of such occupant, assignee, manager or other transferee; (x) Tenant shall not furnish or render any services to an occupant, assignee, manager or other transferee with respect to whom transfer consideration is required to be paid, or manage or operate the Premises or any capital additions so transferred, with respect to which transfer consideration is being paid; (y) Tenant shall not consummate a Transfer with any person in which Landlord owns an interest, directly or indirectly (by applying constructive ownership rules set forth in Section 856(d)(5) of the Revenue Code); and (z) Tenant shall not consummate a Transfer with any person or in any manner that could cause any portion of the amounts received by Landlord pursuant to this Lease or any sublease, license or other arrangement for the right to use, occupy or possess any portion of the Premises to fail to qualify as "rents from real property" within the meaning of Section 856(d) of the Revenue Code, or any similar or successor provision thereto or which could cause any other income of Landlord to fail to qualify as income described in Section 856(c)(2) of the Revenue Code.

29.4 As conditions precedent to Tenant subleasing the Premises or to Landlord considering a request by Tenant to Tenant's transfer of rights or sharing of the Premises, Landlord may require any or all of the following:

(a) Tenant shall remain fully liable under this Lease during the unexpired Term;

(b) Tenant shall provide Landlord with evidence reasonably satisfactory to Landlord that the value of Landlord's interest under this Lease shall not be diminished or reduced by the proposed Transfer. Such evidence shall include evidence respecting the relevant business experience and financial responsibility and status of the proposed transferee, assignee or sublessee;

(c) Tenant shall reimburse Landlord for Landlord's actual costs and expenses, including reasonable attorneys' fees, charges and disbursements incurred in connection with the review, processing and documentation of such request;

(d) If Tenant's transfer of rights or sharing of the Premises provides for the receipt by, on behalf of or on account of Tenant of any consideration of any kind whatsoever (including a premium rental for a sublease or lump sum payment for an assignment, but

excluding Tenant's reasonable costs in marketing and subleasing the Premises) in excess of the rental and other charges due to Landlord under this Lease, Tenant shall pay fifty percent (50%) of all of such excess to Landlord, after making deductions for any reasonable marketing expenses, tenant improvement funds expended by Tenant, alterations, cash concessions, brokerage commissions, attorneys' fees and free rent actually paid by Tenant. If said consideration consists of cash paid to Tenant, payment to Landlord shall be made upon receipt by Tenant of such cash payment;

(e) The proposed transferee, assignee or sublessee shall agree that, in the event Landlord gives such proposed transferee, assignee or sublessee notice that Tenant is in Default under this Lease, such proposed transferee, assignee or sublessee shall thereafter make all payments otherwise due Tenant directly to Landlord, which payments shall be received by Landlord without any liability being incurred by Landlord, except to credit such payment against those due by Tenant under this Lease, and any such proposed transferee, assignee or sublessee shall agree to attorn to Landlord or its successors and assigns should this Lease be terminated for any reason; *provided*, *however*, that in no event shall Landlord or its Lenders, successors or assigns be obligated to accept such attornment;

(f) Landlord's consent to any such Transfer shall be effected on Landlord's forms;

(g) A default by Tenant shall not then be continuing hereunder in any respect;

(h) Such proposed transferee, assignee or sublessee's use of the Premises shall be the same as the Permitted Use;

(i) Landlord shall not be bound by any provision of any agreement pertaining to the Transfer, except for Landlord's written consent to the same;

(j) Tenant shall pay all transfer and other taxes (including interest and penalties) assessed or payable for any Transfer;

(k) Landlord's consent (or waiver of its rights) for any Transfer shall not waive Landlord's right to consent to any later Transfer;

(l) Tenant shall deliver to Landlord one executed copy of any and all written instruments evidencing or relating to the Transfer; and

(m) A list of Hazardous Materials (as defined in Section 21.7), certified by the proposed transferee, assignee or sublessee to be true and correct, that the proposed transferee, assignee or sublessee intends to use or store in the Premises. Additionally, Tenant shall deliver to Landlord, on or before the date any proposed transferee, assignee or sublessee takes occupancy of the Premises, all of the items relating to Hazardous Materials of such proposed transferee, assignee or sublessee as described in Section 21.2.

29.5 Any Transfer that is not in compliance with the provisions of this Article shall be void and shall, at the option of Landlord, terminate this Lease.

29.6 The consent by Landlord to a Transfer shall not relieve Tenant or proposed transferee, assignee or sublessee from obtaining Landlord's consent to any further Transfer, nor shall it release Tenant or any proposed transferee, assignee or sublessee of Tenant from full and primary liability under this Lease.

29.7 Notwithstanding any Transfer, Tenant shall remain fully and primarily liable for the payment of all Rent and other sums due or to become due hereunder, and for the full performance of all other terms, conditions and covenants to be kept and performed by Tenant. The acceptance of Rent or any other sum due hereunder, or the acceptance of performance of any other term, covenant or condition thereof, from any person or entity other than Tenant shall not be deemed a waiver of any of the provisions of this Lease or a consent to any Transfer.

29.8 If Tenant delivers to Landlord a Transfer Notice indicating a desire to transfer this Lease for substantially the remainder of the Term to a proposed transferee, assignee or sublessee other than as provided within Section 29.4 or as permitted under this Lease as an Exempt Transfer, then Landlord shall have the option, exercisable by giving notice to Tenant at any time within ten (10) days after Landlord's receipt of such Transfer Notice, to terminate this Lease as of the date specified in the Transfer Notice as the Transfer Date, except for those provisions that, by their express terms, survive the expiration or earlier termination hereof. If Landlord exercises such option, then Tenant shall have the right to withdraw such Transfer Notice by delivering to Landlord written notice of such election within five (5) days after Landlord's delivery of notice electing to exercise Landlord's option to terminate this Lease. In the event Tenant withdraws the Transfer Notice as provided in this Section, this Lease shall continue in full force and effect. No failure of Landlord to exercise its option to terminate this Lease shall be deemed to be Landlord's consent to a proposed Transfer.

29.9 If Tenant sublets the Premises or any portion thereof, Tenant hereby immediately and irrevocably assigns to Landlord, as security for Tenant's obligations under this Lease, all rent from any such subletting, and appoints Landlord as assignee and attorney-in-fact for Tenant, and Landlord (or a receiver for Tenant appointed on Landlord's application) may collect such rent and apply it toward Tenant's obligations under this Lease; *provided* that, until the occurrence of a Default (as defined below) by Tenant, Tenant shall have the right to collect such rent.

30. Subordination, Non-Disturbance and Attornment.

30.1 This Lease shall be subject and subordinate to the lien of any mortgage, deed of trust, or lease in which Landlord is tenant now or hereafter in force against the Building or the Project and to all advances made or hereafter to be made upon the security thereof without the necessity of the execution and delivery of any further instruments on the part of Tenant to effectuate such subordination. Notwithstanding the foregoing or anything in this Lease to the contrary, Tenant's agreement to subordinate its interest under this Lease to a lien or ground lease not in existence as of the Execution Date of this Lease shall be conditioned upon the holder of such lien, or a ground lessor, as applicable, confirming in writing that Tenant's leasehold interest hereunder shall not be disturbed so long as no Default by Tenant exists under this Lease and acknowledging and accepting Tenant's prepayment of Base Rent set forth in Section 7.1.

Landlord represents and warrants to Tenant that as of the Execution Date no deed of trust, mortgage or ground lease exists on the Building or the Project.

30.2 Notwithstanding the foregoing, Tenant shall execute and deliver upon demand such further instrument or instruments evidencing such subordination of this Lease to the lien of any such mortgage or mortgages or deeds of trust or lease in which Landlord is tenant as may be required by Landlord*; provided* such subordination provides the non-disturbance protection for Tenant provided for in Section 30.1. If any such mortgagee, beneficiary or landlord under a lease wherein Landlord is tenant (each, a "**Mortgagee**") so elects, however, this Lease shall be deemed prior in lien to any such lease, mortgage, or deed of trust upon or including the Premises regardless of date and Tenant shall execute a statement in writing to such effect at Landlord's request. If Tenant fails to execute any document required from Tenant under this Section within ten (10) days after written request therefor, Tenant hereby constitutes and appoints Landlord or its special attorney-in-fact to execute and deliver any such document or documents in the name of Tenant. Such power is coupled with an interest and is irrevocable.

30.3 Upon written request of Landlord and opportunity for Tenant to review, Tenant agrees to execute any Lease amendments not materially altering the terms of this Lease, if required by a mortgagee or beneficiary of a deed of trust encumbering real property of which the Premises constitute a part incident to the financing of the real property of which the Premises constitute a part.

30.4 In the event any proceedings are brought for foreclosure, or in the event of the exercise of the power of sale under any mortgage or deed of trust made by Landlord covering the Premises, Tenant shall at the election of the purchaser at such foreclosure or sale attorn to the purchaser upon any such foreclosure or sale and recognize such purchaser as Landlord under this Lease.

31. Defaults and Remedies.

31.1 Late payment by Tenant to Landlord of Rent and other sums due shall cause Landlord to incur costs not contemplated by this Lease, the exact amount of which shall be extremely difficult and impracticable to ascertain. Such costs include processing and accounting charges and late charges that may he imposed on Landlord by the terms of any mortgage or trust deed covering the Premises. Therefore, if any installment of Rent due from Tenant is not received by Landlord within three (3) days after such payment is due, Tenant shall pay to Landlord (a) an additional sum of six percent (6%) of the overdue Rent as a late charge plus (b) interest at an annual rate (the "**Default Rate**") equal to the lesser of (a) twelve percent (12%) and (b) the highest rate permitted by Applicable Laws*; provided* that, during each twelve (12) month period during the Term, the foregoing additional sum and interest at the Default Rate shall not be charged on the first late payment of Rent during the applicable twelve (12) month period unless such payment of rent is not received by Landlord within three (3) days after notice to Tenant that such payment is overdue. The parties agree that this late charge represents a fair and reasonable estimate of the costs that Landlord shall incur by reason of late payment by Tenant and shall be payable as Additional Rent to Landlord due with the next installment of Rent or within five (5) business days after Landlord's demand, whichever is earlier. Landlord's acceptance of any Additional Rent (including a late charge or any other amount hereunder) shall not be deemed an

extension of the date that Rent is due or prevent Landlord from pursuing any other rights or remedies under this Lease, at law or in equity.

31.2 No payment by Tenant or receipt by Landlord of a lesser amount than the Rent payment herein stipulated shall be deemed to be other than on account of the Rent, nor shall any endorsement or statement on any check or any letter accompanying any check or payment as Rent be deemed an accord and satisfaction, and Landlord may accept such check or payment without prejudice to Landlord's right to recover the balance of such Rent or pursue any other remedy provided in this Lease or in equity or at law. If a dispute shall arise as to any amount or sum of money to be paid by Tenant to Landlord hereunder, Tenant shall have the right to make payment "under protest," such payment shall not be regarded as a voluntary payment, and there shall survive the right on the part of Tenant to institute suit for recovery of the payment paid under protest.

31.3 If Tenant fails to pay any sum of money required to be paid by it hereunder, or shall fail to perform any other act on its part to be performed hereunder, in each case within the applicable cure period (if any) described in Section 31.4, then Landlord may, without waiving or releasing Tenant from any obligations of Tenant, but shall not be obligated to, make such payment or perform such act*; provided* that such failure by Tenant unreasonably interfered with the use of the Building or the Project by any other tenant or with the efficient operation of the Building or the Project, or resulted or could have resulted in a violation of Applicable Laws or the cancellation of an insurance policy maintained by Landlord. Notwithstanding the foregoing, in the event of an emergency, Landlord shall have the right to enter the Premises and act in accordance with its rights as provided elsewhere in this Lease. In addition to the late charge described in Section 31.1, Tenant shall pay to Landlord as Additional Rent all sums so paid or incurred by Landlord, together with interest at the Default Rate, computed from the date such sums were paid or incurred.

31.4 The occurrence of any one or more of the following events shall constitute a "Default" hereunder by Tenant:

(a) Tenant abandons the Premises;

(b) Tenant fails to make any payment of Rent, as and when due, or to satisfy its obligations under Article 19, where such failure shall continue for a period of five (5) days after written notice thereof from Landlord to Tenant;

(c) Tenant fails to observe or perform any obligation or covenant contained herein (other than described in Subsections 31.4(a) and 31.4(b)) to be performed by Tenant, where such failure continues for a period of twenty (20) days after written notice thereof from Landlord to Tenant*; provided* that, if the nature of Tenant's default is such that it reasonably requires more than twenty (20) days to cure, Tenant shall not be deemed to be in Default if Tenant commences such cure within said twenty (20) day period and thereafter diligently prosecute the same to completion; and *provided*, *further*, that such cure is completed no later than forty-five (45) days after Tenant's receipt of written notice from Landlord;

(d) Tenant makes an assignment for the benefit of creditors;

(e) A receiver, trustee or custodian is appointed to or does take title, possession or control of all or substantially all of Tenant's assets;

(f) Tenant files a voluntary petition under the United States Bankruptcy Code or any successor statute (as the same may be amended from time to time, the "Bankruptcy Code") or an order for relief is entered against Tenant pursuant to a voluntary or involuntary proceeding commenced under any chapter of the Bankruptcy Code;

(g) Any involuntary petition is filed against Tenant under any chapter of the Bankruptcy Code and is not dismissed within one hundred twenty (120) days;

(h) A default exists under the Convertible Promissory Note or the Side Letter (defined below), after expiration of any applicable notice and cure periods;

(i) Tenant fails to deliver an estoppel certificate in accordance with Article 20; or

(j) Tenant's interest in this Lease is attached, executed upon or otherwise judicially seized and such action is not released within one hundred twenty (120) days of the action.

Notices given under this Section shall specify the alleged default and shall demand that Tenant perform the provisions of this Lease or pay the Rent that is in arrears, as the case may be, within the applicable period of time, or quit the Premises. No such notice shall be deemed a forfeiture or a termination of this Lease unless Landlord elects otherwise in such notice.

31.5 In the event of a Default by Tenant, and at any time thereafter, with or without notice or demand and without limiting Landlord in the exercise of any right or remedy that Landlord may have, Landlord has the right to do any or all of the following:

(a) Halt any Tenant Improvements and Alterations and order Tenant's contractors, subcontractors, consultants, designers and material suppliers to stop work;

(b) Terminate Tenant's right to possession of the Premises by written notice to Tenant or by any lawful means, in which case Tenant shall immediately surrender possession of the Premises to Landlord. In such event, Landlord shall have the immediate right to re-enter and remove all persons and property, and such property may be removed and stored in a public warehouse or elsewhere at the cost and for the account of Tenant, all without service of notice or resort to legal process and without being deemed guilty of trespass or becoming liable for any loss or damage that may be occasioned thereby; and

(c) Terminate this Lease, in which event Tenant shall immediately surrender possession of the Premises to Landlord. In such event, Landlord shall have the immediate right to re-enter and remove all persons and property, and such property may be removed and stored in a public warehouse or elsewhere at the cost and for the account of Tenant, all without service of notice or resort to legal process and without being deemed guilty of trespass or becoming liable

for any loss or damage that may be occasioned thereby. In the event that Landlord shall elect to so terminate this Lease, then Landlord shall be entitled to recover from Tenant all damages incurred by Landlord by reason of Tenant's Default, including:

(i) The worth at the time of award of any unpaid Rent that had accrued at the time of such termination; plus

(ii) The worth at the time of award of the amount by which the unpaid Rent that would have accrued during the period commencing with termination of the Lease and ending at the time of award exceeds that portion of the loss of Landlord's rental income from the Premises that Tenant proves to Landlord's reasonable satisfaction could have been reasonably avoided; plus

(iii) The worth at the time of award of the amount by which the unpaid Rent for the balance of the Term after the time of award exceeds that portion of the loss of Landlord's rental income from the Premises that Tenant proves to Landlord's reasonable satisfaction could have been reasonably avoided; plus

(iv) Any other amount necessary to compensate Landlord for all the detriment caused by Tenant's failure to perform its obligations under this Lease or that in the ordinary course of things would be likely to result therefrom, including the cost of restoring the Premises to the condition required under the terms of this Lease, including any rent payments not otherwise chargeable to Tenant (e.g., during any "free" rent period or rent holiday); plus

(v) At Landlord's election, such other amounts in addition to or in lieu of the foregoing as may be permitted from time to time by Applicable Laws.

As used in Subsections 31.5(c)(i) and 31.5(c)(ii), "worth at the time of award" shall be computed by allowing interest at the Default Rate. As used in Subsection 31.5(c)(iii), the "worth at the time of the award" shall be computed by taking the present value of such amount, using the discount rate of the Federal Reserve Bank of San Francisco at the time of the award plus one (1) percentage point.

31.6 In addition to any other remedies available to Landlord at law or in equity and under this Lease, Landlord shall have the remedy described in California Civil Code Section 1951.4 and may continue this Lease in effect after Tenant's Default and abandonment and recover Rent as it becomes due, *provided* Tenant has the right to sublet or assign, subject only to reasonable limitations. In addition, Landlord shall not be liable in any way whatsoever for its failure or refusal to relet the Premises. For purposes of this Section, the following acts by Landlord will not constitute the termination of Tenant's right to possession of the Premises:

(a) Acts of maintenance or preservation or efforts to relet the Premises, including alterations, remodeling, redecorating, repairs, replacements or painting as Landlord shall consider advisable for the purpose of reletting the Premises or any part thereof; or

(b) The appointment of a receiver upon the initiative of Landlord to protect Landlord's interest under this Lease or in the Premises.

Notwithstanding the foregoing, in the event of a Default by Tenant, Landlord may elect at any time to terminate this Lease and to recover damages to which Landlord is entitled.

31.7 If Landlord does not elect to terminate this Lease as provided in Section 31.5, then Landlord may, from time to time, recover all Rent as it becomes due under this Lease. At any time thereafter, Landlord may elect to terminate this Lease and to recover damages to which Landlord is entitled.

31.8 In the event Landlord elects to terminate this Lease and relet the Premises, Landlord may execute any new lease in its own name. Tenant hereunder shall have no right or authority whatsoever to collect any Rent from such tenant. The proceeds of any such reletting shall be applied as follows:

(a) First, to the payment of any indebtedness other than Rent due hereunder from Tenant to Landlord, including storage charges or brokerage commissions owing from Tenant to Landlord as the result of such reletting;

(b) Second, to the payment of the costs and expenses of reletting the Premises, including (i) alterations and repairs that Landlord deems reasonably necessary and advisable and (ii) reasonable attorneys' fees, charges and disbursements incurred by Landlord in connection with the retaking of the Premises and such reletting;

(c) Third, to the payment of Rent and other charges due and unpaid hereunder; and

(d) Fourth, to the payment of future Rent and other damages payable by Tenant under this Lease.

31.9 All of Landlord's rights, options and remedies hereunder shall be construed and held to be nonexclusive and cumulative. Landlord shall have the right to pursue any one or all of such remedies, or any other remedy or relief that may be provided by Applicable Laws, whether or not stated in this Lease. No waiver of any default of Tenant hereunder shall be implied from any acceptance by Landlord of any Rent or other payments due hereunder or any omission by Landlord to take any action on account of such default if such default persists or is repeated, and no express waiver shall affect defaults other than as specified in said waiver.

31.10 Landlord's termination of (a) this Lease or (b) Tenant's right to possession of the Premises shall not relieve Tenant of any liability to Landlord that has previously accrued or that shall arise based upon events that occurred prior to the later to occur of (i) the date of Lease termination or (ii) the date Tenant surrenders possession of the Premises.

31.11 To the extent permitted by Applicable Laws, Tenant waives any and all rights of redemption granted by or under any present or future Applicable Laws if Tenant is evicted or dispossessed for any cause, or if Landlord obtains possession of the Premises due to Tenant's default hereunder or otherwise.

31.12 Landlord shall not be in default or liable for damages under this Lease unless Landlord fails to perform obligations required of Landlord within a reasonable time, but in no event shall such failure continue for more than thirty (30) days after written notice from Tenant specifying the nature of Landlord's failure; *provided*, *however*, that if the nature of Landlord's obligation is such that more than thirty (30) days are required for its performance, then Landlord shall not be in default if Landlord commences performance within such thirty (30) day period and thereafter diligently prosecutes the same to completion. In no event shall Tenant have the right to terminate or cancel this Lease or to withhold or abate rent or to set off any Claims against Rent as a result of any default or breach by Landlord of any of its covenants, obligations, representations, warranties or promises hereunder, except as may otherwise be expressly set forth in this Lease. Nothing in this Lease shall be construed to limit Tenant's remedies in the event Tenant brings a lawsuit for any default by Landlord, in which case Tenant may pursue any remedies available at law or in equity (*provided* that Tenant's recourse will be limited by Article 35 and the other terms and provisions of this Lease).

31.13 In the event of any default by Landlord, Tenant shall give notice by registered or certified mail to any (a) beneficiary of a deed of trust or (b) mortgagee under a mortgage covering the Premises, the Building or the Project and to any landlord of any lease of land upon or within which the Premises, the Building or the Project is located, and shall offer such beneficiary, mortgagee or landlord a reasonable opportunity to cure the default, including time to obtain possession of the Building or the Project by power of sale or a judicial action if such should prove necessary to effect a cure; *provided* that Landlord shall furnish to Tenant in writing, upon written request by Tenant, the names and addresses of all such persons who are to receive such notices.

32. Bankruptcy. In the event a debtor, trustee or debtor in possession under the Bankruptcy Code, or another person with similar rights, duties and powers under any other Applicable Laws, proposes to cure any default under this Lease or to assume or assign this Lease and is obliged to provide adequate assurance to Landlord that (a) a default shall be cured, (b) Landlord shall be compensated for its damages arising from any breach of this Lease and (c) future performance of Tenant's obligations under this Lease shall occur, then such adequate assurances shall include any or all of the following, as designated by Landlord in its sole and absolute discretion:

32.1 Those acts specified in the Bankruptcy Code or other Applicable Laws as included within the meaning of "adequate assurance," even if this Lease does not concern a shopping center or other facility described in such Applicable Laws;

32.2 A prompt cash payment to compensate Landlord for any monetary defaults or actual damages arising directly from a breach of this Lease;

32.3 A cash deposit in an amount at least equal to the then-current amount of the Security Deposit; or

32.4 The assumption or assignment of all of Tenant's interest and obligations under this Lease.

33. Brokers.

33.1 Tenant represents and warrants that it has had no dealings with any real estate broker or agent in connection with the negotiation of this Lease other than Hughes Marino ("Broker"), and that it knows of no other real estate broker or agent that is or might be entitled to a commission in connection with this Lease. Landlord shall compensate Broker in relation to this Lease pursuant to a separate agreement between Landlord and Broker.

33.2 Tenant represents and warrants that no broker or agent has made any representation or warranty relied upon by Tenant in Tenant's decision to enter into this Lease, other than as contained in this Lease.

33.3 Tenant acknowledges and agrees that the employment of brokers by Landlord is for the purpose of solicitation of offers of leases from prospective tenants and that no authority is granted to any broker to furnish any representation (written or oral) or warranty from Landlord unless expressly contained within this Lease. Landlord is executing this Lease in reliance upon Tenant's representations, warranties and agreements contained within Sections 33.1 and 33.2.

33.4 Tenant agrees to indemnify, save, defend (at Landlord's option and with counsel reasonably acceptable to Landlord) and hold the Landlord Indemnitees harmless from any and all cost or liability for compensation claimed by any broker or agent, other than Broker, employed or engaged by Tenant or claiming to have been employed or engaged by Tenant.

34. Definition of Landlord. With regard to obligations imposed upon Landlord pursuant to this Lease, the term "Landlord," as used in this Lease, shall refer only to Landlord or Landlord's then-current successor-in-interest. In the event of any transfer, assignment or conveyance of Landlord's interest in this Lease or in Landlord's fee title to or leasehold interest in the Property, as applicable, Landlord herein named (and in case of any subsequent transfers or conveyances, the subsequent Landlord) shall be automatically freed and relieved, from and after the date of such transfer, assignment or conveyance, from all liability for the performance of any covenants or obligations contained in this Lease thereafter to be performed by Landlord and, without further agreement, the transferee, assignee or conveyee of Landlord's in this Lease or in Landlord's fee title to or leasehold interest in the Property, as applicable, shall be deemed to have assumed and agreed to observe and perform any and all covenants and obligations of Landlord hereunder during the tenure of its interest in the Lease or the Property. Landlord or any subsequent Landlord may transfer its interest in the Premises or this Lease without Tenant's consent.

35. Limitation of Landlord's Liability.

35.1 If Landlord is in default under this Lease and, as a consequence, Tenant recovers a monetary judgment against Landlord, the judgment shall be satisfied only out of (a) the proceeds of sale received on execution of the judgment and levy against the right, title and interest of Landlord in the Building and the Project, (b) rent or other income from such real property receivable by Landlord or (c) the consideration received by Landlord from the sale, financing, refinancing or other disposition of all or any part of Landlord's right, title or interest in the Building or the Project.

35.2 Except as otherwise provided in Section 35.1, Landlord shall not be personally liable for any deficiency under this Lease. If Landlord is a partnership or joint venture, then the partners of such partnership shall not be personally liable for Landlord's obligations under this Lease, and no partner of Landlord shall be sued or named as a party in any suit or action, and service of process shall not be made against any partner of Landlord except as may be necessary to secure jurisdiction of the partnership or joint venture. If Landlord is a corporation, then the shareholders, directors, officers, employees and agents of such corporation shall not be personally liable for Landlord's obligations under this Lease, and no shareholder, director, officer, employee or agent of Landlord shall be sued or named as a party in any suit or action, and service of process shall not be made against any shareholder, director, officer, employee or agent of Landlord. If Landlord is a limited liability company, then the members of such limited liability company shall not be personally liable for Landlord's obligations under this Lease, and no member of Landlord shall be sued or named as a party in any suit or action, and service of process shall not be made against any member of Landlord except as may be necessary to secure jurisdiction of the limited liability company. No partner, shareholder, director, employee, member or agent of Landlord shall be required to answer or otherwise plead to any service of process, and no judgment shall be taken or writ of execution levied against any partner, shareholder, director, employee, member or agent of Landlord.

35.3 Each of the covenants and agreements of this Article shall be applicable to any covenant or agreement either expressly contained in this Lease or imposed by Applicable Laws and shall survive the expiration or earlier termination of this Lease.

36. Joint and Several Obligations. If more than one person or entity executes this Lease as Tenant, then:

36.1 Each of them is jointly and severally liable for the keeping, observing and performing of all of the terms, covenants, conditions, provisions and agreements of this Lease to be kept, observed or performed by Tenant; and

36.2 The term "**Tenant**," as used in this Lease shall mean and include each of them, jointly and severally. The act of, notice from, notice to, refund to, or signature of any one or more of them with respect to the tenancy under this Lease, including any renewal, extension, expiration, termination or modification of this Lease, shall be binding upon each and all of the persons executing this Lease as Tenant with the same force and effect as if each and all of them had so acted, so given or received such notice or refund, or so signed.

37. Representations. Tenant guarantees, warrants and represents that (a) Tenant is duly incorporated or otherwise established or formed and validly existing under the laws of its state of incorporation, establishment or formation, (b) Tenant has and is duly qualified to do business in the state in which the Property is located, (c) Tenant has full corporate, partnership, trust, association or other appropriate power and authority to enter into this Lease and to perform all Tenant's obligations hereunder, (d) each person (and all of the persons if more than one signs) signing this Lease on behalf of Tenant is duly and validly authorized to do so and (e) neither (i) the execution, delivery or performance of this Lease nor (ii) the consummation of the transactions contemplated hereby will violate or conflict with any provision of documents or instruments under which Tenant is constituted or to which Tenant is a party. In addition, Tenant

guarantees, warrants and represents that none of (x) it, (y) its affiliates or partners nor (z) to the best of its knowledge, its members, shareholders or other equity owners or any of their respective employees, officers, directors, representatives or agents is a person or entity with whom U.S. persons or entities are restricted from doing business under regulations of the Office of Foreign Asset Control ("**OFAC**") of the Department of the Treasury (including those named on OFAC's Specially Designated and Blocked Persons List) or under any statute, executive order (including the September 24, 2001, Executive Order Blocking Property and Prohibiting Transactions with Persons Who Commit, Threaten to Commit, or Support Terrorism) or other similar governmental action.

38. Confidentiality. Each party shall keep the terms and conditions of this Lease and any information provided to such party or its employees, agents or contractors pursuant to Article 9 confidential and shall not (a) disclose to any third party any terms or conditions of this Lease or any other Lease-related document (including subleases, assignments, work letters, construction contracts, letters of credit, subordination agreements, non-disturbance agreements, brokerage agreements or estoppels) or (b) provide to any third party an original or copy of this Lease (or any Lease-related document). Landlord shall keep confidential the economic and commercial terms and conditions of this Lease and all proprietary, business and technical information of Tenant obtained by Landlord; *provided*, *however*, that Landlord may disclose such information in the form of aggregate leasing data provided to investors in the normal course of business. Notwithstanding the foregoing, confidential information under this Section may be released by Landlord or Tenant under the following circumstances: (x) if required by Applicable Laws or in any judicial proceeding; *provided* that the releasing party has given the other party reasonable notice of such requirement, if feasible, (y) to a party's attorneys, accountants, brokers and other bona fide consultants or advisers (with respect to this Lease only); *provided* such third parties agree to be bound by this Section or (z) to bona fide prospective assignees or subtenants of this Lease; *provided* they agree in writing to be bound by this Section.

39. Notices. Any notice, consent, demand, bill, statement or other communication required or permitted to be given hereunder shall be in writing and shall be given by personal delivery, overnight delivery with a reputable nationwide overnight delivery service, or certified mail (return receipt requested), and if given by personal delivery, shall be deemed delivered upon receipt; if given by overnight delivery, shall be deemed delivered one (1) business day after deposit with a reputable nationwide overnight delivery service; and, if given by certified mail (return receipt requested), shall be deemed delivered three (3) business days after the time the notifying party deposits the notice with the United States Postal Service. Any notices given pursuant to this Lease shall be addressed to Tenant at the Premises, or to Landlord or Tenant at the addresses shown in Sections 2.9 and 2.10, respectively. Either party may, by notice to the other given pursuant to this Section, specify additional or different addresses for notice purposes.

40. Intentionally Omitted.

41. Miscellaneous.

41.1 Landlord reserves the right to change the name of the Building or the Project in its sole discretion.

41.2 To induce Landlord to enter into this Lease, Tenant agrees that it shall promptly furnish to Landlord, from time to time, upon Landlord's written request, the most recent year-end financial statements reflecting Tenant's current financial condition audited by a nationally recognized accounting firm. Tenant shall, within ninety (90) days after the end of Tenant's financial year, furnish Landlord with a certified copy of Tenant's year-end financial statements for the previous year audited by a nationally recognized accounting firm. Tenant represents and warrants that all financial statements, records and information furnished by Tenant to Landlord in connection with this Lease are true, correct and complete in all respects. If audited financials are not otherwise prepared, unaudited financials complying with generally accepted accounting principles and certified by the chief financial officer of Tenant as true, correct and complete in all respects shall suffice for purposes of this Section.

41.3 Where applicable in this Lease, the singular includes the plural and the masculine or neuter includes the masculine, feminine and neuter. The words "include," "includes," "included" and "including" shall mean "'include,' etc., without limitation." The section headings of this Lease are not a part of this Lease and shall have no effect upon the construction or interpretation of any part hereof.

41.4 If either party commences an action against the other party arising out of or in connection with this Lease, then the substantially prevailing party shall be reimbursed by the other party for all reasonable costs and expenses, including reasonable attorneys' fees and expenses, incurred by the substantially prevailing party in such action or proceeding and in any appeal in connection therewith.

41.5 Submission of this instrument for examination or signature by Tenant does not constitute a reservation of or option for a lease, and shall not be effective as a lease or otherwise until execution by and delivery to both Landlord and Tenant.

41.6 Time is of the essence with respect to the performance of every provision of this Lease in which time of performance is a factor.

41.7 [Intentionally Omitted]

41.8 Whenever consent or approval of either party is required, that party shall not unreasonably withhold such consent or approval, except as may be expressly set forth to the contrary.

41.9 The terms of this Lease are intended by the parties as a final expression of then-agreement with respect to the terms as are included herein, and may not be contradicted by evidence of any prior or contemporaneous agreement.

41.10 Any provision of this Lease that shall prove to be invalid, void or illegal shall in no way affect, impair or invalidate any other provision hereof, and all other provisions of this Lease shall remain in full force and effect and shall be interpreted as if the invalid, void or illegal provision did not exist.

41.11 Landlord may, but shall not be obligated to, record a short form or memorandum hereof without Tenant's consent. Within ten (10) days after receipt of written request from Landlord, Tenant shall execute a termination of any short form or memorandum of lease recorded with respect hereto. Neither party shall record this Lease. The party requesting the recording of any short form or memorandum of this Lease shall be responsible for such cost, including any transfer or other taxes incurred in connection with said recordation.

41.12 The language in all parts of this Lease shall be in all cases construed as a whole according to its fair meaning and not strictly for or against either Landlord or Tenant.

41.13 Each of the covenants, conditions and agreements herein contained shall inure to the benefit of and shall apply to and be binding upon the parties hereto and their respective heirs; legatees; devisees; executors; administrators; and permitted successors, assigns and sublessees. Nothing in this Section shall in any way alter the provisions of this Lease restricting assignment or subletting.

41.14 Except for BioMed Realty, L.P., who is an intended third-party beneficiary of this Lease, this Lease is solely for the benefit of the parties hereto and their respective successors and permitted assigns and this Lease shall not otherwise be deemed to confer upon or give to any other third party any right, claim, cause of action or other interest herein.

41.15 This Lease shall be governed by, construed and enforced in accordance with the laws of the state in which the Premises are located, without regard to such state's conflict of law principles.

41.16 Tenant guarantees, warrants and represents that the individual or individuals signing this Lease have the power, authority and legal capacity to sign this Lease on behalf of and to bind all entities, corporations, partnerships, limited liability companies, joint venturers or other organizations and entities on whose behalf said individual or individuals have signed.

41.17 This Lease may be executed in one or more counterparts, each of which, when taken together, shall constitute one and the same document.

41.18 No provision of this Lease may be modified, amended or supplemented except by an agreement in writing signed by Landlord and Tenant. The waiver by Landlord or Tenant of any breach by the other party of any term, covenant or condition herein contained shall not be deemed to be a waiver of any subsequent breach of the same or any other term, covenant or condition herein contained.

41.19 To the extent permitted by Applicable Laws, the parties waive trial by jury in any action, proceeding or counterclaim brought by the other party hereto related to matters arising out of or in any way connected with this Lease; the relationship between Landlord and Tenant; Tenant's use or occupancy of the Premises; or any claim of injury or damage related to this Lease or the Premises.

42. Option to Extend Term. Tenant shall have the option ("Option") to extend the Term by five (5) years as to the entire Premises (and no less than the entire Premises) upon the following

terms and conditions. Any extension of the Term pursuant to the Option shall be on all the same terms and conditions as this Lease, except as follows:

42.1 Base Rent and increases of Base Rent during the Option term shall equal the fair market value ("FMV"). If Landlord and Tenant cannot agree on the FMV within thirty (30) days after Landlord's receipt of an Option Notice (as defined below), they shall mutually agree on a third party real estate broker with at least ten (10) years' experience in the leasing of life science properties in the San Diego, California, area, who shall determine the FMV, which determination shall be binding on Landlord and Tenant. Landlord and Tenant shall each pay one-half (1/2) of the cost of the broker. FMV shall be defined as the amount of rent that a well-informed tenant, willing (but not obliged) to lease the Premises, would pay, and that a well-informed landlord, willing (but not obliged) to lease to a tenant, would accept, taking into consideration (y) all uses to which the Premises are adapted and might in reason be applied and (z) the then-market terms being offered in the Torrey Pines submarket for premises reasonably comparable to the Premises.

42.2 The Option is not assignable separate and apart from this Lease.

42.3 The Option is conditional upon Tenant giving Landlord written notice of its election to exercise the Option at least nine (9) months prior to the end of the expiration of the then-current Term. Time shall be of the essence as to Tenant's exercise of the Option. Tenant assumes full responsibility for maintaining a record of the deadlines to exercise the Option. Tenant acknowledges that it would be inequitable to require Landlord to accept any exercise of the Option after the date provided for in this Section.

42.4 Notwithstanding anything contained in this Article to the contrary, Tenant shall not have the right to exercise the Option:

(a) During the time commencing from the date Landlord delivers to Tenant a written notice that Tenant is in default under any provisions of this Lease and continuing until Tenant has cured the specified default to Landlord's reasonable satisfaction; or

(b) At any time after any Default as described in Article 31 of the Lease (*provided*, *however*, that, for purposes of this Subsection 42.4(b), Landlord shall not be required to provide Tenant with notice of such Default) and continuing until Tenant cures any such Default, if such Default is susceptible to being cured; or

(c) In the event that Tenant has defaulted in the performance of its obligations under this Lease two (2) or more times and a service or late charge has become payable under Section 31.1 for each of such defaults during the twelve (12)-month period immediately prior to the date that Tenant intends to exercise the Option, whether or not Tenant has cured such defaults.

42.5 The period of time within which Tenant may exercise the Option shall not be extended or enlarged by reason of Tenant's inability to exercise such Option because of the provisions of Section 42.4.

42.6 All of Tenant's rights under the provisions of the Option shall terminate and be of no further force or effect even after Tenant's due and timely exercise of the Option if, after such exercise, but prior to the commencement date of the new term, (a) Tenant fails to pay to Landlord a monetary obligation of Tenant for a period of twenty (20) days after written notice from Landlord to Tenant, (b) Tenant fails to commence to cure a default (other than a monetary default) within thirty (30) days after the date Landlord gives notice to Tenant of such default or (c) Tenant has defaulted under this Lease two (2) or more times and a service or late charge under Section 31.1 has become payable for any such default, whether or not Tenant has cured such defaults.

43. Investment Rights of BioMed Realty, L.P.. In accordance and subject to the terms and conditions set forth in that certain side letter by and between BioMed Realty, L.P. and Tenant dated December 22, 2011 (the "**Side Letter**"), BioMed Realty, L.P. shall have certain participation rights in a future equity financing of Tenant and may have certain Board observer rights, which Board observer rights are subject to the approval of Tenant's Board of Directors.

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IN WITNESS WHEREOF, the parties hereto have executed this Lease as of the date first above written.

LANDLORD:

BMR-JOHN HOPKINS COURT LLC,
a Delaware limited liability company

By: /s/ Kevin M. Simonsen
Name: Kevin M. Simonsen
Title: VP, Real Estate Counsel

TENANT:

ATYR PHARMA, INC.,
a Delaware corporation

By: /s/ Andrew Cubitt
Name: Andrew Cubitt
Title: VP, Intellectual Property

EXHIBIT A

PREMISES

A-1

EXHIBIT B

WORK LETTER

This Work Letter (this "Work Letter") is made and entered into as of the 22nd day of December, 2011, by and between BMR-John Hopkins Court LLC, a Delaware limited liability company ("Landlord"), and aTyr Pharma, Inc., a Delaware corporation ("Tenant"), and is attached to and made a part of that certain Lease dated as of December 22, 2011 (as the same may be amended, amended and restated, supplemented or otherwise modified from time to time, the "Lease"), by and between Landlord and Tenant for the Premises located at 3545 John Hopkins Court, San Diego, California 92121. All capitalized terms used but not otherwise defined herein shall have the meanings given them in the Lease.

1. General Requirements.

1.1. Authorized Representatives.

(a) Landlord designates, as Landlord's authorized representative ("Landlord's Authorized Representative"), (a) Federico Mina as the person authorized to initial plans, drawings and approvals pursuant to this Work Letter and (b) John Bonanno as the person authorized to initial plans, drawings, approvals and to sign change orders pursuant to this Work Letter and any amendments to this Work Letter or the Lease. Tenant shall not be obligated to respond to or act upon any such item until such item has been initialed or signed (as applicable) by the appropriate Landlord's Authorized Representative. Landlord may change either Landlord's Authorized Representative upon one (1) business day's prior written notice to Tenant.

(b) Tenant designates both Debbie Walker and Dean Petersen (each, a "Tenant's Authorized Representative") acting individually as the individuals authorized to initial and sign all plans, drawings, change orders and approvals pursuant to this Work Letter. Landlord shall not be obligated to respond to or act upon any such item until such item has been initialed or signed (as applicable) by Tenant's Authorized Representative. Tenant may change Tenant's Authorized Representative upon one (1) business day's prior written notice to Landlord.

1.2. Schedule. The schedule for design and development of the Tenant Improvements, including the time periods for preparation and review of construction documents, approvals and performance, shall be in accordance with the schedule attached hereto as Exhibit 1 (the "Schedule"). The Schedule shall be subject to adjustment as mutually agreed upon in writing by the parties, or as otherwise provided in this Work Letter.

1.3. Landlord's Architects, Contractors and Consultants. The architect, engineering consultants, design team, general contractor and subcontractors responsible for the construction of the Tenant Improvements shall be Ferguson Pape Baldwin Architects, Prevost Construction, Apex Mechanical and Ickler Electric, and Landlord shall use commercially reasonable efforts to obtain market competitive rates from such parties in connection with the design, development and construction of the Tenant Improvements.

2. Tenant Improvements. All Tenant Improvements shall be performed by Landlord's contractor ("Contractor"), at Tenant's sole cost and expense (subject to Landlord's obligations with respect to any portion of the Base TI Allowance and, if properly requested by Tenant pursuant to the terms of the Lease, the Additional TI Allowance used by Landlord in completing the Tenant Improvements) and in substantial accordance with the Approved Plans (as defined below), the Lease and this Work Letter. To the extent that the total projected cost of the Tenant Improvements (as projected by Landlord) exceeds the TI Allowance (such excess, the "Excess TI Costs") and Tenant agrees with Landlord's projection and has been given opportunity to value engineer the project to a total that is at or below the TI Allowance, if desired, (provided that Tenant's opportunity to value engineer the project shall end on January 6, 2012), Tenant shall pay the costs of the Tenant Improvements on a pari passu basis with Landlord as such costs become due, in the proportion of Excess TI Costs payable by Tenant to the Base TI Allowance (and, if properly requested by Tenant pursuant to the Lease, the Additional TI Allowance) payable by Landlord. If Tenant fails to pay, or is late in paying, any sum due to Landlord under this Work Letter, then Landlord shall have all of the rights and remedies set forth in the Lease for nonpayment of Rent (including the right to interest and the right to assess a late charge), and for purposes of any litigation instituted with regard to such amounts the same shall be considered Rent. All material and equipment furnished by Landlord or its contractors as the Tenant Improvements shall be new or "like new," and the Tenant Improvements shall be performed in a first-class, workmanlike manner. Landlord and Tenant shall use commercially reasonable efforts to cooperate with each other to enforce any and all warranties from the Contractor with respect to the Tenant Improvements. Landlord warrants that, as of Substantial Completion of the Tenant Improvements, the Tenant Improvements shall be in compliance with all Applicable Laws, and Landlord shall, at its sole cost and expense and as Tenant's sole remedy, correct any breach of such warranty promptly following receipt of written notice thereof from Tenant.

2.1. Work Plans. Landlord shall prepare and submit to Tenant for approval schematics covering the Tenant Improvements prepared in conformity with the applicable provisions of this Work Letter (the "Draft Schematic Plans"). The Draft Schematic Plans shall contain sufficient information and detail to accurately describe the proposed design to Tenant. Tenant shall notify Landlord in writing within five (5) days after receipt of the Draft Schematic Plans whether Tenant approves or objects to the Draft Schematic Plans and of the manner, if any, in which the Draft Schematic Plans are unacceptable. Tenant's failure to respond within such five (5) day period shall be deemed approval by Tenant. If Tenant reasonably objects to the Draft Schematic Plans, then Landlord shall revise the Draft Schematic Plans and cause Tenant's objections to be remedied in the revised Draft Schematic Plans. Landlord shall then resubmit the revised Draft Schematic Plans to Tenant for approval, such approval not to be unreasonably withheld, conditioned or delayed. Tenant's approval of or objection to revised Draft Schematic Plans and Landlord's correction of the same shall be in accordance with this Section until Tenant has approved the Draft Schematic Plans in writing or been deemed to have approved them. The iteration of the Draft Schematic Plans that is approved or deemed approved by Tenant without objection shall be referred to herein as the "Approved Schematic Plans." In the event that Draft Schematic Plans are not approved by Tenant in accordance with this Section on or before the Execution Date, then, notwithstanding anything in the Lease or this Work Letter to the contrary, Landlord shall be entitled to a day-for-day delay for every day after such date until Draft Schematic Plans are approved by Tenant in accordance with this Section.

2.2. Construction Plans. Landlord shall prepare final plans and specifications for the Tenant Improvements that (a) are consistent with and are logical evolutions of the Approved Schematic Plans and (b) incorporate any other Tenant-requested (and Landlord-approved) Changes (as defined below). As soon as such final plans and specifications ("Construction Plans") are completed, Landlord shall deliver the same to Tenant for Tenant's approval, which approval shall not be unreasonably withheld, conditioned or delayed. Such Construction Plans shall be approved or disapproved by Tenant within five (5) days after delivery to Tenant. Tenant's failure to respond within such five (5) day period shall be deemed approval by Tenant. If the Construction Plans are disapproved by Tenant, then Tenant shall notify Landlord in writing of its reasonable objections to such Construction Plans, and the parties shall confer and negotiate in good faith to reach agreement on the Construction Plans. Promptly after the Construction Plans are approved by Landlord and Tenant, two (2) copies of such Construction Plans shall be initialed and dated by Landlord and Tenant, and Landlord shall promptly submit such Construction Plans to all appropriate Governmental Authorities for approval. The Construction Plans so approved, and all change orders specifically permitted by this Work Letter, are referred to herein as the "Approved Plans."

2.3. Changes to the Tenant Improvements. Any changes to the Approved Plans (each, a "Change") shall be requested and instituted in accordance with the provisions of this Article 2 and shall be subject to the written approval of the non-requesting party in accordance with this Work Letter.

(a) Change Request. Either Landlord or Tenant may request Changes after Tenant approves the Approved Plans by notifying the other party thereof in writing in substantially the same form as the AIA standard change order form (a "Change Request"), which Change Request shall detail the nature and extent of any requested Changes, including (a) the Change, (b) the party required to perform the Change and (c) any modification of the Approved Plans and the Schedule, as applicable, necessitated by the Change, If the nature of a Change requires revisions to the Approved Plans, then the requesting party shall be solely responsible for the cost and expense of such revisions and any increases in the cost of the Tenant Improvements as a result of such Change; *provided* that if any funds remain available from the Base TI Allowance following Substantial Completion of the Tenant Improvements, then such funds shall be used to pay for the cost of such Change. Change Requests shall be signed by the requesting party's Authorized Representative.

(b) Approval of Changes. All Change Requests shall be subject to the other party's prior written approval, which approval shall not be unreasonably withheld, conditioned or delayed. The non-requesting party shall have five (5) business days after receipt of a Change Request to notify the requesting party in writing of the non-requesting party's decision either to approve or object to the Change Request. The non-requesting party's failure to respond within such five (5) business day period shall be deemed approval by the non-requesting party.

3. Requests for Consent. Except as otherwise provided in this Work Letter, Tenant shall respond to all requests for consents, approvals or directions made by Landlord pursuant to this Work Letter within five (5) days following Tenant's receipt of such request. Tenant's failure to respond within such five (5) day period shall be deemed approval by Tenant.

4. TI Allowance.

4.1. Application of TI Allowance. Landlord shall contribute, in the following order, the Base TI Allowance; if properly requested by Tenant pursuant to the terms of the Lease, the Additional TI Allowance; and any Excess TI Costs advanced by Tenant to Landlord toward the costs and expenses incurred in connection with the performance of the Tenant Improvements, in accordance with Article 4 of the Lease. If the entire TI Allowance is not applied toward or reserved for the costs of the Tenant Improvements, then Tenant shall not be entitled to a credit of such unused portion of the TI Allowance. If the entire Excess TI Costs advanced by Tenant to Landlord are not applied toward the costs of the Tenant Improvements, then Landlord shall promptly return such excess to Tenant following completion of the Tenant Improvements. Tenant may apply the Base TI Allowance and, if properly requested by Tenant pursuant to the terms of the Lease, the Additional TI Allowance for the payment of construction and other costs in accordance with the terms and provisions of the Lease.

4.2. Approval of Budget for the Tenant Improvements. Notwithstanding anything to the contrary set forth elsewhere in this Work Letter or the Lease, Landlord shall not have any obligation to expend any portion of the TI Allowance until Landlord and Tenant shall have approved in writing the budget for the Tenant Improvements (the "Approved Budget"), which Landlord shall provide as soon as commercially reasonable following full execution of the Lease. Prior to Landlord's approval of the Approved Budget, Tenant shall pay all of the costs and expenses incurred in connection with the Tenant Improvements as they become due and Landlord shall promptly reimburse Tenant for any such costs and expenses reflected in and upon the mutual approval of the Approved Budget. Tenant shall promptly reimburse Landlord for costs or expenses relating to the Tenant Improvements that exceed the amount of the TI Allowance.

5. Miscellaneous.

5.1. Number; Headings. Where applicable in this Work Letter, the singular includes the plural and the masculine or neuter includes the masculine, feminine and neuter. The section headings of this Work Letter are not a part of this Work Letter and shall have no effect upon the construction or interpretation of any part hereof.

5.2. Attorneys' Fees. If either party commences an action against the other party arising out of or in connection with this Work Letter, then the substantially prevailing party shall be entitled to have and recover from the other party reasonable attorneys' fees, charges and disbursements and costs of suit.

5.3. Time of Essence. Time is of the essence with respect to the performance of every provision of this Work Letter in which time of performance is a factor.

5.4. Covenant and Condition. Each provision of this Work Letter performable by Tenant shall be deemed both a covenant and a condition.

5.5. Withholding of Consent. Whenever consent or approval of either party is required, that party shall not unreasonably withhold, condition or delay such consent or approval, except as may be expressly set forth to the contrary.

5.6. Invalidity. Any provision of this Work Letter that shall prove to be invalid, void or illegal shall in no way affect, impair or invalidate any other provision hereof, and all other provisions of this Work Letter shall remain in full force and effect and shall be interpreted as if the invalid, void or illegal provision did not exist.

5.7. Interpretation. The language in all parts of this Work Letter shall be in all cases construed as a whole according to its fair meaning and not strictly for or against either Landlord or Tenant.

5.8. Successors. Each of the covenants, conditions and agreements herein contained shall inure to the benefit of and shall apply to and be binding upon the parties hereto and their respective heirs; legatees; devisees; executors; administrators; and permitted successors, assigns, sublessees. Nothing in this Section shall in any way alter the provisions of the Lease restricting assignment or subletting.

5.9. Governing Law. This Work Letter shall be governed by, construed and enforced in accordance with the laws of the state in which the Premises are located, without regard to such state's conflict of law principles.

5.10. Power and Authority. Tenant guarantees, warrants and represents that the individual or individuals signing this Work Letter have the power, authority and legal capacity to sign this Work Letter on behalf of and to bind all entities, corporations, partnerships, limited liability companies, joint venturers or other organizations and entities on whose behalf said individual or individuals have signed.

5.11. Counterparts. This Work Letter may be executed in one or more counterparts, each of which, when taken together, shall constitute one and the same document.

5.12. Amendments; Waiver. No provision of this Work Letter may be modified, amended or supplemented except by an agreement in writing signed by Landlord and Tenant. The waiver by Landlord of any breach by Tenant of any term, covenant or condition herein contained shall not be deemed to be a waiver of any subsequent breach of the same or any other term, covenant or condition herein contained.

5.13. Waiver of Jury Trial. To the extent permitted by Applicable Laws, the parties waive trial by jury in any action, proceeding or counterclaim brought by the other party hereto related to matters arising out of or in any way connected with this Work Letter; the relationship between Landlord and Tenant; Tenant's use or occupancy of the Premises; or any claim of injury or damage related to this Work Letter or the Premises.

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF, Landlord and Tenant have executed this Work Letter to be effective on the date first above written.

LANDLORD:

BMR-JOHN HOPKINS COURT LLC,
a Delaware limited liability company

By: /s/ Kevin M. Simonsen
Name: Kevin M. Simonsen
Title: VP, Real Estate Counsel

TENANT:

ATYR PHARMA, INC.,
a Delaware corporation

By: /s/ Andrew Cubitt
Name: Andrew Cubitt
Title: VP, Intellectual Property

SCHEDULE

EXHIBIT C

ACKNOWLEDGEMENT OF TERM COMMENCEMENT DATE
AND TERM EXPIRATION DATE

THIS ACKNOWLEDGEMENT OF [PHASE 1] [PHASE 2] TERM COMMENCEMENT DATE AND TERM EXPIRATION DATE is entered into as of [ ], 2012, with reference to that certain Lease (the "Lease") dated as of December [ ], 2011, by aTyr Pharma, Inc., a Delaware corporation ("Tenant"), in favor of BMR-John Hopkins Court LLC, a Delaware limited liability company ("Landlord"). All capitalized terms used herein without definition shall have the meanings ascribed to them in the Lease.

Tenant hereby confirms the following:

1. Tenant accepted possession of [Phase 1/Phase 2] on [ ], 2012.

2. To Tenant's knowledge, [Phase 1/Phase 2] is in good order, condition and repair.

3. The [Phase 1/Phase 2] Tenant Improvements are Substantially Complete.

4. All conditions of the Lease to be performed by Landlord as a condition to the full effectiveness of the Lease have been satisfied, and Landlord has fulfilled all of its duties in the nature of inducements offered to Tenant to lease [Phase 1/Phase 2].

5. In accordance with the provisions of Article 4 of the Lease, the [Phase 1/Phase 2] Term Commencement Date is [ ], 2012, and, unless the Lease is terminated prior to the Term Expiration Date pursuant to its terms, the Term Expiration Date shall be [ ], 2012.

6. Tenant commenced occupancy of [Phase 1/Phase 2] for the Permitted Use on [ ], 2012.

7. The Lease is in full force and effect, and the same represents the entire agreement between Landlord and Tenant concerning the Premises[, except [ ]].

8. Tenant has no existing defenses against the enforcement of the Lease by Landlord, and there exist no offsets or credits against Rent owed or to be owed by Tenant.

9. The obligation to pay Rent is presently in effect and all Rent obligations on the part of Tenant under the Lease with respect to [Phase 1/Phase 2] commenced to accrue on [ ], 2012, with Base Rent payable on the dates and amounts set forth in the chart below:

Dates	Approximate Square Feet of Rentable Area	Base Rent per Square Foot of Rentable Area	Monthly Base Rent	Annual Base Rent
Months [ ]-[ ]	[ ]	$[ ] [monthly] [OR] [annually]	[ ]	[ ]

10. The undersigned Tenant has not made any prior assignment, transfer, hypothecation or pledge of the Lease or of the rents thereunder or sublease of the Premises or any portion thereof.

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF, Tenant has executed this Acknowledgment of [Phase 1/Phase 2] Term Commencement Date and Term Expiration Date as of the date first written above.

TENANT:

aTyr Pharma, Inc.,
a Delaware corporation

By: _____
Name: _____
Title: _____

EXHIBIT D

FORM OF ADDITIONAL TI ALLOWANCE ACCEPTANCE LETTER

[TENANT LETTERHEAD]

BMR-John Hopkins Court LLC
17190 Bernardo Center Drive
San Diego, California 92128
Attn: Vice President, Real Estate Counsel

[Date]

Re: Additional TI Allowance

To Whom It May Concern:

This letter concerns that certain Lease dated as of December [ ], 2011 (the "Lease"), between BMR-John Hopkins Court LLC ("Landlord") and aTyr Pharma, Inc. ("Tenant"). Capitalized terms not otherwise defined herein shall have the meanings given them in the Lease.

Tenant hereby notifies Landlord that it wishes to exercise its right to utilize the Additional TI Allowance pursuant to Article 4 of the Lease.

If you have any questions, please do not hesitate to call [ ] at ([ ]) [ ]-[ ].

Sincerely,

[Name]
[Title of Authorized Signatory]

cc: Greg Lubushkin
Karen Sztraicher
John Bonanno
Kevin Simonsen

EXHIBIT E

FORM OF LETTER OF CREDIT

[On letterhead or L/C letterhead of Issuer.]

LETTER OF CREDIT

Date: , 200

_____ (the "Beneficiary")

_____

_____

Attention: _____
L/C. No.: _____
Loan No.: _____

Ladies and Gentlemen:

We establish in favor of Beneficiary our irrevocable and unconditional Letter of Credit numbered as identified above (the "L/C") for an aggregate amount of $, expiring at :00 p.m, on or, if such day is not a Banking Day, then the next succeeding Banking Day (such date, as extended from time to time, the "Expiry Date"). "Banking Day" means a weekday except a weekday when commercial banks in are authorized or required to close.

We authorize Beneficiary to draw on us (the "Issuer") for the account of (the "Account Party"), under the terms and conditions of this L/C.

Funds under this L/C are available by presenting the following documentation (the "Drawing Documentation"): (a) the original L/C and (b) a sight draft substantially in the form of Attachment 1, with blanks filled in and bracketed items provided as appropriate. No other evidence of authority, certificate, or documentation is required.

Drawing Documentation must be presented at Issuer's office at on or before the Expiry Date by personal presentation, courier or messenger service, or fax. Presentation by fax shall be effective upon electronic confirmation of transmission as evidenced by a printed report from the sender's fax machine. After any fax presentation, but not as a condition to its effectiveness, Beneficiary shall with reasonable promptness deliver the original Drawing Documentation by any other means. Issuer will on request issue a receipt for Drawing Documentation.

We agree, irrevocably, and irrespective of any claim by any other person, to honor drafts drawn under and in conformity with this L/C, within the maximum amount of this L/C, presented

to us on or before the Expiry Date, *provided* we also receive (on or before the Expiry Date) any other Drawing Documentation this L/C requires.

We shall pay this L/C only from our own funds by check or wire transfer, in compliance with the Drawing Documentation.

If Beneficiary presents proper Drawing Documentation to us on or before the Expiry Date, then we shall pay under this L/C at or before the following time (the "Payment Deadline"): (a) if presentment is made at or before noon of any Banking Day, then the close of such Banking Day; and (b) otherwise, the close of the next Banking Day. We waive any right to delay payment beyond the Payment Deadline. If we determine that Drawing Documentation is not proper, then we shall so advise Beneficiary in writing, specifying all grounds for our determination, within one Banking Day after the Payment Deadline.

Partial drawings are permitted. This L/C shall, except to the extent reduced thereby, survive any partial drawings.

We shall have no duty or right to inquire into the validity of or basis for any draw under this L/C or any Drawing Documentation. We waive any defense based on fraud or any claim of fraud.

The Expiry Date shall automatically be extended by one year (but never beyond (the "Outside Date")) unless, on or before the date 90 days before any Expiry Date, we have given Beneficiary notice that the Expiry Date shall not be so extended (a "Nonrenewal Notice"). We shall promptly upon request confirm any extension of the Expiry Date under the preceding sentence by issuing an amendment to this L/C, but such an amendment is not required for the extension to be effective. We need not give any notice of the Outside Date.

Beneficiary may from time to time without charge transfer this L/C, in whole but not in part, to any transferee (the "Transferee"). Issuer shall look solely to Account Party for payment of any fee for any transfer of this L/C. Such payment is not a condition to any such transfer. Beneficiary or Transferee shall consummate such transfer by delivering to Issuer the original of this L/C and a Transfer Notice substantially in the form of Attachment 2, purportedly signed by Beneficiary, and designating Transferee. Issuer shall promptly reissue or amend this L/C in favor of Transferee as Beneficiary. Upon any transfer, all references to Beneficiary shall automatically refer to Transferee, who may then exercise all rights of Beneficiary. Issuer expressly consents to any transfers made from time to time in compliance with this paragraph.

Any notice to Beneficiary shall be in writing and delivered by hand with receipt acknowledged or by overnight delivery service such as FedEx (with proof of delivery) at the above address, or such other address as Beneficiary may specify by written notice to Issuer. A copy of any such notice shall also be delivered, as a condition to the effectiveness of such notice, to: _____ (or such replacement as Beneficiary designates from time to time by written notice).

No amendment that adversely affects Beneficiary shall be effective without Beneficiary's written consent.

This L/C is subject to and incorporates by reference: (a) the International Standby Practices 98 ("ISP 98"): and (b) to the extent not inconsistent with ISP 98, Article 5 of the Uniform Commercial Code of the State of New York.

Very truly yours,

[Issuer Signature]

ATTACHMENT 1 TO EXHIBIT E

FORM OF SIGHT DRAFT

[BENEFICIARY LETTERHEAD]

TO:

[Name and Address of Issuer]

SIGHT DRAFT

AT SIGHT, pay to the Order of , the sum of United States Dollars ($). Drawn under [Issuer] Letter of Credit No. dated , .

[Issuer is hereby directed to pay the proceeds of this Sight Draft solely to the following account: .]

[Name and signature block, with signature or purported signature of Beneficiary]

Date:

ATTACHMENT 2 TO EXHIBIT E

FORM OF TRANSFER NOTICE

[BENEFICIARY LETTERHEAD]

TO:

[Name and Address of Issuer] (the "Issuer")

TRANSFER NOTICE

By signing below, the undersigned, Beneficiary (the "Beneficiary") under Issuer's Letter of Credit No. dated , (the "L/C"), transfers the L/C to the following transferee (the "Transferee"):

[Transferee Name and Address]

The original L/C is enclosed. Beneficiary directs Issuer to reissue or amend the L/C in favor of Transferee as Beneficiary. Beneficiary represents and warrants that Beneficiary has not transferred, assigned, or encumbered the L/C or any interest in the L/C, which transfer, assignment, or encumbrance remains in effect.

[Name and signature block, with signature or purported signature of Beneficiary]

Date:]

EXHIBIT F

RULES AND REGULATIONS

NOTHING IN THESE RULES AND REGULATIONS ("RULES AND REGULATIONS") SHALL SUPPLANT ANY PROVISION OF THE LEASE. IN THE EVENT OF A CONFLICT OR INCONSISTENCY BETWEEN THESE RULES AND REGULATIONS AND THE LEASE, THE LEASE SHALL PREVAIL.

1. Neither Tenant nor Tenant's employees, agents, contractors or invitees shall encumber or obstruct the common entrances, lobbies, elevators, sidewalks and stairways of the Building(s) or the Project or use them for any purposes other than ingress or egress to and from the Building(s) or the Project.

2. Except as specifically provided in the Lease, no sign, placard, picture, advertisement, name or notice shall be installed or displayed on any part of the outside of the Premises or the Building(s) without Landlord's prior written consent. Landlord shall have the right to remove, at Tenant's sole cost and expense and without notice, any sign installed or displayed in violation of this rule.

3. If Landlord objects in writing to any curtains, blinds, shades, screens, hanging plants or other objects attached to or used in connection with any window or door of the Premises or placed on any windowsill, and (a) such window, door or windowsill is visible from the exterior of the Premises and (b) such curtain, blind, shade, screen, hanging plant or other object is not included in plans approved by Landlord, then Tenant shall promptly remove said curtains, blinds, shades, screens, hanging plants or similar objects at its sole cost and expense.

4. No deliveries shall be made that impede or interfere with other tenants in or the operation of the Project.

5. Tenant shall not place a load upon any floor of the Premises that exceeds the load per square foot that (a) such floor was designed to carry or (b) is allowed by Applicable Laws. Fixtures and equipment that cause noises or vibrations that may be transmitted to the structure of the Building(s) to such a degree as to be objectionable to other tenants shall be placed and maintained by Tenant, at Tenant's sole cost and expense, on vibration eliminators or other devices sufficient to eliminate such noises and vibrations to levels reasonably acceptable to Landlord and the affected tenants of the Project.

6. Tenant shall not use any method of heating or air conditioning other than that present at the Project and serving the Premises as of the Execution Date.

7. Tenant shall not install any radio, television or other antennae; cell or other communications equipment; or other devices on the roof or exterior walls of the Premises except in accordance with the Lease. Tenant shall not interfere with radio, television or other digital or electronic communications at the Project or elsewhere.

8. Canvassing, peddling, soliciting and distributing handbills or any other written material within, on or around the Project (other than within the Premises) are prohibited. Tenant shall cooperate with Landlord to prevent such activities by Tenant or its employees, agents, contractors and invitees.

9. Tenant shall store all of its trash, garbage and Hazardous Materials within its Premises or in receptacles designated by Landlord outside of the Premises. Tenant shall not place in any such receptacle any material that cannot be disposed of in the ordinary and customary manner of trash, garbage and Hazardous Materials disposal. Any Hazardous Materials transported through Common Areas shall be held in secondary containment devices.

10. The Premises shall not be used for lodging or for any improper, immoral or objectionable purpose. No cooking shall be done or permitted in the Premises*; provided, however,* that Tenant may use (a) equipment approved in accordance with the requirements of insurance policies that Landlord or Tenant is required to purchase and maintain pursuant to the Lease for brewing coffee, tea, hot chocolate and similar beverages, (b) microwave ovens for employees' use and (c) equipment shown on Tenant Improvement plans approved by Landlord*; provided*, further, that any such equipment and microwave ovens are used in accordance with Applicable Laws.

11. Tenant shall not, without Landlord's prior written consent, use the name of the Project, if any, in connection with or in promoting or advertising Tenant's business except as Tenant's address.

12. Tenant shall comply with all safety, fire protection and evacuation procedures and regulations established by Landlord or any Governmental Authority.

13. Tenant assumes any and all responsibility for protecting the Premises from theft, robbery and pilferage, which responsibility includes keeping doors locked and other means of entry to the Premises closed.

14. Tenant shall furnish Landlord with copies of keys, pass cards or similar devices for locks to the Premises.

15. Tenant shall cooperate and participate in all reasonable security programs affecting the Premises.

16. Tenant shall not permit any animals in the Project, other than for guide animals or for use in laboratory experiments.

17. Bicycles shall not be taken into the Building(s) except into areas designated by Landlord.

18. The water and wash closets and other plumbing fixtures shall not be used for any purposes other than those for which they were constructed, and no sweepings, rubbish, rags or other substances shall be deposited therein.

19. Discharge of industrial sewage shall only be permitted if Tenant, at its sole expense, first obtains all necessary permits and licenses therefor from all applicable Governmental Authorities.

20. Smoking is prohibited at the Project.

21. The Project's hours of operation are currently 24 hours a day seven days a week.

22. Tenant shall comply with all orders, requirements and conditions now or hereafter imposed by Applicable Laws or Landlord ("Waste Regulations") regarding the collection, sorting, separation and recycling of waste products, garbage, refuse and trash generated by Tenant (collectively, "Waste Products"), including (without limitation) the separation of Waste Products into receptacles reasonably approved by Landlord and the removal of such receptacles in accordance with any collection schedules prescribed by Waste Regulations.

23. Tenant, at Tenant's sole cost and expense, shall cause the Premises to be exterminated on a monthly basis to Landlord's reasonable satisfaction and shall cause all portions of the Premises used for the storage, preparation, service or consumption of food or beverages to be cleaned daily in a manner reasonably satisfactory to Landlord, and to be treated against infestation by insects, rodents and other vermin and pests whenever there is evidence of any infestation. Tenant shall not permit any person to enter the Premises or the Project for the purpose of providing such extermination services, unless such persons have been approved by Landlord. If requested by Landlord, Tenant shall, at Tenant's sole cost and expense, store any refuse generated in the Premises by the consumption of food or beverages in a cold box or similar facility.

Landlord may waive any one or more of these Rules and Regulations for the benefit of Tenant or any other tenant, but no such waiver by Landlord shall be construed as a waiver of such Rules and Regulations in favor of Tenant or any other tenant, nor prevent Landlord from thereafter enforcing any such Rules and Regulations against any or all of the tenants of the Project, including Tenant. These Rules and Regulations are in addition to, and shall not be construed to in any way modify or amend, in whole or in part, the terms covenants, agreements and conditions of the Lease. Landlord reserves the right to make such other and reasonable rules and regulations as, in its judgment, may from time to time be needed for safety and security, the care and cleanliness of the Project, or the preservation of good order therein; provided, however, that Tenant shall not be obligated to adhere to such additional rules or regulations until Landlord has provided Tenant with written notice thereof. Tenant agrees to abide by these Rules and Regulations and any additional rules and regulations issued or adopted by Landlord. Tenant shall be responsible for the observance of these Rules and Regulations by Tenant's employees, agents, contractors and invitees.

EXHIBIT G

FORM OF ESTOPPEL CERTIFICATE

To: BMR-John Hopkins Court LLC
17190 Bernardo Center Drive
San Diego, California 92128
Attention: Vice President, Real Estate Counsel

BioMed Realty, L.P.
17190 Bernardo Center Drive
San Diego, California 92128

Re: 3545 John Hopkins Court, San Diego, California 92121 (the "Premises") at 3545-3575 John Hopkins Court, San Diego, California 92121 (the "Property")

The undersigned tenant ("Tenant") hereby certifies to you as follows:

1. Tenant is a tenant at the Property under a lease (the "Lease") for the Premises dated as of December [ ], 2011. The Lease has not been cancelled, modified, assigned, extended or amended [except as follows: [ ]], and there are no other agreements, written or oral, affecting or relating to Tenant's lease of the Premises or any other space at the Property. The lease term expires on [ ], 20[ ].

2. Tenant took possession of the Premises, currently consisting of [ ] square feet, on [ ], 20[ ], and commenced to pay rent on [ ], 20[ ]. Tenant has full possession of the Premises, has not assigned the Lease or sublet any part of the Premises, and does not hold the Premises under an assignment or sublease[, except as follows: [ ]].

3. All base rent, rent escalations and additional rent under the Lease have been paid through [ ], 20[ ]. There is no prepaid rent[, except $[ ]][, and the amount of security deposit is $[ ] [in cash][OR][in the form of a letter of credit]]. Tenant currently has no right to any future rent abatement under the Lease.

4. Base rent is currently payable in the amount of $[ ] per month.

5. Tenant is currently paying estimated payments of additional rent of $[ ] per month on account of real estate taxes, insurance, management fees and common area maintenance expenses.

6. All work to be performed for Tenant under the Lease has been performed as required under the Lease and has been accepted by Tenant[, except [ ]], and all allowances to be paid to Tenant, including allowances for tenant improvements, moving expenses or other items, have been paid.

7. The Lease is in full force and effect, free from default and free from any event that could become a default under the Lease, and Tenant has no claims against the landlord or

offsets or defenses against rent, and there are no disputes with the landlord. Tenant has received no notice of prior sale, transfer, assignment, hypothecation or pledge of the Lease or of the rents payable thereunder[, except [ ]].

8. Tenant has no rights or options to purchase the Property.

9. To Tenant's knowledge, no hazardous wastes have been generated, treated, stored or disposed of by or on behalf of Tenant in, on or around the Premises or the Project in violation of any environmental laws.

10. The undersigned has executed this Estoppel Certificate with the knowledge and understanding that [INSERT NAME OF LANDLORD, PURCHASER OR LENDER, AS APPROPRIATE] or its assignee is acquiring the Property in reliance on this certificate and that the undersigned shall be bound by this certificate. The statements contained herein may be relied upon by [INSERT NAME OF PURCHASER OR LENDER, AS APPROPRIATE], [LANDLORD], BioMed Realty, L.P., BioMed Realty Trust, Inc., and any [other] mortgagee of the Property and their respective successors and assigns.

Any capitalized terms not defined herein shall have the respective meanings given in the Lease.

Dated this [ ] day of [ ], 20[ ].

[ ],
a [ ]

By: _____
Name: _____
Title: _____

EXHIBIT H

FORM OF CONVERTIBLE UNSECURED PROMISSORY NOTE

THE SECURITIES REPRESENTED HEREBY HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"). OR ANY STATE SECURITIES LAWS. THESE SECURITIES ARE SUBJECT TO RESTRICTIONS ON TRANSFERABILITY AND RESALE AND MAY NOT BE TRANSFERRED OR RESOLD EXCEPT AS PERMITTED UNDER THE ACT AND THE APPLICABLE STATE SECURITIES LAWS, PURSUANT TO REGISTRATION OR EXEMPTION THEREFROM. HOLDERS SHOULD BE AWARE THAT THEY MAY BE REQUIRED TO BEAR THE FINANCIAL RISKS OF THIS INVESTMENT FOR AN INDEFINITE PERIOD OF TIME.

SUBORDINATED CONVERTIBLE UNSECURED PROMISSORY NOTE

December 22, 2011
San Diego, California

For value received, aTyr Pharma, Inc., a Delaware corporation (the "Company"), promises to pay to BioMed Realty, L.P., a Maryland limited partnership ("Holder"), the principal amount of Two Million Dollars ($2,000,000.00) (the "Principal Amount"). Reference is made to that certain Lease, dated as of December 22, 2011, as amended from time to time (the "Lease"), by and between the Company and BMR-John Hopkins Court LLC, a wholly owned subsidiary of Holder ("Landlord"). Capitalized terms used herein but not defined herein shall have the meanings ascribed to them in the Lease. Interest on the Principal Amount shall accrue, compounded annually, at a rate equal to eight percent (8%) per annum (the "Interest Rate"), commencing on the date hereof. The Interest Rate shall be computed on the basis of the actual number of days elapsed and a year of 365 days. This Subordinated Convertible Unsecured Promissory Note (this "Note") is subject to the following terms and conditions.

1 Maturity. Unless earlier converted pursuant to Section 3 hereof, the principal and any accrued but unpaid interest under this Note shall be due and payable on the earliest of (i) the three-year anniversary of the Phase I Term Commencement Date under the Lease, (ii) a Liquidation Event (as defined in the Company's Amended and Restated Certificate of Incorporation as amended from time to time (the "COI")) or (iii) the closing of an initial firm commitment underwritten public offering of common stock of the Company pursuant to a registration statement under the Act (such date, the "Maturity Date").

2 Payment.

2.1 Unless this Note is converted pursuant to Section 3 hereof, or interest hereunder is forgiven pursuant to Section 9 hereof, any Principal Amount and any accrued but unpaid interest under this Note then outstanding shall be due and payable on the Maturity Date. Payment shall be credited first to costs of collection or enforcement, if any, then to accrued interest due and payable through such payment date, and the remainder applied to the Principal Amount.

2.2 With the prior written consent of the Holder, the Company may prepay this Note in full, but not in part. The Company shall deliver to the Holder written notice of its

intended prepayment at least twenty (20) days in advance of the intended prepayment date.

3 **Conversion of the Note**.

3.1 Elective Conversion into New Preferred Stock. If the Company completes a Threshold New Preferred Financing, then at any time prior to the Maturity Date, at Holder's election and exercisable by written notice to the Company, Holder may elect to convert, in whole but not in part, the Principal Amount into that number of fully paid and nonassessable shares of the Company's New Preferred Stock equal to the quotient obtained by dividing the Principal Amount by the New Series Price (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the New Preferred Stock after the date of issuance of the New Preferred Stock, but excluding any Stock Distribution (as defined below) received by Holder). Upon conversion into New Preferred Stock, Holder agrees to execute and shall become a party to and have substantially the same rights as the other holders of New Preferred Stock, including, but not limited to, those rights as set forth in the COI, any stock purchase agreement, registration rights agreement, investor rights agreement, voting agreement or similar agreement governing the New Preferred Stock and/or the holders thereof in effect as of the date of conversion. For the avoidance of doubt, if the Company completes a Threshold New Preferred Financing, Holder shall have the rights of conversion set forth in this Section 3.1, and shall not have rights of conversion as set forth in Section 3.2 below.

3.2 Elective Conversion into Series C Preferred Stock. If the Company does not complete a Threshold New Preferred Financing, or effects a Liquidation Event prior to a Threshold New Preferred Financing, then at any time and from time to time following the earlier of (i) Holder's receipt of notice of the Liquidation Event under Section 14 below and (ii) June 30, 2013, at Holder's election and exercisable by written notice to the Company, Holder may elect to convert, in whole but not in part, the Principal Amount into 1,934,236 fully paid and nonassessable shares of Series C Preferred Stock of the Company (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series C Preferred Stock after the Effective Time (as defined in the COI), but excluding any Stock Distribution received by Holder). Upon conversion into Series C Preferred Stock, Holder agrees to execute and shall become a party to and have substantially the same rights as the other holders of Series C Preferred Stock, including, but not limited to, those rights as set forth in the COI, any stock purchase agreement, registration rights agreement, investor rights agreement, voting agreement or similar agreement governing the Series C Preferred Stock and/or the holders thereof in effect as of the date of conversion. The Company shall take all actions reasonably necessary to give effect to the conversion rights set forth in this Section 3.

For purposes of this Note:

"Threshold New Preferred Financing" means the sale (or series of related sales) by the Company of New Preferred Stock on or before June 30, 2013 to one or more investors in an aggregate amount of not less than Fifteen Million Dollars ($15,000,000.00) (excluding the exchange, conversion or cancellation of this Note or any notes or warrants issued prior to the date hereof), which includes at least one investor (who is not a current investor in the Company as of the date hereof) that commits Two Million Dollars ($2,000,000.00) or more in such financing.

"New Series Price" means the lowest price paid per share for the New Preferred Stock by investors in the Threshold New Preferred Financing.

"New Preferred Stock" means the Company's series of preferred stock issued in connection with the Threshold New Preferred Financing.

3.3 Mechanics and Effect of Conversion. Upon conversion of this Note, any interest payable in respect of the Principal Amount shall be immediately forgiven and shall not converted into New Preferred Stock, Series C Preferred Stock or any other shares of the capital stock of the Company. No fractional shares of the Company's capital stock will be issued upon conversion of the Note. In lieu of any fractional share to which Holder would otherwise be entitled, the Company will pay to Holder in cash the amount of the unconverted principal balance of the Note that would otherwise be converted into such fractional share. Upon conversion of the Note pursuant to this Section 3. Holder shall surrender the Note, duly endorsed, at the principal offices of the Company or any transfer agent of the Company (or a notice to the effect that the original Note has been lost, stolen or destroyed and an agreement reasonably acceptable to the Company whereby the Holder agrees to indemnify the Company from any loss incurred by it in connection with this Note*); provided*, that upon conversion pursuant hereto, this Note shall be deemed cancelled and of no further force and effect, whether or not it is delivered for cancellation as set forth in this sentence. At its expense, the Company will, as soon as practicable and in any event within ten (10) days thereafter, issue and deliver to Holder, at Holder's principal office, a certificate or certificates for the number of shares to which Holder is entitled upon such conversion, and a check payable to Holder for any cash amounts payable as described herein. Upon conversion of this Note, the Company will be forever released from all of its obligations and liabilities under this Note with regard to the Principal Amount being converted and any interest which has accrued thereon, including without limitation the obligation to pay such portion of the Principal Amount and any accrued interest.

3.4 No Rights as Stockholder. This Note does not by itself entitle the Holder to any voting rights or other rights as a stockholder of the Company, other than as set forth in Section 9 below. In the absence of conversion of this Note, no provision of this Note, and no enumeration herein of the rights or privileges of the Holder shall cause the Holder to be a stockholder of the Company for any purpose, other than as set forth in Section 9 below.

4 Representations and Warranties of the Company. The Company represents and warrants to Holder as of the date hereof, and with respect to Sections 4.6 and 4.7 for so

long as Holder, or an affiliate of Holder, holds the Note or any equity securities issued to Holder pursuant to the terms hereof, as follows:

4.1 Organization, Good Standing and Qualification. The Company is a corporation duly organized, validly existing and in good standing under the laws of the State of Delaware and has all requisite corporate power and authority to own and operate its properties and assets and to carry on its business as presently conducted. The Company is duly qualified to transact business and is in good standing in each jurisdiction in which the failure so to qualify would have a material adverse effect on its business or properties.

4.2 Authorization. All corporate action on the part of the Company, its officers, directors and stockholders necessary for the authorization, sale, issuance and delivery of the Note and the performance of all obligations of the Company under the Note has been taken prior to the date hereof. The Note constitutes a valid and legally binding obligation of the Company, enforceable against the Company in accordance with its terms, except (i) as limited by applicable bankruptcy, insolvency, reorganization, moratorium, fraudulent conveyance and other laws of general application affecting enforcement of creditors' rights generally, and (ii) as limited by laws relating to the availability of specific performance, injunctive relief or other equitable remedies. Any equity securities of the Company or of any Related Entity (as defined below) issuable to Holder hereunder have been or will be duly reserved for issuance, and upon issuance in accordance with the terms of the Note, will be validly issued, fully paid and non- assessable and free of restrictions on transfer other than restrictions contained in this Note and applicable federal and state securities laws. The issuance of the Note and the issuance of any such equity securities issuable hereunder are not and will not be subject to preemptive rights of any present or future debt or equity holders of the Company or any Related Entity.

4.3 Governmental Consent. No consent, approval, order or authorization of, or registration, qualification, designation, declaration or filing with, any federal, state or local governmental authority on the part of the Company is required in connection with the valid execution, delivery and performance by the Company of the Note and the transactions contemplated thereby, except for filings pursuant to Section 25102(f) of the California Corporate Securities Law of 1968, as amended, and the rules thereunder, other applicable state securities laws and Regulation D of the Act, all of which filings will be timely effected after the date hereof.

4.4 Compliance with Other Instruments. The Company is not in violation or default of any provision of its COI or bylaws currently in effect. The Company is not in violation of, or default under any provision of any instrument, mortgage, deed of trust, loan, contract, commitment or obligation to which it is a party or by which it or any of its properties are bound, which violations or defaults, individually or in the aggregate, would materially adversely affect the business, properties or condition (financial or otherwise) of the Company. The Company is not in violation of any provision of any federal, state or local statute, rule or governmental regulation which would materially adversely affect the business, properties or condition (financial or otherwise) of the Company or any judgment, decree or order to which it is a party. The Company has all franchises,

permits, licenses and any similar authority necessary for the conduct of its business, the lack of which could materially adversely affect the business, properties or condition (financial or otherwise) of the Company. The Company is not in default in any material respect under any of such franchises, permits, licenses or other similar authority.

4.5 Percentage of Outstanding Securities. This Note, together with the aggregate securities actually issued and/or potentially issuable under this Note (assuming for this purpose conversion of the Note into shares of Series C Preferred Stock pursuant to Section 3.2 above), represent less than ten percent (10.0%) of the voting interest and less than ten percent (10.0%) of the value of the outstanding debt and equity securities of the Company or any Related Entity, as applicable.

4.6 Health Care / Lodging Facilities. Neither the Company nor any Related Entity currently operates or manages, or in the future will operate or manage, any health care facilities (including a congregate care facility or assisted living facility) or lodging facilities or provide any person, under a franchise, license or otherwise, rights to any brand name under which any lodging facility or health care facility is operated.

4.7 Financial Information. The Company shall furnish to Holder, as soon as practicable and in any event within ten (10) days after the date of such request, a statement showing the capitalization of the Company and any Related Entity, including but not limited to the total number of outstanding securities of each class and series of capital stock of the Company and such Related Entity, in sufficient detail as to permit Holder to calculate its percentage ownership in securities of the Company and such Related Entity and voting power to elect directors to their respective Board of Directors.

5 **Representations and Warranties of Holder**. Holder hereby represents and warrants to the Company as of the date hereof that:

5.1 Experience. Holder is experienced in investing in the securities of development stage companies such as die Company and acknowledges that investment in the Securities (as defined below) involves a number of significant risks, it is able to fend for itself, it can bear the economic risk of its investment, including the full loss of its investment, and it has such knowledge and experience in financial or business matters that it is capable of evaluating the merits and risks of the investment in the Securities. Holder also represents it was not organized solely for the purpose of acquiring the Securities. As used herein, "Securities" shall mean this Note and the equity securities issuable hereunder (and the securities issuable upon conversion of such equity securities).

5.2 Accredited Investor. Holder represents that it is an "accredited investor" within the meaning of Rule 501(a) of the Act.

5.3 Purchase Entirely for Own Account. This Note is issued to Holder in reliance upon Holder's representation to the Company, which by Holder's purchase of this Note, Holder hereby confirms, that the Securities to be received by Holder will be acquired for investment for Holder's own account, not as a nominee or agent, and not with a view to the resale or distribution of any part thereof, and that Holder has no present intention of

selling, granting any participation in, or otherwise distributing the same. Holder further represents that it does not have any contract, undertaking, agreement or arrangement with any person to sell, transfer or grant participations to such person or to any third person, with respect to the Securities.

5.4 Restricted Securities. Holder understands that the Securities are characterized as "restricted securities" under the federal securities laws inasmuch as they are being acquired from the Company in a transaction not involving a public offering and that under such laws and applicable regulations such Securities may be resold without registration under the Act only in certain limited circumstances. In this connection, Holder represents that it is familiar with Rule 144, as presently in effect, and understands the resale limitations imposed thereby and by the Act. Holder must bear the economic risk of this investment indefinitely unless the Securities are registered pursuant to the Act, or an exemption from registration is available. Holder understands that the Company has no present intention of registering the Securities. Holder also understands that there is no assurance that any exemption from registration under the Act will be available and that, even if available, such exemption may not allow Holder to transfer all or any portion of the Securities under the circumstances, in the amounts or at the times Holder might propose.

5.5 No Public Market. Holder understands that no public market now exists for any of the securities issued by the Company and that the Company has made no assurances that a public market will ever exist for the Securities.

6 Restrictions on Transfer. Holder hereby acknowledges that the Securities shall not be transferred except upon the conditions specified in this Section 6, which conditions are intended to insure compliance with the provisions of the Act. Holder may not assign, pledge, or otherwise transfer this Note without the prior written consent of the Company, except for transfers to any of the Holder's affiliates, partners, members, affiliated funds or entities under common control, or to the estate of any of its partners or members. Holder will cause any proposed transferee of Securities held by Holder to agree to take and hold such Securities subject to the provisions and upon the conditions specified in the Note.

6.1 Legends. Each certificate representing the Securities or any securities of the Company issued to Holder upon any stock split, stock dividend, recapitalization, merger, consolidation or similar event, shall (unless otherwise permitted or unless the securities evidenced by such certificate shall have been registered under the Act) be stamped or otherwise imprinted with a legend substantially in the following form (in addition to any legend required under applicable state securities laws):

"THE SECURITIES REPRESENTED HEREBY HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR ANY STATE SECURITIES LAWS. THESE SECURITIES ARE SUBJECT TO RESTRICTIONS ON TRANSFERABILITY AND RESALE AND MAY NOT BE TRANSFERRED OR RESOLD EXCEPT AS PERMITTED UNDER

THE ACT AND THE APPLICABLE STATE SECURITIES LAWS, PURSUANT TO REGISTRATION OR EXEMPTION THEREFROM. HOLDERS SHOULD BE AWARE THAT THEY MAY BE REQUIRED TO BEAR THE FINANCIAL RISKS OF THIS INVESTMENT FOR AN INDEFINITE PERIOD OF TIME."

6.2 Notice of Proposed Transfers. The holder of each certificate representing the Securities required to bear the legend set forth in Section 6.1 by acceptance thereof agrees to comply in all respects with the provisions of this Section 6. Prior to any proposed transfer of any Securities, the holder thereof shall give written notice to the Company of such holder's intention to effect such transfer. Each such notice shall describe the manner and circumstances of the proposed transfer in sufficient detail, and shall be accompanied (except in transactions involving the distribution without consideration of such Securities by a holder to any of its affiliates, partners, members, affiliated funds or entities under common control, or to die estate of any of its partners or members) by either:

6.2.1 a written opinion of legal counsel who shall be reasonably satisfactory to the Company, addressed to the Company and reasonably satisfactory in form and substance to the Company's counsel, to the effect that the proposed transfer of the Securities may be effected without registration under the Act; or

6.2.2 a "no-action" letter from the Securities and Exchange Commission to the effect that the distribution of such Securities without registration will not result in a recommendation by the staff of the Securities and Exchange Commission that action be taken with respect thereto, whereupon the holder of such Securities shall be entitled to transfer such Securities in accordance with the terms of the notice delivered by such holder to the Company.

Each certificate evidencing the Securities transferred as above provided shall bear the restrictive legend set forth in Section 6.1 above, except that such certificate shall not bear such restrictive legend if the opinion of counsel or "no-action" letter referred to above expressly indicates that such legend is not required in order to establish compliance with the Act or if such legend is no longer required pursuant to Rule 144. Notwithstanding the foregoing, Holder may transfer the Securities at any time to an affiliate of Holder as deemed necessary or advisable, in Holder's discretion, to ensure BioMed Realty Trust, Inc.'s compliance with requirements relating to BioMed Realty Trust, Inc.'s status as a real estate investment trust for federal income tax purposes, without having to provide to the Company the documentation contained in Section 6.2.1 or 6.2.2.

7 Assignment. Subject to the restrictions on transfer set forth in Section 6 and this Section 7 of the Note, the rights and obligations of the Company and Holder will be binding upon and inure to the benefit of the successors, assigns, heirs, administrators and transferees of the parties.

8 Events of Default. Upon the occurrence or existence of any Event of Default (as defined below) and at any time thereafter during the continuance of an Event of Default,

the entire Principal Amount of this Note, together with all unpaid accrued interest thereon, and all unpaid fees, charges, costs and expenses, if any, owed by the Company to the Holder hereunder, may become or may be declared by the Holder to be immediately due and payable. In addition to the foregoing remedies, upon the occurrence or existence of any Event of Default, the Holder may exercise any other right, power or remedy permitted to it by applicable law, either by suit in equity or by action at law, or both.

8.1 Events of Default. The occurrence of any one or more of the following events with respect to the Company constitutes an "Event of Default" hereunder:

(a) The Company breaches any covenant or obligation in this Note, and fails to cure such breach within thirty (30) days of such breach;

(b) The Company fails to pay timely any of the Principal Amount due under this Note on the date the same becomes due and payable or any accrued interest or other amounts due under this Note on the date the same becomes due and payable;

(c) The dissolution, termination of existence of the Company or inability of the Company to pay its debts as they become due, or appointment of a receiver, trustee or custodian, for all or any part of the property of the Company under any reorganization, bankruptcy, insolvency, arrangement, readjustment of debt, dissolution or liquidation law or statute of any jurisdiction, now or in the future in effect; or

(d) The commencement of any proceeding against the Company under any reorganization, bankruptcy, insolvency, arrangement, readjustment of debt, dissolution or liquidation law or statute of any jurisdiction, now or in the future, if within sixty (60) days after the commencement of such proceeding (i) such action has not been dismissed or all orders or proceedings thereunder affecting the operations or the business of the Company stayed, or (ii) the stay of any such order or proceedings has been set aside.

8.2 Default Rate. As long as any payment due under this Note remains past due (whether at the stated maturity, by acceleration or otherwise) for five (5) days or more, interest under this Note shall accrue on such overdue payment at a rate (the "Default Rate") (which is in lieu of and not in addition to the Interest Rate) equal to the lesser of twelve percent (12%) per annum or the maximum rate permitted by applicable law from the date of such non-payment until such amount is paid in full (whether after or before judgment).

8.3 Payment of Expenses. Following the occurrence of an Event of Default, the Company shall pay, on demand, all reasonable costs and expenses of collection of this Note (including reasonable attorneys' fees, costs and disbursements) in respect of such Event of Default, whether or not any suit or other legal proceedings shall be instituted.

8.4 No Usury. Payments of interest shall not be required, for any period for which interest is computed hereunder, to the extent that contracting for or receipt thereof would

be contrary to provisions of any applicable law to the Holder limiting the highest rate of interest that may be lawfully contracted for, charged or received by the Holder, as determined by a final judgment of a court of competent jurisdiction. Any interest paid in excess of such highest rate shall be applied to the unpaid principal balance of this Note. In the event that any such excess exceeds the principal amount, the amount of such xcess over the principal amount shall be refunded to the Company.

9 **Certain Stock Distributions**. In the case of any stock dividend, stock distribution or similar transaction (any such transaction, a "Stock Distribution") by the Company of shares of the capital stock or other securities of any Related Entity ("Distribution Securities") after the date of issuance of this Note and prior to the conversion of this Note by Holder, Holder shall be entitled to receive, and the Company shall promptly deliver to Holder, such number of the Distribution Securities as shall be issued or distributed pursuant to such Stock Distribution as if Holder is a holder of 1,934,236 shares of Series C Preferred Stock of the Company (as equitably adjusted to reflect any stock split, stock dividend, combination, consolidation, reorganization, recapitalization, reclassification or other similar event involving the Series C Preferred Stock after the Effective Time) (such shares of Series C Preferred Stock, the "Deemed Held Stock") as of the record date determined by the Company's Board of Directors for such Stock Distribution. Holder shall be deemed to be a holder of such Deemed Held Stock solely for purposes of this Section 9 and shall otherwise have no other rights in, to or by reason of this Section 9 in the Deemed Held Stock, including, but not limited to, any rights of a stockholder or rights otherwise associated with ownership of shares of capita] stock. The right of the Holder to receive any Distribution Securities pursuant to this Section 9 is subject to and conditioned upon Holder agreeing to enter into such agreements with the Company and/or any Related Entity as the holders of a majority of the shares of Series C Preferred Stock of the Company have entered into and/or are subject to with respect to such holders' ownership of any Distribution Securities*; provided* that if Holder receives any Distribution Securities from the Company and thereafter elects not to convert the Note prior to the Maturity Date, upon payment in full by the Company of any and all principal and interest then due and payable hereunder, Holder shall promptly surrender all such Distribution Securities to the Company (or such Related Entity as may be designated by the Company) and waive any and all rights in and to such securities. As used herein, "Related Entity" shall mean any entity initially formed, organized or otherwise established as a subsidiary or other affiliate of the Company, either prior to, at or after the date of this Note, regardless of whether or not the Company thereafter continues to hold any equity or other ownership interest therein. In the event that Holder receives aggregate cash proceeds derived from Holder's Distribution Securities exceeding Three Million Five Hundred Thousand Dollars ($3,500,000.00) prior to the Maturity Date, then any accrued but unpaid interest under this Note shall be forgiven and no interest under this Note shall thereafter accrue or otherwise be payable by the Company with respect hereto.

10 **Subordination.** Holder agrees that payment of amounts due under this Note is expressly subordinated to the prior payment of, and shall rank junior in priority to, all amounts due by the Company under that certain Loan and Security Agreement dated as of March 18, 2011 by and between the Company and Comerica Bank ("Comerica"), as

the same may be amended from time to time. To the extent requested by Comerica, the Holder and the Company shall enter into a reasonable and customary subordination agreement providing for such subordination and other related terms as described in the preceding sentence.

11 **Early Termination of Lease**. If at any time prior to the Maturity Date the Lease terminates, other than as a result of a Default by the Company, a portion of the Principal Amount equal to the amount to be deemed as a credit against the Base Rent (as defined in the Lease) for months under the Lease which have not, as of such termination date, elapsed, shall immediately be forgiven and no longer deemed to be outstanding, due or otherwise payable hereunder.

12 **Governing Law**. This Note and all acts and transactions pursuant hereto and the rights and obligations of the parties hereto shall be governed, construed and interpreted in accordance with the laws of the State of California, without giving effect to principles of conflicts of law.

13 **Notices.** All notices and other communications required or permitted hereunder shall be in writing and shall be deemed effectively given upon personal delivery, upon three (3) business days after deposit with the United States Post Office, by registered or certified mail, return receipt requested, postage prepaid, one (1) business day after deposit with a nationally recognized air courier, or upon receipt of confirmation with regard to delivery by facsimile and addressed: (a) if to Holder, at Holder's address as set forth on Holder's signature page hereto, or at such other address as Holder shall have furnished to the Company in writing, or (b) if to the Company, at its current address or at such other address as the Company shall have furnished to Holder in writing.

14 **Notification of Certain Events**. The Company shall provide Holder with at least ten (10) days prior written notice of any Liquidation Event.

15 **Amendments and Waivers**. Any term of this Note may be amended and the observance of any term of this Note may be waived (either generally or in a particular instance and either retroactively or prospectively), only with the written consent of the Company and the Holder. Any amendment or waiver effected in accordance with this Section 15 shall be binding upon Holder and the Company.

16 **Lost Documents.** Upon receipt by the Company of evidence and indemnity reasonably satisfactory to it of the loss, theft, destruction or mutilation of, and upon surrender and cancellation of this Note, if mutilated, the Company will make and deliver in lieu of this Note a new note of the same series and of like tenor and unpaid Principal Amount and dated as of the date to which interest, if any, has been paid on the unpaid Principal Amount of this Note.

17 **Waivers and Rights of Holder**. The Company hereby waives demand, presentment for payment, protest, notice of nonpayment, notice of protest, notice of dishonor, and any other notices of any kind, and any and all exemption rights that it holds at law or in equity with respect to the indebtedness evidenced by this Note.

18 **Attorneys' Fees.** If any action at law or in equity is necessary to enforce or interpret the terms of this Note, the prevailing party shall be entitled to reasonable attorneys' fees, costs and disbursements in addition to any other relief to which such party may be entitled.

19 **Severability.** If one or more provisions of this Note are held to be unenforceable under applicable law, such provision shall be excluded from this Note and the balance of this Note shall be interpreted as if such provision were so excluded and shall be enforceable in accordance with its terms.

20 **California Corporate Securities Law.** THE SALE OF THE SECURITIES WHICH ARE THE SUBJECT OF THIS NOTE HAS NOT BEEN QUALIFIED WITH THE COMMISSIONER OF CORPORATIONS OF THE STATE OF CALIFORNIA AND THE ISSUANCE OF SUCH SECURITIES OR THE PAYMENT OR RECEIPT OF ANY PART OF THE CONSIDERATION THEREFOR PRIOR TO THE QUALIFICATION IS UNLAWFUL UNLESS THE SALE OF SECURITIES IS EXEMPT FROM THE QUALIFICATION BY SECTION 25100, 25102, OR 25105 OF THE CALIFORNIA CORPORATIONS CODE. THE RIGHTS OF ALL PARTIES TO THIS NOTE ARE EXPRESSLY CONDITIONED UPON SUCH QUALIFICATION BEING OBTAINED, UNLESS THE SALE IS SO EXEMPT.

21 **Counterparts.** This Note may be executed in two or more counterparts (including by facsimile or PDF copy), each of which shall be deemed an original and all of which together shall constitute one instrument.

(Signature Page Follows)

The parties have executed this Subordinated Convertible Unsecured Promissory Note as of the date first written above.

COMPANY:

ATYR PHARMA, INC.

By: /s/ Andrew Cubitt
Name: Andrew Cubitt
Title: VP, Intellectual Property

HOLDER:

BIOMED REALTY, L.P.

By: /s/ Brian Wolfe
Name: Brian Wolfe
Title: Corporate Counsel, Asst. Secretary

Address: 17190 Bernardo Center Drive
San Diego, CA 92128
Attn: Corporate Legal

IN WITNESS WHEREOF, the parties hereto have executed this Lease as of the date first above written.

LANDLORD:

BMR-JOHN HOPKINS COURT LLC,
a Delaware limited liability company

By: /s/ Brain Wolfe
Name: Brian Wolfe
Title: Corporate Counsel, Asst. Secretary

TENANT:

ATYR PHARMA, INC.,
a Delaware corporation

By: /s/ Andrew Cubitt
Name: Andrew Cubitt
Title: VP, Intellectual Property

If the foregoing accurately sets forth the agreements that the Company and BioMed have reached with respect to the subject matter hereof, please indicate your agreement to the terms contained herein by countersigning in the place indicated below.

Sincerely,

ATYR PHARMA, INC.

By: /s/ Andrew Cubitt
Name: Andrew Cubitt
Title: VP, Intellectual Property

AGREED AND ACCEPTED:

BIOMED REALTY, L.P.

By: /s/ Brian Wolfe
Name: Brian Wolfe
Title: Corporate Counsel, Asst. Secretary

Exhibit 10.10

LOAN AND SECURITY AGREEMENT

THIS LOAN AND SECURITY AGREEMENT (this "**Agreement**") dated as of April 25, 2012 (the "**Effective Date**") between **SILICON VALLEY BANK**, a California corporation ("**Bank**"), and **ATYR PHARMA, INC.**, a Delaware corporation ("'**Borrower**"), provides the terms on which Bank shall lend to Borrower and Borrower shall repay Bank. The parties agree as follows:

1 ACCOUNTING AND OTHER TERMS

Accounting terms not defined in this Agreement shall be construed following GAAP. Calculations and determinations must be made following GAAP. Capitalized terms not otherwise defined in this Agreement shall have the meanings set forth in Section 13. All other terms contained in this Agreement, unless otherwise indicated, shall have the meanings provided by the Code to the extent such terms are defined therein.

2 LOAN AND TERMS OF PAYMENT

2.1 Promise to Pay. Borrower hereby unconditionally promises to pay Bank the outstanding principal amount of all Credit Extensions and accrued and unpaid interest thereon as and when due in accordance with this Agreement.

2.1.1 Growth Capital Loan.

(a) Availability. Subject to the terms and conditions of this Agreement, Bank agrees to make advances to Borrower (each a "**Growth Capital Advance**" and collectively the "**Growth Capital Advances**"), from time to time, prior to the Growth Capital Commitment Termination Date, in an aggregate amount not to exceed the Growth Capital Loan Commitment.

(i) One Million Two Hundred Fifty Thousand Dollars ($1,250,000) of the Growth Capital Loan Commitment (the "**First Tranche**") shall be funded in one (1) Growth Capital Advance on or about the Effective Date. After repayment, the Growth Capital Advance under the First Tranche may not be reborrowed.

(ii) Subject to the terms of this Agreement, the remaining One Million Two Hundred Fifty Thousand Dollars ($1,250,000) of the Growth Capital Loan Commitment (the "**Second Tranche**") shall be funded in one (1) Growth Capital Advance between July 31, 2012 and that date which is six (6) months following the Effective Date, as requested in writing by Borrower, provided that Bank's calls with Borrower's investors shall have yielded diligence results satisfactory to Bank in its good faith sole discretion. After repayment, the Growth Capital Advance under the Second Tranche may not be reborrowed.

(b) Repayment of Growth Capital Advance.

(i) Interest-Only Payments. For each Growth Capital Advance, Borrower shall make monthly payments of interest-only commencing on the first (1st) Business Day of the first (1st) month following the month in which the Funding Date occurs with respect to such Growth Capital Advance and continuing thereafter during the Interest-Only Period, on the first (1st) Business Day of each successive month.

(ii) Principal and Interest Payments. For each Growth Capital Advance outstanding as of December 31, 2012, Borrower shall make thirty-six (36) consecutive equal monthly payments of principal plus accrued and unpaid interest, commencing on the first (1st) Business Day of the first (1st) month after the Interest-Only Period (the "**Conversion Date**"), in principal amounts that would fully amortize the applicable Growth Capital Advance, as of the Conversion Date, over the Repayment Period. The Final Payment and all unpaid principal and accrued and unpaid interest on each Growth Capital Advance is due and payable in foil on the Growth Capital Maturity Date.

(c) Voluntary Prepayment. Borrower shall have the option to prepay all Growth Capital Advances in full, provided Borrower (i) shall provide written notice to Bank of its election to prepay the Growth Capital Advances at least thirty (30) days prior to such prepayment and (ii) pays, on the date of such prepayment, (a) all outstanding principal and accrued but unpaid interest, plus (b) the Final Payment, plus (c) all other sums, including Bank Expenses, if any, that shall have become due and payable.

(d) Mandatory Prepayment Upon an Acceleration. If the Growth Capital Advances are accelerated in accordance with the terms of this Agreement following the occurrence of an Event of Default, Borrower shall immediately pay to Bank an amount equal to the sum of (i) all outstanding principal and accrued but unpaid interest, plus (ii) the Final Payment, plus (iii) all other sums, including Bank Expenses, if any, that shall have become due and payable in accordance with the terms of this Agreement.

2.2 Payment of Interest on the Credit Extensions.

(a) Interest Rate. Subject to Section 2.2(b), the principal amount outstanding for each Growth Capital Advance shall accrue interest at a per annum rate equal to four and one-half of one percentage points (4.50%) above the Basic Rate, fixed on the Funding Date for each Growth Capital Advance, which shall be payable monthly.

(b) Default Rate. Immediately upon the occurrence and during the continuance of an Event of Default, Obligations shall bear interest at a rate per annum which is five percentage points (5.00%) above the rate that is otherwise applicable thereto unless Bank otherwise elects from time to time in its sole discretion to impose a smaller increase. Fees and expenses which are required to be paid by Borrower pursuant to the Loan Documents (including, without limitation, Bank Expenses) but are not paid when due shall bear interest until paid at a rate equal to the highest rate then applicable to the Obligations. Payment or acceptance of the increased interest rate provided in this Section 2.2(b) is not a permitted alternative to timely

payment and shall not constitute a waiver of any Event of Default or otherwise prejudice or limit any rights or remedies of Bank.

(c) Adjustment to Interest Rate. Changes to the interest rate of any Credit Extension based on changes to the Basic Rate shall be effective on the effective date of any change to the Basic Rate and to the extent of any such change.

(d) Computation; 360-Day Year. In computing interest, the date of the making of any Credit Extension shall be included and the date of payment shall be excluded; *provided*, *however*, that if any Credit Extension is repaid on the same day on which it is made, such day shall be included in computing interest on such Credit Extension. Interest shall be computed on the basis of a 360-day year for the actual number of days elapsed.

(e) Debit of Accounts. Bank may debit any of Borrower's deposit accounts, including the Designated Deposit Account, for principal and interest payments or any other amounts Borrower owes Bank when due. These debits shall not constitute a set-off.

(f) Interest Payment Date. Unless otherwise provided, interest is payable monthly on the first (1st) calendar day of each month. Payments of principal and/or interest received after 12:00 p.m. Pacific time are considered received at the opening of business on the next Business Day. When a payment is due on a day that is not a Business Day, the payment is due the next Business Day and additional fees or interest, as applicable, shall continue to accrue until paid.

2.3 Fees. Borrower shall pay to Bank the following:

(a) Final Payment. The Final Payment, when due hereunder;

(b) Good Faith Deposit. Borrower has paid to Bank a good faith deposit of Ten Thousand Dollars ($10,000) (the "**Good Faith Deposit**") to initiate Bank's due diligence review process, which amount shall be applied to the Bank Expenses on the Effective Date, with any remaining amount to be refunded to Borrower; and

(c) Expenses. All Bank Expenses (including reasonable attorneys' fees and expenses, plus expenses for documentation and negotiation of this Agreement) incurred through and after the Effective Date, when due.

3 CONDITIONS OF LOANS

3.1 Conditions Precedent to Initial Credit Extension. Bank's obligation to make the initial Credit Extension is subject to the condition precedent that Bank shall have received, in form and substance satisfactory to Bank, such documents, and completion of such other matters, as Bank may reasonably deem necessary or appropriate, including, without limitation:

(a) duly executed original signatures to the applicable Loan Documents;

(b) duly executed original signatures to the Control Agreements with respect to any securities accounts of Borrower existing as of the Effective Date, including without limitation, any securities accounts held with Bank's Affiliates;

(c) the Operating Documents and good standing certificates of Borrower, with regard to each jurisdiction in which Borrower is registered to do business, such good standing certificates to be certified by the applicable governmental authority as of a date no earlier than thirty (30) days prior to the Effective Date;

(d) duly executed original signatures to the completed Borrowing Resolutions for Borrower;

(e) the duly executed original signature to a payoff letter from Comerica Bank;

(f) Evidence that (i) the Liens securing Indebtedness owed by Borrower to Comerica Bank will be terminated and (ii) the documents and/or filings evidencing the perfection of such Liens, including without limitation any financing statements and/or control agreements, have or will, concurrently with the initial Credit Extension, be terminated.

(g) certified copies, dated as of a recent date, of financing statement searches, as Bank shall request, accompanied by' written evidence (including any UCC termination statements) that the Liens indicated in any such financing statements either constitute Permitted Liens, or have been, or in connection with the initial Credit Extension will be, terminated or released;

(h) the Perfection Certificate executed by Borrower;

(i) evidence satisfactory to Bank that the insurance policies required by Section 6.5 hereof are in full force and effect, together with appropriate evidence showing lender loss payable and/or additional insured clauses and cancellation notice to Bank (or endorsements reflecting the same) in favor of Bank; and

(j) payment of the fees and Bank Expenses then due as specified in Section 2.3 hereof.

3.2 Conditions Precedent to all Credit Extensions. Bank's obligations to make each Credit Extension, including the initial Credit Extension, are subject to the following conditions precedent:

(a) timely receipt of an executed Payment/Advance Form;

(b) the representations and warranties in this Agreement shall be true, accurate, and complete in all material respects on the date of the Payment/Advance Form and on the Funding Date of each Credit Extension; provided, however, that such materiality qualifier shall not be applicable to any representations and warranties that already are qualified or modified by materiality in the text thereof; and provided, further that those representations and warranties expressly referring to a specific date shall be true, accurate and complete in all

material respects as of such date, and no Event of Default shall have occurred and be continuing or result from the Credit Extension. Each Credit Extension is Borrower's representation and warranty on that date that the representations and warranties in this Agreement remain true, accurate, and complete in all material respects; provided, however, that such materiality qualifier shall not be applicable to any representations and warranties that already are qualified or modified by materiality in the text thereof; and provided, further that those representations and warranties expressly referring to a specific date shall be true, accurate and complete in all material respects as of such date; and

(c) in Bank's sole discretion, (i) Bank has not determined that it is the intention of Borrower's then existing investors to not continue to fund Borrower in the amounts and timeframe to the extent necessary to enable Borrower to satisfy the Obligations as they become due and payable, and Borrower has not obtained sufficient commitments of new investors(s) satisfactory to Bank to fund Borrower in the amounts and timeframe to the extent necessary to enable Borrower to satisfy the Obligations as they become due and payable; or (ii) there is a material impairment in the perfection or priority of the Bank's security interest in the Collateral.

3.3 Covenant to Deliver. Borrower agrees to deliver to Bank each item required to be delivered to Bank under this Agreement as a condition precedent to any Credit Extension. Borrower expressly agrees that a Credit Extension made prior to the receipt by Bank of any such item shall not constitute a waiver by Bank of Borrower's obligation to deliver such item, and any such Credit Extension in the absence of a required item shall be made in Bank's sole discretion. As soon as possible, but in any event within thirty (30) days following the Effective Date, Borrower shall have delivered to Bank a Subordination Agreement by BioMed Realty, L.P. ("**BioMed**") in favor of Bank, in form and substance satisfactory to Bank, together with the duly executed original signatures thereto.

3.4 Procedures for Borrowing. Subject to the prior satisfaction of all other applicable conditions to the making of a Credit Extension set forth in this Agreement, to obtain a Credit Extension, Borrower shall notify Bank (which notice shall be irrevocable) by electronic mail, facsimile, or telephone by 12:00 p.m. Pacific time on the Funding Date of the Credit Extension. Together with any such electronic or facsimile notification, Borrower shall deliver to Bank by electronic mail or facsimile a completed Payment/Advance Form executed by a Responsible Officer or his or her designee. Bank may rely on any telephone notice given by a person who Bank believes is a Responsible Officer or designee. Bank shall credit Credit Extensions to the Designated Deposit Account. Bank may make Credit Extensions under this Agreement based on instructions from a Responsible Officer or his or her designee or without instructions if the Credit Extensions are necessary to meet Obligations that have become clue.

4 CREATION OF SECURITY INTEREST

4.1 Grant of Security Interest. Borrower hereby grants Bank, to secure the payment and performance in full of all of the Obligations, a continuing security interest in, and pledges to Bank, the Collateral, wherever located, whether now owned or hereafter acquired or arising, and all proceeds and products thereof. Borrower represents, warrants, and covenants that the security interest granted herein is and shall at all times continue to be a first priority perfected security

interest in the Collateral (subject only to Permitted Liens that may have superior priority to Bank's Lien under this Agreement). If Borrower shall acquire a commercial tort claim, Borrower shall promptly notify Bank in a writing signed by Borrower of the general details thereof and grant to Bank in such writing a security interest therein and in the proceeds thereof, all upon the terms of this Agreement, with such writing to be in form and substance reasonably satisfactory to Bank.

Borrower acknowledges that it previously has entered, and/or may in the future enter, into Bank Services Agreements with Bank. Regardless of the terms of any Bank Services Agreement, Borrower agrees that any amounts Borrower owes Bank thereunder shall be deemed to be Obligations hereunder and that it is the intent of Borrower and Bank to have all such Obligations secured by the first priority perfected security interest in the Collateral granted herein (subject only to Permitted Liens that may have superior priority to Bank's Lien in this Agreement).

If this Agreement is terminated, Bank's Lien in the Collateral shall continue until the Obligations (other than inchoate indemnity obligations) are satisfied in full, and at such time, Bank shall, at Borrower's sole cost and expense, terminate its security interest in the Collateral and all rights therein shall revert to Borrower. In the event (x) all Obligations (other than inchoate indemnity obligations), except for Bank Services, are satisfied in full, and (y) this Agreement is terminated, Bank shall terminate the security interest granted herein upon Borrower providing cash collateral acceptable to Bank in its good faith business judgment for Bank Services, if any. In the event such Bank Services consist of outstanding Letters of Credit, Borrower shall provide to Bank cash collateral in an amount equal to 105% (110% for Letters of Credit denominated in a Foreign Currency) of the Dollar Equivalent of the face amount of all such Letters of Credit plus all interest, fees, and costs due or to become due in connection therewith (as estimated by Bank in its good faith business judgment), to secure all of the Obligations relating to such Letters of Credit.

4.2 Authorization to File Financing Statements. Borrower hereby authorizes Bank to file financing statements, without notice to Borrower, with all appropriate jurisdictions to perfect or protect Bank's interest or rights hereunder, including a notice that any disposition of the Collateral, by Borrower or any other Person, shall be deemed to violate the rights of Bank under the Code.

5 REPRESENTATIONS AND WARRANTIES

Borrower represents and warrants as follows:

5.1 Due Organization, Authorization; Power and Authority. Borrower is duly existing and in good standing as a Registered Organization in its jurisdiction of formation and is qualified and licensed to do business and is in good standing in any jurisdiction in which the conduct of its business or its ownership of property requires that it be qualified except where the failure to do so could not reasonably be expected to have a material adverse effect on Borrower's business. In connection with this Agreement, Borrower has delivered to Bank a completed certificate signed by Borrower, entitled "Perfection Certificate". Borrower represents and warrants to Bank that (a) Borrower's exact legal name is that indicated on the Perfection

Certificate and on the signature page hereof; (b) Borrower is an organization of the type, and is organized in the jurisdiction, set forth in the Perfection Certificate; (c) the Perfection Certificate accurately sets forth Borrower's organizational identification number or accurately states that Borrower has none; (d) the Perfection Certificate accurately sets forth Borrower's place of business, or, if more than one, its chief executive office as well as Borrower's mailing address (if different than its chief executive office); (e) Borrower (and each of its predecessors) has not, in the past five (5) years, changed its jurisdiction of formation, organizational structure or type, or any organizational number assigned by its jurisdiction; and (f) all other information set forth on the Perfection Certificate pertaining to Borrower and each of its Subsidiaries is accurate and complete (it being understood and agreed that Borrower may from time to time update certain information in the Perfection Certificate after the Effective Date to the extent permitted by one or more specific provisions in this Agreement). If Borrower is not now a Registered Organization but later becomes one, Borrower shall promptly notify Bank of such occurrence and provide Bank with Borrower's organizational identification number.

The execution, delivery and performance by Borrower of the Loan Documents to which it is a party have been duly authorized, and do not (i) conflict with any of Borrower's organizational documents, (ii) contravene, conflict with, constitute a default under or violate any material Requirement of Law, (iii) contravene, conflict with or violate any applicable order, writ, judgment, injunction, decree, determination or award of any Governmental Authority by which Borrower or any its Subsidiaries or any of their property or assets may be bound or affected, (iv) require any action by, filing, registration, or qualification with, or Governmental Approval from, any Governmental Authority (except such Governmental Approvals that have already been obtained and are in full force and effect) or (v) constitute an event of default under any material agreement by which Borrower is bound. Borrower is not in default under any agreement to which it is a party or by which it is bound in which the default could reasonably be expected to have a material adverse effect on Borrower's business.

5.2 Collateral. Borrower has good title to, has rights in, and the power to transfer each item of the Collateral upon which it purports to grant a Lien hereunder, free and clear of any and all Liens except Permitted Liens. Borrower has no deposit accounts other than the deposit accounts with Bank, the deposit accounts, if any, described in the Perfection Certificate delivered to Bank in connection herewith, or of which Borrower has given Bank notice and taken such actions as are necessary to give Bank a perfected security interest therein. Any Accounts that constitute assets of Borrower are bona fide, existing obligations of the applicable Account Debtors.

The Collateral is not in the possession of any third party bailee (such as a warehouse) except as otherwise provided in the Perfection Certificate. None of the components of the Collateral shall be maintained at locations other than as provided in the Perfection Certificate or as permitted pursuant to Section 7.2.

All Inventory is in all material respects of good and marketable quality, free from material defects.

To the best of Borrower's knowledge, Borrower is the sole owner of the Intellectual Property which it owns or purports to own except for (a) non-exclusive licenses granted to its

customers in the ordinary course of business and licenses granted to the Related Special Purpose Entities in accordance with the terms of Sections 6.11 and 7.1, (b) over-the-counter software that is commercially available to the public, and (c) material Intellectual Property licensed to Borrower and noted on the Perfection Certificate. To the best of Borrower's knowledge, each Patent which it owns or purports to own and which is material to Borrower's business is valid and enforceable, and no part of the Intellectual Property which Borrower owns or purports to own and which is material to Borrower's business has been judged invalid or unenforceable, in whole or in part. To the best of Borrower's knowledge, no claim has been made that any part of the Intellectual Property violates the rights of any third party except to the extent such claim would not reasonably be expected to have a material adverse effect on Borrower's business.

Except as noted on the Perfection Certificate, Borrower is not a party to, nor is it bound by, any Restricted License.

5.3 Litigation. There are no actions or proceedings pending or, to the knowledge of the Responsible Officers, threatened in writing by or against Borrower or any Subsidiary or any Borrower-owned Related Special Purpose Entity involving more than Fifty Thousand Dollars ($50,000) individually or in the aggregate.

5.4 No Material Deviation in Financial Statements. All consolidated financial statements for Borrower and any of its Subsidiaries delivered to Bank fairly present in all material respects Borrower's consolidated financial condition and Borrower's consolidated results of operations. There has not been any material deterioration in Borrower's consolidated financial condition since the date of the most recent financial statements submitted to Bank.

5.5 Solvency. Borrower is not left with unreasonably small capital after the transactions in this Agreement; and Borrower is able to pay its debts (including trade debts) as they mature,

5.6 Regulatory Compliance. Borrower is not an "investment company" or a company "controlled" by an "investment company" under the Investment Company Act of 1940, as amended. Borrower is not engaged as one of its important activities in extending credit for margin stock (under Regulations X, T and U of the Federal Reserve Board of Governors). Borrower has complied in all material respects with the Federal Fair Labor Standards Act. Neither Borrower nor any Subsidiary or Borrower-owned Related Special Purpose Entity is a "holding company" or an "affiliate" of a "holding company" or a "subsidiary company" of a "holding company" as each term is defined and used in the Public Utility Holding Company Act of 2005. Borrower has not violated any laws, ordinances or rules, the violation of which could reasonably be expected to have a material adverse effect on its business. None of Borrower's, nor any Subsidiary's or Borrower-owned Related Special Purpose Entity's properties or assets has been used by Borrower or any Subsidiary or Related Special Purpose Entity or, to the best of Borrower's knowledge, by previous Persons, in disposing, producing, storing, treating, or transporting any hazardous substance other than legally. Borrower and each of its Subsidiaries and Borrower-owned Related Special Purpose Entities have obtained all consents, approvals and authorizations of, made all declarations or filings with, and given all notices to, all Governmental Authorities that are necessary to continue their respective businesses as currently conducted.

5.7 Subsidiaries; Investments. Borrower does not own any stock, partnership interest or other equity securities except for Permitted Investments.

5.8 Tax Returns and Payments; Pension Contributions. Borrower has timely filed all required tax returns and reports, and Borrower has timely paid all foreign, federal, state and material local taxes, assessments, deposits and contributions owed by Borrower. Borrower may defer payment of any contested taxes, provided that Borrower (a) in good faith contests its obligation to pay the taxes by appropriate proceedings promptly and diligently instituted and conducted, (b) notifies Bank in writing of the commencement of, and any material development in, the proceedings, (c) posts bonds or takes any other steps required to prevent the Governmental Authority levying such contested taxes from obtaining a Lien upon any of the Collateral that is other than a "Permitted Lien". Borrower is unaware of any claims or adjustments proposed for any of Borrower's prior tax years that could result in additional taxes becoming due and payable by Borrower. Borrower has paid all amounts necessary to fund all present pension, profit sharing and deferred compensation plans in accordance with their terms, and Borrower has not withdrawn from participation in, and has not permitted partial or complete termination of, or permitted the occurrence of any other event with respect to, any such plan that could reasonably be expected to result in any liability of Borrower, including any liability to the Pension Benefit Guaranty Corporation or its successors or any other governmental agency.

5.9 Use of Proceeds. Borrower shall use the proceeds of the Credit Extensions solely as working capital to fund its general business requirements and not for personal, family, household or agricultural purposes.

5.10 Full Disclosure. No written representation, warranty or other statement of Borrower in any certificate or written statement given to Bank, as of the date such representation, warranty, or other statement was made, taken together with all such written certificates and written statements given to Bank, contains any untrue statement of a material fact or omits to state a material fact necessary to make the statements contained in the certificates or statements not misleading (it being recognized by Bank that the projections and forecasts provided by Borrower in good faith and based upon reasonable assumptions are not viewed as facts and that actual results during the period or periods covered by such projections and forecasts may differ from the projected or forecasted results).

5.11 Definition of "Knowledge." For purposes of the Loan Documents, whenever a representation or warranty is made to Borrower's knowledge or awareness, to the "best of Borrower's knowledge, or with a similar qualification, knowledge or awareness means the actual knowledge, after reasonable investigation, of the Responsible Officers.

6 AFFIRMATIVE COVENANTS

Borrower shall do all of the following:

6.1 Government Compliance.

(a) Maintain its and all its Subsidiaries' legal existence and good standing in their respective jurisdictions of formation and maintain qualification in each jurisdiction in which the failure to so qualify would reasonably be expected to have a material adverse effect on

Borrower's business or operations. Borrower shall comply, and have each Subsidiary and each Borrower-owned Related Special Purpose Entity comply, with all laws, ordinances and regulations to which it is subject, noncompliance with which could have a material adverse effect on Borrower's business.

(b) Obtain all of the Governmental Approvals necessary for the performance by Borrower of its obligations under the Loan Documents to which it is a party and the grant of a security interest to Bank in the Collateral. Borrower shall promptly provide copies of any such obtained Governmental Approvals to Bank.

6.2 Financial Statements, Reports, Certificates.

(a) Monthly Financial Statements. As soon as available, but no later than thirty (30) days after the last day of each month, (i) company prepared consolidated and consolidating balance sheets and income statements covering Borrower's and each Subsidiary's consolidated and consolidating operations for such month, (ii) company prepared monthly balance sheets for each of the Related Special Purpose Entities, and (iii) a detailed breakdown of funds received by Borrower from each of the Related Special Purpose Entities for services rendered and the then-outstanding principal balance of each loan made by Borrower to a Related Special Purpose Entity, in the case of each of the reports set forth in the foregoing clauses (i) through (iii), certified by a Responsible Officer and in a form acceptable to Bank in its reasonable discretion (collectively, the "**Monthly Financial Statements**");

(b) Monthly Compliance Certificate. Within thirty (30) days after the last day of each month and together with the Monthly Financial Statements and the quarterly financial statements set forth in clause (c) below, a duly completed Compliance Certificate signed by a Responsible Officer, certifying that as of the end of such month, Borrower was in full compliance with all of the terms and conditions of this Agreement, and setting forth such other information as Bank shall reasonably request;

(c) Quarterly Financial Statements. As soon as available, but no later than thirty (30) days after the last day of each calendar quarter, (i) company prepared combined balance sheets and income statements covering Borrower's, each Subsidiary's and each Related Special Purpose Entity's combined operations for such quarter, and (ii) a detailed breakdown of funds received by Borrower from each of the Related Special Purpose Entities for services rendered and the then-outstanding principal balance of each loan made by Borrower to a Related Special Purpose Entity, certified by a Responsible Officer and in a form acceptable to Bank in its reasonable discretion;

(d) Annual Audited Financial Statements. As soon as available, but no later than one hundred eighty (180) days after the last day of Borrower's fiscal year beginning with the 2012 fiscal year, audited consolidated and consolidating (or combined, as applicable) financial statements of Borrower, the Subsidiaries and the Related Special Purpose Entities, prepared under GAAP, consistently applied, together with an unqualified opinion (other than with respect to a going concern comment typical for venture backed companies) on the financial statements from an independent certified public accounting firm acceptable to Bank in its reasonable discretion;

(e) Other Statements. Within five (5) days of delivery, copies of all financial statements and reports made available to Borrower's security holders or to any holders of Subordinated Debt (to the extent not already provided to Bank);

(f) SEC Filings. In the event that Borrower becomes subject to the reporting requirements under the Exchange Act within five (5) days of filing, copies of all periodic and other reports, proxy statements and other materials filed by Borrower with the SEC, any Governmental Authority succeeding to any or all of the functions of the SEC or with any national securities exchange, or distributed to its shareholders, as the case may be. Documents required to be delivered pursuant to the terms hereof (to the extent any such documents are included in materials otherwise filed with the SEC) may be delivered electronically and if so delivered, shall be deemed to have been delivered on the date on which Borrower posts such documents, or provides a link thereto, on Borrower's website on the Internet at Borrower's website address;

(g) Legal Action Notice. A prompt report of any legal actions pending or threatened in writing against Borrower or any of its Subsidiaries or Borrower-owned Related Special Purpose Entity that could result in damages or costs to Borrower or any of its Subsidiaries or Borrower-owned Related Special Purpose Entity of, individually or in the aggregate, Fifty Thousand Dollars ($50,000) or more;

(h) Financial Projections. As soon as available, but not later than the earlier of seven (7) days after approval by Borrower's Board of Directors or sixty (60) days after each fiscal year, annual financial projections for the following fiscal year commensurate in form and substance with those provided to Borrower's venture capital investors; and

(i) Other Financial Information. Budgets, sales projections, operating plans and other financial information reasonably requested by Bank.

6.3 Inventory; Returns. Keep all Inventory in good and marketable condition, free from material defects. Returns and allowances between Borrower and its Account Debtors shall follow Borrower's customary practices as they exist at the Effective Date. Borrower must promptly notify Bank of all returns, recoveries, disputes and claims that involve more than One Hundred Thousand Dollars ($100,000).

6.4 Taxes; Pensions. Timely file, and require each of its Subsidiaries and Borrower-owned Related Special Purpose Entities to timely file, all required foreign, federal, state and material local tax returns and reports and timely pay, and require each of its Subsidiaries and Borrower-owned Related Special Purpose Entities to timely pay, all foreign, federal, state and material local taxes, assessments, deposits and contributions owed by Borrower and each of its Subsidiaries and Borrower-owned Related Special Purpose Entities, except for deferred payment of any taxes contested pursuant to the terms of Section 5.8 hereof, and shall deliver to Bank, on demand, appropriate certificates attesting to such payments, and pay all amounts necessary to fund all present pension, profit sharing and deferred compensation plans in accordance with their terms.

6.5 Insurance. Keep its business and the Collateral insured for risks and in amounts standard for companies in Borrower's industry and location and as Bank may reasonably request. Insurance policies shall be in a form, with companies, and in amounts that are satisfactory to Bank in Bank's reasonable discretion. All property policies shall have a lender's loss payable endorsement showing Bank as a lender loss payee and waive subrogation against Bank, and all liability policies shall show, or have endorsements showing, Bank as an additional insured. All policies (or their respective endorsements) shall provide that the insurer shall give Bank at least twenty (20) days notice before canceling, amending, or declining to renew its policy. At Bank's request, Borrower shall deliver certified copies of policies and evidence of all premium payments. Proceeds payable under any policy shall, at Bank's option, be payable to Bank on account of the Obligations. Notwithstanding the foregoing, (a) so long as no Event of Default has occurred and is continuing, Borrower shall have the option of applying the proceeds of any casualty policy up to One Hundred Thousand Dollars ($100,000) in the aggregate for all losses under all casualty policies in any one year, toward the replacement or repair of destroyed or damaged property; provided that any such replaced or repaired property (i) shall be of equal or like value as the replaced or repaired Collateral and (ii) shall be deemed Collateral in which Bank has been granted a first priority security interest, and (b) after the occurrence and during the continuance of an Event of Default, all proceeds payable under such casualty policy shall, at the option of Bank, be payable to Bank on account of the Obligations. If Borrower fails to obtain insurance as required under this Section 6.5 or to pay any amount or furnish any required proof of payment to third persons and Bank, Bank may make all or part of such payment or obtain such insurance policies required in this Section 6.5, and take any action under the policies Bank deems prudent.

6.6 Operating Accounts.

(a) Maintain its primary operating and other deposit accounts and securities accounts with Bank and Bank's Affiliates, which accounts shall include Borrower maintaining Collateral Account balances at or through Bank or Bank's Affiliates representing at least eighty percent (80%) of all Consolidated Cash.

(b) Provide Bank five (5) days prior written notice before establishing any Collateral Account at or with any bank or financial institution other than Bank or Bank's Affiliates. For each Collateral Account that Borrower at any time maintains, Borrower shall cause the applicable bank or financial institution (other than Bank) at or with which any Collateral Account is maintained to execute and deliver a Control Agreement or other

appropriate instrument with respect to such Collateral Account to perfect Bank's Lien in such Collateral Account in accordance with the terms hereunder, which control agreements may not be terminated without the prior written consent of Bank. The provisions of the previous sentence shall not apply to deposit accounts exclusively used for payroll, payroll taxes and other employee wage and benefit payments to or for the benefit of Borrower's employees and identified to Bank by Borrower as such.

6.7 Reserved.

6.8 Protection of Intellectual Property Rights.

(a) (i) Use commercially reasonable efforts to protect, defend and maintain the validity and enforceability of its Intellectual Property; (ii) promptly advise Bank in writing of material infringements of its Intellectual Property; and (iii) not allow any Intellectual Property material to Borrower's business to be abandoned, forfeited or dedicated to the public without Bank's written consent.

(b) Provide written notice to Bank within ten (10) days of entering or becoming bound by any Restricted License (other than over-the-counter software, that is commercially available to the public). Borrower shall take such commercially reasonable steps as Bank requests to obtain the consent of, or waiver by, any person whose consent or waiver is necessary for (i) any Restricted License to be deemed "Collateral" and for Bank to have a security interest in it that might otherwise be restricted or prohibited by law or by the terms of any such Restricted License, whether now existing or entered into in the future, and (ii) Bank to have the ability in the event of a liquidation of any Collateral to dispose of such Collateral in accordance with Bank's rights and remedies under this Agreement and the other Loan Documents.

6.9 Litigation Cooperation. Make available to Bank, without expense to Bank, Borrower and its officers, employees and agents and Borrower's books and records, to the extent that Bank may deem them reasonably necessary to prosecute or defend any third-party suit or proceeding instituted by or against Bank with respect to any Collateral or relating to Borrower.

6.10 Access to Collateral; Books and Records. Allow Bank, or its agents, at reasonable times, on three (3) Business Days' notice (provided no notice is required if an Event of Default has occurred and is continuing), to inspect the Collateral and audit and copy Borrower's Books. Such inspections or audits shall be conducted no more often than once every twelve (12) months unless an Event of Default has occurred and is continuing. The foregoing inspections and audits shall be at Borrower's expense. In the event Borrower and Bank schedule an audit more than ten (10) days in advance, and Borrower cancels or seeks to reschedule the audit with less than ten (10) days written notice to Bank, then (without limiting any of Bank's rights or remedies), Borrower shall pay Bank a fee of One Thousand Dollars ($1,000) plus any out-of-pocket expenses incurred by Bank to compensate Bank for the anticipated costs and expenses of the cancellation or rescheduling.

6.11 Additional Covenants Regarding Related Special Purpose Entities. Not less than ten (10) Business Days prior to formation of any Related Special Purpose Entity or prior to any request to make an exclusive license to a Related Special Purpose Entity, Borrower shall

provide Bank with written notice of its intent to form such Related Special Purpose Entity (an "**RSPE Notice**"), and include in such RSPE Notice: (a) a description of the individual drug discovery program Borrower intends to license to such Related Special Purpose Entity, (b) whether Borrower is requesting Bank's written consent to exclusive, licensing of any of Borrower's Intellectual Property to such Related Special Purpose Entity (which consent, solely in the case of a request for exclusivity in connection with a transfer of, or the execution of an agreement with a third party entered into in an arm's length transaction which is reasonably anticipated to result in a transfer of, such Related Special Purpose Entity from Common Control with Borrower, shall not be unreasonably withheld, conditioned or delayed and will be deemed to have been given by Bank if Bank does not reject such request in writing within ten (10) Business Days following receipt by Bank of the applicable RSPE Notice), and (c) the aggregate principal amount of any loan Borrower intends to make to such Related Special Purpose Entity (each loan by Borrower to a Related Special Purpose Entity, an "**RSPE Loan**"); provided that (x) such RSPE Loan shall not exceed the Individual RSPE Note Threshold, and (y) such RSPE Loan, when taken together with all other RSPE Loans, shall not exceed the Maximum Aggregate RSPE Loan Amount. Should Borrower make any such RSPE Loan, Borrower shall immediately (a) deliver to Bank the original fully-executed promissory note evidencing such RSPE Loan and any collateral security for such RSPE Loan, together with appropriate instruments of assignment or transfer, all as Bank may deem necessary or appropriate for Borrower to pledge all of its right, title and interest in such note and collateral security, in form and substance satisfactory to Bank, and (b) take all other actions reasonably required by Bank to cause such note and collateral to be included in "Collateral" and to perfect and protect Bank's security interest therein. Any document, agreement, or instrument executed or issued pursuant to this Section 6.11 shall be a Loan Document.

6.12 Further Assurances. Execute any further instruments and take further action as Bank reasonably requests to perfect or continue Bank's Lien in the Collateral or to effect the purposes of this Agreement.

7 NEGATIVE COVENANTS

Borrower shall not do any of the following without Bank's prior written consent:

7.1 Dispositions. Convey, sell, lease, transfer, assign, or otherwise dispose of (collectively, **"Transfer**"), or permit any of its Subsidiaries or Borrower-owned. Related Special Purpose Entities to Transfer, all or any part of its business or property, except for Transfers (a) of Inventory hi the ordinary course of business; (b) of worn-out or obsolete Equipment; (c) in connection with Permitted Liens and Permitted Investments; (d) of non-exclusive licenses for the use of the property of Borrower in the ordinary course of business, (e) of the equity securities of Borrower-owned Related Special Purpose Entities such that such Related Special Purpose Entities are under Common Control with Borrower; (f) licenses of Intellectual Property to Related Special Purpose Entities that could not result in a legal transfer of title of the licensed property but that may be exclusive in certain respects, so long as Bank has consented to or approved such licenses in accordance with Section 6,11, and (g) other Transfers not to exceed Twenty-Five Thousand Dollars ($25,000) in any twelve (12) month period.

7.2 Changes in Business, Management, Ownership or Business Locations.

(a) Engage in or permit any of its Subsidiaries to engage in any business other than the businesses currently engaged in by Borrower and such Subsidiary, as applicable, or reasonably related thereto; (b) liquidate or dissolve; or (c) (i) have a change in management such that the Chief Executive Officer of Borrower ceases to hold such office and a replacement satisfactory to Borrower's Board of Directors is not made within ninety (90) days after such departure, (ii) enter into any transaction or series of related transactions in which the stockholders of Borrower who were not stockholders immediately prior to the first such transaction own more than forty-nine percent (49%) of the voting stock of Borrower immediately after giving effect to such transaction or related series of such transactions (other than by the sale of Borrower's equity securities in a public offering or to venture capital investors so long as Borrower identifies to Bank the venture capital investors prior to the closing of the transaction and provides to Bank a description of the material terms of the transaction), (iii) enter into any transaction or series of related transactions resulting in Borrower ceasing to own at least seventy-five percent (75%) of Pangu, and at least one hundred percent (100%) of its other Subsidiaries, or (iv) enter into any transaction or series of related transactions resulting in a Related Special Purpose Entity ceasing to be owned by Borrower or under Common Control with Borrower, unless prior thereto, or in connection therewith, such Related Special Purpose Entity shall have paid to Borrower an aggregate amount equal to or greater than the aggregate principal amount of the RSPE Loan made by Borrower to such Related Special Purpose Entity.

Borrower shall not, without at least thirty (30) days prior written notice to Bank: (1) except with respect to the office relocation that will occur within ninety (90) days of the date hereof (so long as Borrower notifies Bank immediately upon taking possession of the new premises and, to the extent not previously delivered, delivers to Bank concurrently with such move, a landlord waiver or subordination agreement reasonably satisfactory to Bank, signed by the landlord of such new office location), add any new offices or other physical business facilities, including warehouses (unless such new offices or business facilities contain less than Twenty-Five Thousand Dollars ($25,000) in Borrower's assets or property) or deliver any portion of the Collateral valued, individually or in the aggregate, in excess of Twenty-Five Thousand Dollars ($25,000) to a bailee at a location other than to a bailee and at a location already disclosed in the Perfection Certificate, (2) change its jurisdiction of organization, (3) change its organizational structure or type, (4) change its legal name, or (5) change any organizational number (if any) assigned by its jurisdiction of organization. If Borrower intends to deliver any portion of the Collateral valued, individually or in the aggregate, in excess of Twenty-Five Thousand Dollars ($25,000) to a bailee, and Bank and such bailee are not already parties to a bailee agreement governing both the Collateral and the location to which Borrower intends to deliver the Collateral, then Borrower will first receive the written consent of Bank, and such bailee shall execute and deliver a bailee agreement in form and substance satisfactory to Bank in its sole discretion.

7.3 Mergers or Acquisitions. Merge or consolidate, or permit any of its Subsidiaries or Borrower-owned Related Special Purpose Entities to merge or consolidate, with any other Person, or acquire, or permit any of its Subsidiaries or Borrower-owned Related Special Purpose Entities to acquire, all or substantially all of the capital stock or property of another Person. A Subsidiary may merge or consolidate into another Subsidiary or into Borrower.

7.4 Indebtedness. Create, incur, assume, or be liable for any Indebtedness, or permit any Subsidiary or Borrower-owned Related Special Purpose Entity to do so, other than Permitted Indebtedness.

7.5 Encumbrance. Create, incur, allow, or suffer any Lien on any of its property, or assign, or convey any right to receive income, including the sale of any Accounts, or permit any of its Subsidiaries or Borrower-owned Related Special Purpose Entities to do so, except for Permitted Liens; permit any Collateral not to be subject to the first priority security interest granted herein; or enter into any agreement, document, instrument or other arrangement (except with or in favor of Bank) with any Person that directly or indirectly prohibits, or has the effect of prohibiting, Borrower from assigning, mortgaging, pledging, granting a security interest in or upon, or encumbering any of Borrower's Intellectual Property, except as is otherwise permitted in Section 7.1 hereof and the definition of "Permitted Lien" herein.

7.6 Maintenance of Collateral Accounts. Maintain any Collateral Account except pursuant to the terms of Section 6.6 hereof.

7.7 Distributions; Investments. Pay any dividends or make any distribution or payment or redeem, retire or purchase any capital stock, other than solely by issuance of capital stock in connection with either (A) the exercise of stock options or warrants by way of cashless exercise, or (B) in connection with the satisfaction of withholding tax obligations related to the exercise of stock options; provided that (i) Borrower may convert any of its convertible securities into other securities pursuant to the terms of such convertible securities or otherwise in exchange thereof, (ii) Borrower may pay dividends solely in capital stock of Borrower or any Related Special Purpose Entity; and (iii) Borrower may repurchase the stock of former employees, directors or consultants pursuant to stock repurchase agreements so long as an Event of Default does not exist at the time of such repurchase and would not exist after giving effect to such repurchase, provided such repurchases do not exceed in the aggregate of One Hundred Thousand Dollars ($100,000) in any fiscal year; or (a) directly or indirectly make any Investment other than Permitted Investments.

7.8 Transactions with Affiliates. Directly or indirectly enter into or permit to exist any material transaction with any Affiliate of Borrower, except for (i) transactions that are in the ordinary course of Borrower's business, in each case, upon fair and reasonable terms that are no less favorable to Borrower than would be obtained in an arm's length transaction with a nonaffiliated Person, and (ii) transactions with Related Special Purpose Entities contemplated by and made in accordance with Sections 6.11 and 7.1 on substantially similar terms to transactions heretofore entered into by Borrower with its Affiliates.

7.9 Subordinated Debt.

(a) Make or permit any payment on any Subordinated Debt, except under the terms of the subordination, intercreditor, or other similar agreement to which such Subordinated Debt is subject, or (b) amend any provision in any document relating to the Subordinated Debt that would increase the amount thereof or adversely affect the subordination thereof to Obligations owed to Bank.

7.10 Compliance. Become an "'investment company" or a company controlled by an "investment company", under the Investment Company Act of 1940, as amended, or undertake as one of its important activities extending credit to purchase or carry margin stock (as defined in Regulation U of the Board of Governors of the Federal Reserve System), or use the proceeds of any Credit Extension for that purpose; fail to meet the minimum funding requirements of ERISA, permit a Reportable Event or Prohibited Transaction, as defined in ERISA, to occur; fail to comply with the Federal Fair Labor Standards Act or violate any other law or regulation, if the violation could reasonably be expected to have a material adverse effect on Borrower's business, or permit any of its Subsidiaries or Borrower-owned Related Special Purpose Entities to do so; withdraw or permit any Subsidiary or Borrower-owned Related Special Purpose Entity to withdraw from participation in, permit partial or complete termination of, or permit the occurrence of any other event with respect to, any present pension, profit sharing and deferred compensation plan that could reasonably be expected to result in any liability of Borrower, including any liability to the Pension Benefit Guaranty Corporation or its successors or any other governmental agency.

8 EVENTS OF DEFAULT

Any one of the following shall constitute an event of default (an "**Event of Default**") under this Agreement:

8.1 Payment Default. Borrower fails to (a) make any payment of principal or interest on any Credit Extension on its due date, or (b) pay any other Obligations within three (3) Business Days after such Obligations are due and payable (which three (3) Business Day grace period shall not apply to payments due on the Growth Capital Maturity Date). During the cure period, the failure to make or pay any payment specified in clauses (a) or (b) hereunder is not an Event of Default (but no Credit Extension will be made during the cure period);

8.2 Covenant Default.

(a) Borrower fails or neglects to perform any obligation in Sections 6.2, 6.4, 6.5, 6.6, 6.8(b), 6.10, or 6.11 or violates any covenant in Section 7; or

(b) Borrower fails or neglects to perform, keep, or observe any other term, provision, condition, covenant or agreement contained in this Agreement or any Loan Documents, and as to any default (other than those specified in this Section 8) under such other term, provision, condition, covenant or agreement that can be cured, has failed to cure the default within ten (10) days after the occurrence thereof; provided, however, that if the default cannot by its nature be cured within the ten (10) day period or cannot after diligent attempts by Borrower be cured within such ten (10) day period, and such default is likely to be cured within a reasonable time, then Borrower shall have an additional period (which shall not in any case exceed thirty (30) days) to attempt to cure such default, and within such reasonable time period the failure to cure the default shall not be deemed an Event of Default (but no Credit Extensions shall be made during such cure period). Cure periods provided under this section shall not apply, among other things, to financial covenants or any other covenants set forth in clause (a) above.

8.3 Investor Abandonment; Priority of Security Interest. If (i) Bank determines in its good faith judgment that it is the clear intention of Borrower's then existing investors to not continue to fund Borrower in the amounts and timeframe to the extent necessary to enable Borrower to satisfy the Obligations as they become due and payable, and Borrower has not obtained sufficient commitments of new investors(s) satisfactory to Bank to fund Borrower in the amounts and timeframe to the extent necessary to enable Borrower to satisfy the Obligations as they become due and payable, or (ii) there is a material impairment in the perfection or priority of the Bank's security interest in the Collateral;

8.4 Attachment; Levy; Restraint on Business.

(a) (i) The service of process seeking to attach, by trustee or similar process, any funds of Borrower or of any entity under the control of Borrower (including any Subsidiary or Borrower-owned Related Special Purpose Entity) on deposit or otherwise maintained with Bank or any Bank Affiliate, or (ii) a notice of lien or levy is filed against any of Borrower's assets by any government agency, and the same under subclauses (i) and (ii) hereof are not, within ten (10) days after the occurrence thereof, discharged or stayed (whether through the posting of a bond or otherwise); provided, however, no Credit Extensions shall be made during any ten (10) day cure period; or

(b) (i) any material portion of Borrower's assets is attached, seized, levied on, or comes into possession of a trustee or receiver, or (ii) any court order enjoins, restrains, or prevents Borrower from conducting any material part of its business;

8.5 Insolvency. (a) Borrower fails to be solvent as described in Section 5.5 hereof; (b) Borrower begins an Insolvency Proceeding; or (c) an Insolvency Proceeding is begun against Borrower and not dismissed or stayed within forty-five (45) days (but no Credit Extensions shall be made while of any of the conditions described in clause (a) exist and/or until any Insolvency Proceeding is dismissed);

8.6 Other Agreements. There is, under any agreement to which Borrower is a party with a third party or parties, (a) any default resulting in a right by such third party or parties, whether or not exercised, to accelerate the maturity of any Indebtedness in an amount individually or in the aggregate in excess of Fifty Thousand Dollars ($50,000); or (b) any default by Borrower, the result of which could have a material adverse effect on Borrower's business;

8.7 Judgments. One or more final judgments, orders, or decrees for the payment of money in an amount, individually or in the aggregate, of at least Fifty Thousand Dollars ($50,000) (not covered by independent third-party insurance as to which liability has been accepted by such insurance earner, subject to standard deductibles) shall be rendered against Borrower and the same are not, within ten (10) days after the entry thereof, discharged or execution thereof stayed or bonded pending appeal, or such judgments are not discharged prior to the expiration of any such stay (provided that no Credit Extensions will be made prior to the discharge, stay, or bonding of such judgment, order, or decree);

8.8 Misrepresentations. Borrower or any Person acting for Borrower makes any representation, warranty or other statement now or later in this Agreement, any Loan Document

or in any writing delivered to Bank or to induce Bank to enter this Agreement or any Loan Document, and such representation, warranty, or other statement is incorrect in any material respect when made;

8.9 Subordinated Debt. A default or breach occurs under any agreement between Borrower and any creditor of Borrower that signed a subordination, intercreditor, or other similar agreement with Bank, or any creditor that has signed such an agreement with Bank breaches any terms of such agreement (notwithstanding the foregoing, in the case of agreements between Borrower and BioMed, this Section 8.9 shall apply only to breaches occurring under documents evidencing or securing Indebtedness of Borrower to BioMed);

8.10 RSPE Loan Amount; Proceeds from Related Special Purpose Entities. Any RSPE Loan shall (x) exceed the Individual RSPE Note Threshold applicable to such RSPE Loan, or (y) exceed, when taken together with all other RSPE Loans, the Maximum Aggregate RSPE Loan Amount; or any Related Special Purpose Entity shall fail to pay to Borrower an amount equal to or greater than eighty-five percent (85%) of the RSPE Loan made by Borrower to such Related Special Purpose Entity within ninety (90) days following the funding of such RSPE Loan; or

8.11 Governmental Approvals. Any Governmental Approval shall have been (a) revoked, rescinded, suspended, modified in an adverse manner or not renewed in the ordinary course for a full term or (b) subject to any decision by a Governmental Authority that designates a hearing with respect to any applications for renewal of any of such Governmental Approval or that could result in the Governmental Authority taking any of the actions described in clause (a) above, and such decision or such revocation, rescission, suspension, modification or non-renewal (i) has, or could reasonably be expected to have, a Material Adverse Change, or (ii) adversely affects the legal qualifications of Borrower or any of its Subsidiaries to hold such Governmental Approval in any applicable jurisdiction and such revocation, rescission, suspension, modification or non-renewal could reasonably be expected to affect the status of or legal qualifications of Borrower or any of its Subsidiaries to hold any Governmental Approval in any other jurisdiction. Notwithstanding the foregoing, failure of one or more clinical trials in respect of a drug discovery program shall not, in and of itself, be deemed to constitute an Event of Default under this Section 8.10.

9 BANK'S RIGHTS AND REMEDIES

9.1 Rights and Remedies. While an Event of Default occurs and continues Bank may, without notice or demand, do any or all of the following:

(a) declare all Obligations immediately due and payable (but if an Event of Default described in Section 8.5 occurs all Obligations are immediately due and payable without any action by Bank);

(b) stop advancing money or extending credit for Borrower's benefit under this Agreement or under any other agreement between Borrower and Bank;

(c) for any Letters of Credit, demand that Borrower (i) deposit cash with Bank in an amount equal to 105% (110% for Letters of Credit denominated in a Foreign Currency) of the Dollar Equivalent of the aggregate face amount of all Letters of Credit remaining undrawn (plus all interest, fees, and costs due or to become due in connection therewith (as estimated by Bank in its good faith business judgment)), to secure all of the Obligations relating to such Letters of Credit, as collateral security for the repayment of any future drawings under such Letters of Credit, and Borrower shall forthwith deposit and pay such amounts, and (ii) pay in advance all letter of credit fees scheduled to be paid or payable over the remaining term of any Letters of Credit;

(d) terminate any FX Contracts;

(e) settle or adjust disputes and claims directly with Account Debtors for amounts on terms and in any order that Bank considers advisable, notify any Person owing Borrower money of Bank's security interest in such funds, and verify the amount of such account;

(f) make any payments and do any acts it considers necessary or reasonable to protect the Collateral and/or its security interest in the Collateral. Borrower shall assemble the Collateral if Bank requests and make it available as Bank designates. Bank may enter premises where the Collateral is located, take and maintain possession of any part of the Collateral, and pay, purchase, contest, or compromise any Lien that appears to be prior or superior to its security interest and pay all expenses incurred. Borrower grants Bank a license to enter and occupy any of its premises, without charge, to exercise any of Bank's rights or remedies;

(g) apply to the Obligations (i) any balances and deposits of Borrower it holds, or (ii) any amount held by Bank owing to or for the credit or the account of Borrower;

(h) ship, reclaim, recover, store, finish, maintain, repair, prepare for sale, advertise for sale and sell the Collateral. Bank is hereby granted a non-exclusive, royalty-free license or other right to use, without charge, Borrower's labels, Patents, Copyrights, mask works, rights of use of any name, trade secrets, trade names, Trademarks, and advertising matter, or any similar property as it pertains to the Collateral, in completing production of, advertising for sale, and selling any Collateral and, in connection with Bank's exercise of its rights under this Section, Borrower's rights under all licenses and all franchise agreements inure to Bank's benefit;

(i) place a "hold'' on any account maintained with Bank and/or deliver a notice of exclusive control, any entitlement order, or other directions or instructions pursuant to any Control Agreement or similar agreements providing control of any Collateral;

(j) demand and receive possession of Borrower's Books; and

(k) exercise all rights and remedies available to Bank under the Loan Documents or at law or equity, including all remedies provided under the Code (including disposal of the Collateral pursuant to the terms thereof).

9.2 Power of Attorney. Borrower hereby irrevocably appoints Bank as its lawful attorney-in-fact, exercisable upon the occurrence and during the continuance of an Event of Default, to: (a) endorse Borrower's name on any checks or other forms of payment or security; (b) sign Borrower's name on any invoice or bill of lading for any Account or drafts against Account Debtors; (c) settle and adjust disputes and claims about the Accounts directly with Account Debtors, for amounts and on terms Bank determines reasonable; (d) make, settle, and adjust all claims under Borrower's insurance policies; (e) pay, contest or settle any Lien, charge, encumbrance, security interest, and adverse claim in or to the Collateral, or any judgment based thereon, or otherwise take any action to terminate or discharge the same; and (f) transfer the Collateral into the name of Bank or a third party as the Code permits. Borrower hereby appoints Bank as its lawful attorney-in-fact to sign Borrower's name on any documents necessary to perfect or continue the perfection of Bank's security interest in the Collateral, regardless of whether an Event of Default has occurred, until all Obligations (other than inchoate indemnity obligations) have been satisfied in full and Bank is under no further obligation to make Credit Extensions hereunder. Bank's foregoing appointment as Borrower's attorney in fact, and all of Bank's rights and powers, coupled with an interest, are irrevocable until all Obligations (other than inchoate indemnity obligations) have been fully repaid and performed and Bank's obligation to provide Credit Extensions terminates.

9.3 Protective Payments. If Borrower fails to obtain the insurance called for by Section 6.5 or fails to pay any premium thereon or fails to pay any other amount which Borrower is obligated to pay under this Agreement or any other Loan Document, Bank may obtain such insurance or make such payment, and all amounts so paid by Bank are Bank Expenses and immediately due and payable, bearing interest at the then highest rate applicable to the Obligations, and secured by the Collateral. Bank will make reasonable efforts to provide Borrower with notice of Bank obtaining such insurance at the time it is obtained or within a reasonable time thereafter. No payments by Bank are deemed an agreement to make similar payments in the future or Bank's waiver of any Event of Default.

9.4 Application of Payments and Proceeds Upon Default. If an Event of Default has occurred and is continuing, Bank may apply any funds in its possession, whether from Borrower account balances, payments, proceeds realized as the result of any collection of Accounts or other disposition of the Collateral, or otherwise, to the Obligations in such order as Bank shall determine in its sole discretion, Any surplus shall be paid to Borrower or other Persons legally entitled thereto; Borrower shall remain liable to Bank for any deficiency. If Bank, in its good faith business judgment, directly or indirectly enters into a deferred payment or other credit transaction with any purchaser at any sale of Collateral, Bank shall have the option, exercisable at any time, of either reducing the Obligations by the principal amount of the purchase price or deferring the reduction of the Obligations until the actual receipt by Bank of cash therefor.

9.5 Bank's Liability for Collateral. So long as Bank complies with reasonable banking practices regarding the safekeeping of the Collateral in the possession or under the control of Bank, Bank shall not be liable or responsible for: (a) the safekeeping of the Collateral; (b) any loss or damage to the Collateral; (c) any diminution in the value of the Collateral; or (d) any act or default of any carrier, warehouseman, bailee, or other Person. Borrower bears all risk of loss, damage or destruction of the Collateral.

9.6 No Waiver; Remedies Cumulative. Bank's failure, at any time or times, to require strict performance by Borrower of any provision of this Agreement or any other Loan Document shall not waive, affect, or diminish any right of Bank thereafter to demand strict performance and compliance herewith or therewith. No waiver hereunder shall be effective unless signed by the party granting the waiver and then is only effective for the specific instance and purpose for which it is given. Bank's rights and remedies under this Agreement and the other Loan Documents are cumulative. Bank has all rights and remedies provided under the Code, by law, or in equity. Bank's exercise of one right or remedy is not an election and shall not preclude Bank from exercising any other remedy under this Agreement or other remedy available at law or in equity, and Bank's waiver of any Event of Default is not a continuing waiver. Bank's delay in exercising any remedy is not a waiver, election, or acquiescence.

9.7 Demand Waiver. Borrower waives demand, notice of default or dishonor, notice of payment and nonpayment, notice of any default, nonpayment at maturity, release, compromise, settlement, extension, or renewal of accounts, documents, instruments, chattel paper, and guarantees held by Bank on which Borrower is liable.

10 NOTICES

All notices, consents, requests, approvals, demands, or other communication by any party to this Agreement or any other Loan Document must be in writing and shall be deemed to have been validly served, given, or delivered: (a) upon the earlier of actual receipt and three (3) Business Days after deposit in the U.S. mail, first class, registered or certified mail return receipt requested, with proper postage prepaid; (b) upon transmission, when sent by electronic mail or facsimile transmission; (c) one (1) Business Day after deposit with a reputable overnight courier with all charges prepaid; or (d) when delivered, if hand-delivered by messenger, all of which shall be addressed to the party to be notified and sent to the address, facsimile number, or email address indicated below. Bank or Borrower may change its mailing or electronic mail address or facsimile number by giving the other party written notice thereof in accordance with the terms of this Section 10.

If to Borrower:	aTyr Pharma, Inc. 3565 General Atomics Court #103 San Diego, CA 92121 Attn: Stan Blackburn, Acting CFO Fax: _____ Email:
If to Bank:	Silicon Valley Bank 4370 La Jolla village Drive, Suite 860 San Diego, CA 92122 Attn: Kevin Wallace Fax: _____ Email:

11 CHOICE OF LAW, VENUE, JURY TRIAL WAIVER AND JUDICIAL REFERENCE

California law governs the Loan Documents without regard to principles of conflicts of law. Borrower and Bank each submit to the exclusive jurisdiction of the State and Federal courts in Santa Clara County, California; provided however, that nothing in this Agreement shall be deemed to operate to preclude Bank from bringing suit or taking other legal action in any other jurisdiction to realize on the Collateral or any other security for the Obligations, or to enforce a judgment or other court order in favor of Bank. Borrower expressly submits and consents in advance to such jurisdiction in any action or suit commenced in any such court, and Borrower hereby waives any objection that it may have based upon lack of personal jurisdiction, improper venue, or forum non conveniens and hereby consents to the granting of such legal or equitable relief as is deemed appropriate by such court. Borrower hereby waives personal service of the summons, complaints, and other process issued in such action or suit and agrees that service of such summons, complaints, and other process may be made by registered or certified mail addressed to Borrower at the address set forth in Section 10, or subsequently provided by Borrower in accordance with, Section 10 of this Agreement and that service so made shall be deemed completed upon the earlier to occur of Borrower's actual receipt thereof or three (3) days after deposit in the U.S. mails, proper postage prepaid.

TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, BORROWER AND BANK EACH WAIVE THEIR RIGHTS TO A JURY TRIAL OF ANY CLAIM OR CAUSE OF ACTION ARISING OUT OF OR BASED UPON THIS AGREEMENT, THE LOAN DOCUMENTS OR ANY CONTEMPLATED TRANSACTION, INCLUDING CONTRACT, TORT, BREACH OF DUTY AND ALL OTHER CLAIMS. THIS WAIVER IS A MATERIAL INDUCEMENT FOR BOTH PARTIES TO ENTER INTO THIS AGREEMENT. EACH PARTY HAS REVIEWED THIS WAIVER WITH ITS COUNSEL.

WITHOUT INTENDING IN ANY WAY TO LIMIT THE PARTIES' AGREEMENT TO WAIVE THEIR RESPECTIVE RIGHT TO A TRIAL BY JURY, if the above waiver of the right to a trial by jury is not enforceable, the parties hereto agree that any and all disputes or controversies of any nature between them arising at any time shall be decided by a reference to a private judge, mutually selected by the parties (or, if they cannot agree, by the Presiding Judge of the Santa Clara County, California Superior Court) appointed in accordance with California Code of Civil Procedure Section 638 (or pursuant to comparable provisions of federal law if the dispute falls within the exclusive jurisdiction of the federal courts), sitting without a jury, in Santa Clara County, California; and the parties hereby submit to the jurisdiction of such court. The reference proceedings shall be conducted pursuant to and in accordance with the provisions of California Code of Civil Procedure §§ 638 through 645.1, inclusive. The private judge shall have the power, among others, to grant provisional relief, including without limitation, entering temporary restraining orders, issuing preliminary and permanent injunctions and appointing receivers. All such proceedings shall be closed to the public and confidential and all records relating thereto shall be permanently sealed. If during the course of any dispute, a party desires to seek provisional relief, but a judge has not been appointed at that point pursuant to the judicial reference procedures, then such party may apply to the Santa Clara County, California Superior Court for such relief. The proceeding before the private judge shall be conducted in the same manner as it would be before a court under the rules of evidence applicable to judicial proceedings. The parties shall be entitled to discovery which shall be conducted in the same manner as it would be before a court under the rules of discovery applicable to judicial

proceedings. The private judge shall oversee discovery and may enforce all discovery rules and orders applicable to judicial proceedings in the same manner as a trial court judge. The parties agree that the selected or appointed private judge shall have the power to decide all issues in the action or proceeding, whether of fact or of law, and shall report a statement of decision thereon pursuant to California Code of Civil Procedure § 644(a). Nothing in this paragraph shall limit the right of any party at any time to exercise self-help remedies, foreclose against collateral, or obtain provisional remedies. The private judge shall also determine all issues relating to the applicability, interpretation, and enforceability of this paragraph.

12 GENERAL PROVISIONS

12.1 Successors and Assigns. This Agreement binds and is for the benefit of the successors and permitted assigns of each party. Borrower may not assign this Agreement or any rights or obligations under it without Bank's prior written consent (which may be granted or withheld in Bank's discretion). Bank has the right, without the consent of or notice to Borrower, to sell, transfer, assign, negotiate, or grant participation in all or any part of, or any interest in, Bank's obligations, rights, and benefits under this Agreement and the other Loan Documents. Notwithstanding the foregoing, unless an Event of Default has occurred and is continuing, Bank shall not assign any interest in the Loan Documents to an operating company which is a direct competitor of Borrower.

12.2 Indemnification. Borrower agrees to indemnify, defend and hold Bank and its directors, officers, employees, agents, attorneys, or any other Person affiliated with or representing Bank (each, an "**Indemnified Person**") harmless against: (a) all obligations, demands, claims, and liabilities (collectively, "**Claims**") claimed or asserted by any other party in connection with the transactions contemplated by the Loan Documents; and (b) all losses or expenses (including Bank Expenses) in any way suffered, incurred, or paid by such Indemnified Person as a result of, following from, consequential to, or arising from transactions between Bank and Borrower (including reasonable attorneys' fees and expenses), except for Claims and/or losses directly caused by such Indemnified Person's gross negligence or willful misconduct.

12.3 Time of Essence. Time is of the essence for the performance of all Obligations in this Agreement.

12.4 Severability of Provisions. Each provision of this Agreement is severable from every other provision in determining the enforceability of any provision.

12.5 Correction of Loan Documents. Bank may correct patent errors and fill in any blanks in this Agreement and the other Loan Documents consistent with the agreement of the parties.

12.6 Amendments in Writing; Waiver; Integration. No purported amendment or modification of any Loan Document, or waiver, discharge or termination of any obligation under any Loan Document, shall be enforceable or admissible unless, and only to the extent, expressly set forth in a writing signed by the party against which enforcement or admission is sought. Without limiting the generality of the foregoing, no oral promise or statement, nor any action,

inaction, delay, failure to require performance or course of conduct shall operate as, or evidence, an amendment, supplement or waiver or have any other' effect on any Loan Document. Any waiver granted shall be limited to the specific circumstance expressly described in it, and shall not apply to any subsequent or other circumstance, whether similar or dissimilar, or give rise to, or evidence, any obligation or commitment to grant any further waiver. The Loan Documents represent the entire agreement about this subject matter and supersede prior negotiations or agreements. All prior agreements, understandings, representations, warranties, and negotiations between the parties about the subject matter of the Loan Documents merge into the Loan Documents.

12.7 Counterparts. This Agreement may be executed in any number of counterparts and by different parties on separate counterparts, each of which, when executed and delivered, is an original, and all taken together, constitute one Agreement.

12.8 Survival. All covenants, representations and warranties made in this Agreement continue in full force until (i) all Obligations (other than inchoate indemnity obligations and any other obligations which, by their terms, are to survive the termination of this Agreement) have been paid in full and satisfied and (ii) Bank has no further commitment to make Credit' Extensions. Without limiting the foregoing, except as otherwise provided in Section 4.1, the grant of security interest by Borrower in Section 4.1 shall survive until the termination of all Bank Services Agreements. The obligation of Borrower in Section 12.2 to indemnify Bank shall survive until the statute of limitations with respect to such claim or cause of action shall have ran.

12.9 Confidentiality. In handling any confidential information, Bank shall exercise the same degree of care that it exercises for its own proprietary information, but disclosure of information may be made: (a) to Bank's Subsidiaries or Affiliates (such Subsidiaries and Affiliates, together with Bank, collectively, "**Bank Entities**"); (b) to prospective transferees or purchasers of any interest in the Credit Extensions (provided, however, Bank shall use its best efforts to obtain any prospective transferee's or purchaser's agreement to the terms of this provision); (c) as required by law, regulation, subpoena, or other order; (d) to Bank's regulators or as otherwise required in connection with Bank's examination or audit; (e) as Bank considers appropriate in exercising remedies under the Loan Documents; and (1) to third-party service providers of Bank so long as such service providers have executed a confidentiality agreement with Bank with terms no less restrictive than those contained herein. Confidential information does not include information that is either: (i) in the public domain or in Bank's possession when disclosed to Bank, or becomes part of the public domain after disclosure to Bank; or (ii) disclosed to Bank by a third party if Bank does not know that the third party is prohibited from disclosing the information.

Bank Entities may use the confidential information for reporting purposes and the development and distribution of databases and market analyses so long as such confidential information is aggregated and anonymized prior to distribution unless otherwise expressly prohibited by Borrower. The provisions of the immediately preceding sentence shall survive the termination of this Agreement.

12.10 Attorneys' Fees, Costs and Expenses. In any action or proceeding between Borrower and Bank arising out of or relating to the Loan Documents, the prevailing party shall be entitled to recover its reasonable attorneys' fees and other costs and expenses incurred, in addition to any other relief to which it may be entitled,

12.11 Electronic Execution of Documents. The words "execution," "signed,'' "signature" and words of like import in any Loan Document shall be deemed to include electronic signatures or the keeping of records in electronic form, each of which shall be of the same legal effect, validity and enforceability as a manually executed signature or the use of a paper-based recordkeeping systems, as the case may be, to the extent and as provided for in any applicable law, including, without limitation, any state law based on the Uniform Electronic Transactions Act.

12.12 Captions. The headings used in this Agreement are for convenience only and shall not affect the interpretation of this Agreement.

12.13 Construction of Agreement. The parties mutually acknowledge that they and their attorneys have participated in the preparation and negotiation of this Agreement. In cases of uncertainty this Agreement shall be construed without regard to which of the parties caused the uncertainty to exist.

12.14 Relationship. The relationship of the parties to this Agreement is determined solely by the provisions of this Agreement. The parties do not intend to create any agency, partnership, joint venture, trust, fiduciary or other relationship with duties or incidents different from those of parties to an arm's-length contract.

12.15 Third Parties. Nothing in this Agreement, whether express or implied, is intended to: (a) confer any benefits, rights or remedies under or by reason of this Agreement on any persons other than the express parties to it and their respective permitted successors and assigns; (b) relieve or discharge the obligation or liability of any person not an express party to this Agreement; or (c) give any person not an express party to this Agreement any right of subrogation or action against any party to this Agreement.

13 DEFINITIONS

13.1 Definitions. As used in the Loan Documents, the word "shall" is mandatory, the word "may" is permissive, the word "or" is not exclusive, the words "includes" and "including" are not limiting, the singular includes the plural, and numbers denoting amounts that are set off in brackets are negative. As used in this Agreement, the following capitalized terms have the following meanings:

"**Account**" is any "account" as defined in the Code with such additions to such term as may hereafter be made, and includes, without limitation, all accounts receivable and other sums owing to Borrower.

"**Account Debtor**" is any "account debtor" as defined in the Code with such additions to such term as may hereafter be made.

"**Affiliate**" is, with respect to any Person, each other Person that owns or controls directly or indirectly the Person, any Person that controls or is controlled by or is under common control with the Person, and each of that Person's senior executive officers, directors, partners and, for any Person that is a limited liability company, that Person's managers and members.

"**Agreement**" is defined in the preamble hereof.

"**Bank**" is defined in the preamble hereof.

"**Bank Entities**" is defined in Section 12.9.

"**Bank Expenses**" are all audit fees and expenses, costs, and expenses (including reasonable attorneys' fees and expenses) for preparing, amending, negotiating, administering, defending and enforcing the Loan Documents (including, without limitation, those incurred in connection with appeals or Insolvency Proceedings and those identified as Bank Expenses in Section 9.3 hereof) or otherwise incurred by Bank with respect to Borrower.

"**Bank Services**" are any products, credit services, and/or financial accommodations previously, now, or hereafter provided to Borrower or any of its Subsidiaries by Bank or any Bank Affiliate, including, without limitation, any letters of credit, cash management services (including, without limitation, merchant services, direct deposit of payroll, business credit cards, and check cashing services), interest rate swap arrangements, and foreign exchange services as any such products or services may be identified in Bank's various agreements related thereto (each, a "**Bank Services Agreement**").

"**Basic Rate**" is the per annum rate of interest (based on a year of 360 days) equal to the sum of U.S. Treasury note yield to maturity for a term equal to three (3) years as reported in the Federal Reserve Statistical Release H.15-Selected Interest Rates under the heading "U.S. Government Securities/Treasury Constant Maturities" on the Funding Date. (In the event Release H.15 is no longer published, Bank shall select a comparable publication to determine the U.S. Treasury note yield to maturity.)

"**BioMed**" is defined in Section 3.1.

"**Borrower**" is defined in the preamble hereof.

"**Borrower's Books**" are all Borrower's books and records including ledgers, federal and state tax returns, records regarding Borrower's assets or liabilities, the Collateral, business operations or financial condition, and all computer programs or storage or any equipment containing such information.

"**Borrowing Resolutions**" are, with respect to any Person, those resolutions substantially in the form attached hereto as Exhibit C.

"**Business Day**" is any day that is not a Saturday, Sunday or a day on which Bank is closed.

"**Cash Equivalents**" means (a) marketable direct obligations issued or unconditionally guaranteed by the United States or any agency or any State thereof having maturities of not more than one (1) year from the date of acquisition; (b) commercial paper maturing no more than one (1) year after its creation and having the highest rating from either Standard & Poor's Ratings Group or Moody's Investors Service, Inc.; and (c) Bank's certificates of deposit issued maturing no more than one (1) year after issue.

"**Code**" is the Uniform Commercial Code, as the same may, from time to time, be enacted and in effect in the State of California; provided, that, to the extent that the Code is used to define any term herein or in any Loan Document and such term is defined differently in different Articles or Divisions of the Code, the definition of such term contained in Article or Division 9 shall govern; provided further, that in the event that, by reason of mandatory provisions of law, any or all of the attachment, perfection, or priority of, or remedies with respect to, Bank's Lien on any Collateral is governed by the Uniform Commercial Code in effect in a jurisdiction other than the State of California, the term "Code" shall mean the Uniform Commercial Code as enacted and in effect in such other jurisdiction solely for purposes of the provisions thereof relating to such attachment, perfection, priority, or remedies and for purposes of definitions relating to such provisions.

"**Collateral**" is any and all properties, rights and assets of Borrower described on Exhibit A.

"**Collateral Account**" is any Deposit Account, Securities Account, or Commodity Account.

"**Commodity Account**" is any "commodity account" as defined in the Code with such additions to such term as may hereafter be made.

"**Common Control**" means, with respect to a Related Special Purpose Entity, that such Related Special Purpose Entity is majority-owned by the individuals and/or entities holding a majority in interest in the ownership of Borrower, and that such individuals and/or entities have the ability to elect a majority of the board of directors (or similar governing body) of such Related Special Purpose Entity, and such board of directors (or similar governing body) has the power to make all decisions and determinations with respect to the repayment and performance by such Related Special Purpose Entity of its RSPE Loan from Borrower and of its obligations and duties with respect to any license granted to it by Borrower for the use of Borrower's Intellectual Property.

"**Compliance Certificate**" is that certain certificate in the form attached hereto as Exhibit D.

"**Consolidated Cash**" means cash and Cash Equivalents of Borrower, its Subsidiaries and the Related Special Purpose Entities, on a combined basis.

"**Contingent Obligation**" is, for any Person, any direct or indirect liability, contingent or not, of that Person for (a) any indebtedness, lease, dividend, letter of credit or other obligation of another such as an obligation, in each case, directly or indirectly guaranteed, endorsed, co-made, discounted or sold with recourse by that Person, or for which that Person is directly or indirectly

liable; (b) any obligations for undrawn letters of credit for the account of that Person; and (c) all obligations from any interest rate, currency or commodity swap agreement, interest rate cap or collar agreement, or other agreement or arrangement designated to protect a Person against fluctuation in interest rates, currency exchange rates or commodity prices; but "Contingent Obligation" does not include endorsements in the ordinary course of business. The amount of a Contingent Obligation is the stated or determined amount of the primary obligation for which the Contingent Obligation is made or, if not determinable, the maximum reasonably anticipated liability for it determined by the Person in good faith; but the amount may not exceed the maximum of the obligations under any guarantee or other support arrangement.

"**Control Agreement**" is any control agreement entered into among the depository institution at which Borrower maintains a Deposit Account or the securities intermediary or commodity intermediary at which Borrower maintains a Securities Account or a Commodity Account, Borrower, and Bank pursuant to which Bank obtains control (within the meaning of the Code) over such Deposit Account, Securities Account, or Commodity Account.

"**Conversion Date**" is defined in Section 2.1.1(b)(ii).

"**Copyrights**" are any and all copyright rights, copyright applications, copyright registrations and like protections in each work or authorship and derivative work thereof, whether published or unpublished and whether or not the same also constitutes a trade secret.

"**Credit Extension**" is any Growth Capital Advance or any other extension of credit by Bank for Borrower's benefit under this Agreement.

"**Deposit Account**" is any "deposit account" as defined in the Code with such additions to such term as may hereafter be made.

"**Designated Deposit Account**" is Borrower's deposit account, account number , maintained with Bank.

"**Dollars**," "**dollars**" or use of the sign "**$**" means only lawful money of the United States and not any other currency, regardless of whether that currency uses the "$" sign to denote its currency or may be readily converted into lawful money of the United States.

"**Dollar Equivalent**" is, at any time, (a) with respect to any amount denominated in Dollars, such amount, and (b) with respect to any amount denominated in a Foreign Currency, the equivalent amount therefor in Dollars as determined by Bank at such time on the basis of the then-prevailing rate of exchange in San Francisco, California, for sales of the Foreign Currency for transfer to the country issuing such Foreign Currency.

"**Effective Date**" is defined in the preamble hereof.

"**Equipment**" is all "equipment" as defined in the Code with such additions to such term as may hereafter be made, and includes without limitation all machinery, fixtures, goods, vehicles (including motor vehicles and trailers), and any interest in any of the foregoing.

"**ERISA**" is the Employee Retirement Income Security Act of 1974, and its regulations.

"**Event of Default**" is defined in Section 8.

"**Exchange Act**" is the Securities Exchange Act of 1934, as amended.

"**Final Payment**" is a payment (in addition to and not a substitution for the regular monthly payments of principal plus accrued interest) due in accordance with Section 2.1.1 above, equal to the original principal amount of the applicable Growth Capital Advance multiplied by the Final Payment Percentage.

"**Final Payment Percentage**" is three percent (3.0%).

"**Foreign Currency**" means lawful money of a country other than the United States.

"**Funding Date**" is any date on which a Credit Extension is made to or for the account of Borrower, which shall be a Business Day.

"**FX Contract**" is any foreign exchange contract by and between Borrower and Bank under which Borrower commits to purchase from or sell to Bank a specific amount of Foreign Currency on a specified date.

"**GAAP**" is generally accepted accounting principles set forth in the opinions and pronouncements of the Accounting Principles Board of the American Institute of Certified Public Accountants and statements and pronouncements of the Financial Accounting Standards Board or in such other statements by such other Person as may be approved by a significant segment of the accounting profession, that are applicable to the circumstances as of the date of determination.

"**General Intangibles**" is all "general intangibles" as defined in the Code in effect on the date hereof with such additions to such term as may hereafter be made, and includes without limitation, all Intellectual Property, claims, income and other tax refunds, security and other deposits, payment intangibles, contract rights, options to purchase or sell real or personal property, rights in all litigation presently or hereafter pending (whether in contract, tort or otherwise), insurance policies (including without limitation key man, property damage, and business interruption insurance), payments of insurance and rights to payment of any kind.

"**Governmental Approval**" is any consent, authorization, approval, order, license, franchise, permit, certificate, accreditation, registration, filing or notice, of, issued by, from or to, or other act by or in respect of, any Governmental Authority.

"**Governmental Authority**" is any nation or government, any state or other political subdivision thereof, any agency, authority, instrumentality, regulatory body, court, central bank or other entity exercising executive, legislative, judicial, taxing, regulatory or administrative functions of or pertaining to government, any securities exchange and any self-regulatory organization.

"**Growth Capital Advance**" is defined in Section 2.1.1(a).

"**Growth Capital Loan Commitment**" is Two Million Five Hundred Thousand Dollars ($2,500,000).

"**Growth Capital Maturity Date**" is December 1, 2015.

"**Indebtedness**" is (a) indebtedness for borrowed money or the deferred price of property or services, such as reimbursement and other obligations for surety bonds and letters of credit, (b) obligations evidenced by notes, bonds, debentures or similar instruments, (c) capital lease obligations, and (d) Contingent Obligations.

"**Indemnified Person**" is defined in Section 12.2.

"**Individual RSPE Note Threshold**" is, with respect to each Related Special Purpose Entity, an amount equal to the product of (i) 1.1765, multiplied by (ii) the aggregate amount contracted to be paid to Borrower by such Related Special Purpose Entity in connection with research and development activities in the ninety (90) day period commencing on the funding date of the applicable RSPE Loan; provided, however, that with respect to each Related Special Purpose Entity, prior to, or in connection with, such Related Special Purpose Entity ceasing to be under Common Control with Borrower, such Related Special Purpose Entity shall have paid to Borrower an aggregate amount equal to or greater than the aggregate principal amount of the RSPE Loan made by Borrower to such Related Special Purpose Entity; provided further than no new loans may be made by Borrower to a Related Special Purpose Entity which is neither Borrower-owned or under Common Control with Borrower.

"**Insolvency Proceeding**" is any proceeding by or against any Person under the United States Bankruptcy Code, or any other bankruptcy or insolvency law, including assignments for the benefit of creditors, compositions, extensions generally with its creditors, or proceedings seeking reorganization, arrangement, or other relief.

"**Intellectual Property**" means all of Borrower's right, title, and interest in and to the following:

(a) its Copyrights, Trademarks and Patents;

(b) any and all trade secrets and trade secret rights, including, without limitation, any rights to unpatented inventions, know-how, operating manuals;

(c) any and all source code;

(d) any and all design rights which may be available to Borrower;

(e) any and all claims for damages by way of past, present and future infringement of any of the foregoing, with the right, but not the obligation, to sue for and collect such damages for said use or infringement of the Intellectual Property rights identified above; and

(f) all amendments, renewals and extensions of any of the Copyrights, Trademarks or Patents.

"**Interest-Only Period**" means the period commencing on the first (1st) Business Day following a Funding Date and continuing through December 31, 2012.

"**Inventory**" is all "inventory" as defined in the Code in effect on the date hereof with such additions to such term as may hereafter be made, and includes without limitation all merchandise, raw materials, parts, supplies, packing and shipping materials, work in process and finished products, including without limitation such inventory as is temporarily out of Borrower's custody or possession or in transit and including any returned goods and any documents of title representing any of the above.

"**Investment**" is any beneficial ownership interest in any Person (including stock, partnership interest or other securities), and any loan, advance or capital contribution to any Person. For clarification, payment by Borrower of the ordinary course operating expenses of Pangu, and payments made by Borrower to Pangu for services rendered shall not be deemed to be "Investments."

"**Letter of Credit**" is a standby or commercial letter of credit issued by Bank upon request of Borrower based upon an application, guarantee, indemnity, or similar agreement.

"**Lien**" is a claim, mortgage, deed of trust, levy, charge, pledge, security interest or other encumbrance of any kind, whether voluntarily incurred or arising by operation of law or otherwise against any property.

"**Loan Documents**" are, collectively, this Agreement the Perfection Certificate, any Bank Services Agreement, any subordination agreement, any note, or notes or guaranties executed by Borrower, and any other present or future agreement between Borrower and/or for the benefit of Bank, all as amended, restated, or otherwise modified.

"**Material Adverse Change**" is (a) a material impairment in the perfection or priority of Bank's Lien in the Collateral or in the value of such Collateral; (b) a material adverse change in the business, operations, or condition (financial or otherwise) of Borrower; or (c) a material impairment of the prospect of repayment of any portion of the Obligations.

"**Maximum Aggregate RSPE Loan Amount**" is Two Million Dollars ($2,000,000) per fiscal quarter of Borrower.

"**Obligations**" are Borrower's obligation to pay when due any debts, principal, interest, Bank Expenses, and other amounts Borrower owes Bank now or later, whether under this Agreement, the other Loan Documents, or otherwise, including, without limitation, any interest accruing after Insolvency Proceedings begin and debts, liabilities, or obligations of Borrower assigned to Bank, and the performance of Borrower's duties under the Loan Documents.

"**Operating Documents**" are, for any Person, such Person's formation documents, as certified with the Secretary of State of such Person's state of formation, and, (a) if such Person is a corporation, its bylaws in current form, (b) if such Person is a limited liability company, its limited liability company agreement (or similar agreement), and (c) if such Person is a partnership, its partnership agreement (or similar agreement), each of the foregoing with all current amendments or modifications thereto.

"**Pangu**" means Pangu Biopharma Limited, a company formed under the laws of Hong Kong.

"**Patents**" means all patents, patent applications and like protections including without limitation improvements, divisions, continuations, renewals, reissues, extensions and continuations-in-part of the same.

"**Payment/Advance Form**" is that certain form attached hereto as Exhibit B.

"**Perfection Certificate**" is defined in Section 5.1.

"**Permitted Indebtedness**" is:

(a) Borrower's Indebtedness to Bank under this Agreement and the other Loan Documents;

(b) Indebtedness existing on the Effective Date and shown on the Perfection Certificate;

(c) Subordinated Debt, including without limitation, the loan from BioMed pursuant to that certain subordinated convertible Promissory Note issued by Borrower to BioMed, dated December 22, 2011;

(d) unsecured Indebtedness to trade creditors incurred in the ordinary course of business;

(e) Indebtedness incurred as a result of endorsing negotiable instruments received in the ordinary course of business;

(f) Indebtedness in an aggregate principal amount not to exceed Two Hundred Fifty Thousand Dollars ($250,000) secured by Permitted Liens specified in clause (c) of the definition of Permitted Liens;

(g) Indebtedness of Subsidiaries to other Subsidiaries, and Indebtedness of Subsidiaries and Related Special Purpose Entities to Borrower constituting Permitted Investments under clauses (f) and (i) of the definition of "Permitted Investments"; and

(h) extensions, refinancings, modifications, amendments and restatements of any items of Permitted Indebtedness (a) through (g) above, provided that the principal amount thereof is not increased or the terms thereof are not modified to impose more burdensome terms upon Borrower or its Subsidiary, as the case may be.

"**Permitted Investments**" are:

(a) Investments shown on the Perfection Certificate and existing on the Effective Date;

(b) Investments consisting of Cash Equivalents;

(c) Investments consisting of the endorsement of negotiable instruments for deposit or collection or similar transactions in the ordinary course of Borrower;

(d) Investments consisting of deposit accounts in which Bank has a perfected security interest;

(e) Investments accepted in connection with Transfers permitted by Section 7.1;

(f) Investments of Subsidiaries in or to other Subsidiaries or Borrower and Investments by Borrower in Subsidiaries not to exceed Fifty Thousand Dollars ($50,000) in the aggregate in any fiscal year;

(g) Investments consisting of (i) travel advances and employee relocation loans and other employee loans and advances in the ordinary course of business, (ii) loans to employees, officers or directors relating to the purchase of equity securities of Borrower or its Subsidiaries pursuant to employee stock purchase plans or agreements approved by Borrower's Board of Directors, and (iii) repurchases of stock permitted under Section 7.7;

(h) Investments (including debt obligations) received in connection with the bankruptcy or reorganization of customers or suppliers and in settlement of delinquent obligations of, and other disputes with, customers or suppliers arising in the ordinary course of business;

(i) Investments consisting of ownership interests in the Related Special Purpose Entities;

(j) RSPE Loans made by Borrower to Related Special Purpose Entities which are owned by Borrower or are under Common Control with Borrower, which are made in accordance with the terms of Section 6.11, and which (i) do not exceed the Individual RSPE Note Threshold, and (ii) when taken together with all other RSPE Loans by Borrower to Related Special Purpose Entities, do not exceed the Maximum Aggregate RSPE Loan Amount;

(k) Investments consisting of notes receivable of, or prepaid royalties and other credit extensions, to customers and suppliers who are not Affiliates, in the ordinary course of business; provided that this paragraph (i) shall not apply to Investments of Borrower in any Subsidiary;

(l) Investments in prepaid expenses, negotiable instruments held for collection, and deposits to secure the performance of bids, trade contracts (other than for borrowed money), contracts for the purchase of property, leases, statutory obligations, surety and appeal bonds, performance bonds and other obligations of a like nature, in each case, incurred in the ordinary course of business and not representing an obligation for borrowed money; and

(m) joint ventures or strategic alliances not involving Related Special Purpose Entities, in the ordinary course of Borrower's business, consisting of the non-exclusive licensing of technology, the development of technology or the providing of technical support, provided that any cash investments by Borrower do not exceed One Hundred Thousand Dollars ($100,000) in the aggregate in any fiscal year.

"**Permitted Liens**" are:

(a) Liens existing on the Effective Date and shown on the Perfection Certificate or arising under this Agreement and the other Loan Documents;

(b) Liens for taxes, fees, assessments or other government charges or levies, either not due and payable or being contested in good faith and for which Borrower maintains adequate reserves on its Books, provided that no notice of any such Lien has been filed or recorded under the Internal Revenue Code of 1986, as amended, and the Treasury Regulations adopted thereunder;

(c) purchase money Liens (i) on Equipment acquired or held by Borrower incurred for financing the acquisition of the Equipment securing no more than Fifty Thousand Dollars ($50,000) in the aggregate amount outstanding, or (ii) existing on Equipment when acquired, if the Lien is confined to the property and improvements and the proceeds of the Equipment;

(d) Liens of carriers, warehousemen, suppliers, or other Persons that are possessory in nature arising in the ordinary course of business so long as such Liens attach only to Inventory, securing liabilities in the aggregate amount not to exceed Fifty Thousand Dollars ($50,000) and which are not delinquent or remain payable without penalty or which are being contested in good faith and by appropriate proceedings which proceedings have the effect of preventing the forfeiture or sale of the property subject thereto;

(e) Liens to secure payment of workers* compensation, employment insurance, old-age pensions, social security and other like obligations incurred in the ordinary course of business (other than Liens imposed by ERISA);

(f) Liens incurred in the extension, renewal or refinancing of the indebtedness secured by Liens described in (a) through (c); provided that any extension, renewal or replacement Lien must be limited to the property encumbered by the existing Lien and the principal amount of the indebtedness may not increase;

(g) leases or subleases of real property granted in the ordinary course of Borrower's business (or, if referring to another Person, in the ordinary course of such Person's business), and leases, subleases, non-exclusive licenses or sublicenses of personal property (other than Intellectual Property) granted in the ordinary course of Borrower's business (or, if referring to another Person, in the ordinary course of such Person's business), if the leases, subleases, licenses and sublicenses do not prohibit granting Bank a security interest therein;

(h) licenses of Intellectual Property permitted under Section 7.1;

(i) Liens arising from attachments or judgments, orders, or decrees in circumstances not constituting an Event of Default under Sections 8.4 and 8,7;

(j) Liens in favor of other financial institutions arising in connection with Borrower's deposit and/or securities accounts held at such institutions, provided that Bank has a perfected security interest in the amounts held in such deposit and/or securities accounts; and

(k) Liens in favor of customs and revenue authorities to secure payment of customs duties in connection with the importation of goods, incurred by Borrower in good faith in the ordinary course of business for sums not yet due, or which are being diligently contested by Borrower in good faith and by appropriate proceedings and reserves with respect thereto are maintained on the books of Borrower in accordance with GAAP.

"**Person**" is any individual, sole proprietorship, partnership, limited liability company, joint venture, company, trust, unincorporated organization, association, corporation, institution, public benefit corporation, firm, joint stock company, estate, entity or government agency.

"**Related Special Purpose Entity**" is an entity formed under the laws of the Cayman Islands or the State of Delaware, such other jurisdiction within the United States as shall be determined by Borrower's Board of Directors, or such other jurisdiction reasonably acceptable to Bank, which entity is initially either owned by Borrower or is under Common Control with Borrower, and is created for the purpose of facilitating a licensing, development, marketing, or other similar collaboration, strategic relationship or acquisition with respect to an individual drag discovery program between Borrower and a "Big Pharma", biotechnology, healthcare or other similar company or its affiliate.

"**Registered Organization**" is any "registered organization" as defined in the Code with such additions to such term as may hereafter be made.

"**Repayment Period**" is a period of time equal to thirty-five (35) consecutive months commencing on the Conversion Date.

"**Requirement of Law**" is as to any Person, the organizational or governing documents of such Person, and any law (statutory or common), treaty, rule or regulation or determination of an arbitrator or a court or other Governmental Authority, in each case applicable to or binding upon such Person or any of its property or to which such Person or any of its property is subject.

"**Responsible Officer**" is any of the Chief Executive Officer, President, Chief Financial Officer or Controller of Borrower.

"**Restricted License**" is any material license or other agreement with respect to which Borrower is the licensee (a) that prohibits or otherwise restricts Borrower from granting a security interest in Borrower's interest in such license or agreement or any other property, or (b) for which a default under or termination of could interfere with the Bank's right to sell any Collateral.

"**RSPE Loan**" is defined in Section 6.11.

"**RSPE Notice**" is defined in Section 6.11.

"**SEC**" shall mean the Securities and Exchange Commission, any successor thereto, and any analogous Governmental Authority.

"**Securities Account**" is any "securities account" as defined in the Code with such additions to such term as may hereafter be made.

"**Subordinated Debt**" is indebtedness incurred by Borrower subordinated to all of Borrower's now or hereafter indebtedness to Bank (pursuant to a subordination, intercreditor, or other similar agreement in form and substance satisfactory to Bank entered into between Bank and the other creditor), on terms acceptable to Bank.

"**Subsidiary**" is, as to any Person, a corporation, partnership, limited liability company or other entity of which shares of stock or other ownership interests having ordinary voting power (other than stock or such other ownership interests having such power only by reason of the happening of a contingency) to elect a majority of the board of directors or other managers of such corporation, partnership or other entity are at the time owned, or the management of which is otherwise controlled, directly or indirectly through one or more intermediaries, or both, by such Person; provided, however, that Related Special Purpose Entities shall not be "Subsidiaries" for purposes of the Loan Documents. Unless the context otherwise requires, each reference to a Subsidiary herein shall be a reference to a Subsidiary of Borrower.

"**Trademarks**" means any trademark and servicemark rights, whether registered or not, applications to register and registrations of the same and like protections, and the entire goodwill of the business of Borrower connected with and symbolized by such trademarks.

"**Transfer**" is defined in Section 7.1.

[Signature page follows.]

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the Effective Date,

BORROWER:

ATYR PHARMA, TNC.

By: /s/ John Mendlein, Ph.D.
Name: John Mendlein
Title: Chief Executive Officer

BANK:

SILICON VALLEY BANK

By: /s/ Kevin Wallace
Name: Kevin Wallace
Title: Relationship Manager

EXHIBIT A

The Collateral consists of all of Borrower's right, title and interest in and to the following personal property:

All goods, Accounts (including health-care receivables), Equipment, Inventory, contract rights or rights to payment of money, leases, license agreements, franchise agreements, General Intangibles, commercial tort claims, documents, instruments (including any promissory notes), chattel paper (whether tangible or electronic), cash, deposit accounts, fixtures, letters of credit rights (whether or not the letter of credit is evidenced by a writing), securities, and all other investment property, supporting obligations, and financial assets, whether now owned or hereafter acquired, wherever located; and

All Borrower's Books relating to the foregoing, and any and all claims, rights and interests in any of the above and all substitutions for, additions, attachments, accessories, accessions and improvements to and replacements, products, proceeds and insurance proceeds of any or all of the foregoing.

Notwithstanding the foregoing, the Collateral does not include any of the following: (a) more than 65% of the presently existing and hereafter arising issued and outstanding shares of capital stock owned by Borrower of any Subsidiary formed in a jurisdiction outside the United States which shares entitle the holder thereof to vote for directors or any other matter, (b) equity securities of any Related Special Purpose Entity, or (c) any Intellectual Property; provided, however, the Collateral shall include all Accounts and all proceeds of Intellectual Property. If a judicial authority (including a U.S. Bankruptcy Court) would hold that a security interest in the underlying Intellectual Property is necessary to have a security interest in such Accounts and such property that are proceeds of Intellectual Property, then the Collateral shall automatically, and effective as of the Effective Date, include the Intellectual Property to the extent necessary to permit perfection of Bank's security interest in such Accounts and such other property of Borrower that are proceeds of the Intellectual Property.

EXHIBIT B

Loan Payment/Advance Request Form

DEADLINE FOR SAME DAY PROCESSING IS NOON Pacific Time.

Fax To: (858)_____-_____ Date: _____

LOAN PAYMENT:

aTyr Pharma, Inc.

From Account# _____ To Account # _____
(Deposit Account #) (Loan Account #)

Principal $ _____ And/or Interest $ _____

Authorized Signature: _____ Phone Number: _____

Print Name/Title: _____

LOAN ADVANCE:

Complete Outgoing Wire Request section below if all or a portion of the funds from this loan advance are for an outgoing wire.

From Account # _____ To Account # _____
(Loan Account #) (Deposit Account #)

Amount of Advance $ _____

All Borrower's representations and warranties in the Loan and Security Agreement are true, correct and complete in all material respects on the date of the request for an advance; provided, however, that such materiality qualifier shall not be applicable to any representations and warranties that already are qualified or modified by materiality in the text thereof; and provided, further that those representations and warranties expressly referring to a specific date shall be true, accurate and complete in all material respects as of such date:

Authorized Signature: _____ Phone Number _____

Print Name/Title: _____

OUTGOING WIRE REQUEST:
Complete only if all or a portion of funds from the loan advance above is to be wired.
Deadline for same day processing is noon, P.S.T.

Beneficiary Name: _____ Amount of Wire: $ _____

Beneficiary Bank: _____ Account Number: _____

City and State:

Beneficiary Bank Transit (ABA) #: _____ Beneficiary Bank Code (Swift, Son, Chip, etc.):
(For International Wire Only)

Intermediary Bank: _____ Transit (ABA) #: _____

For Further Credit to: _____

Special Instruction: _____

By signing below. I (we) acknowledge and agree that my (our) funds transfer request shall be processed in accordance with and subject to the. terms and conditions set forth in the agreements(s) covering funds transfer service(s), which agreements(s) were previously received and executed by me (us).

Authorized Signature: _____ 2nd Signature (if required): _____

Print Name/Title: _____ Print Name/Title: _____

Telephone #: _____ _____

Telephone #:

EXHIBIT C

BORROWING RESOLUTIONS

[see attached]

SVB Silicon Valley Bank

CORPORATE BORROWING CERTIFICATE

BORROWER: **aTyr Pharma, Inc.** **DATE:**
BANK: **Silicon Valley Bank**

I hereby certify as follows, as of the date set forth above:

1. I am the Secretary, Assistant Secretary or other officer of the Borrower. My title is as set forth below.

2. Borrower's exact legal name is set forth above. Borrower is a corporation existing under the laws of Delaware.

3. Attached hereto are true, correct and complete copies' of Borrower's Articles/Certificate of Incorporation (including amendments), as tiled with the Secretary of State of the state in which Borrower is incorporated as set forth in paragraph 2 above. Such Articles/Certificate of Incorporation have not been amended, annulled, rescinded, revoked or supplemented, and remain in full force and effect as of the date hereof.

4. The following resolutions were duly and validly adopted by Borrower's Board of Directors at a duly held meeting of such directors (or pursuant to a unanimous written consent or other authorized corporate action). Such resolutions are in full force and effect as of the date hereof and have not been in any way modified, repealed, rescinded, amended or revoked, and Bank may rely on them until Bank receives written notice of revocation from Borrower.

   RESOLVED, that any one of the following officers or employees of Borrower, whose names, titles and signatures are below, may act on behalf of Borrower:

Name	Title	Signature	Authorized to Add or Remove Signatories
John Mendlein PhD	CEO	/s/ John Mendlein	☒
Andrew Cubitt	VP IP	/s/ Andrew Cubitt	☒
			☐
			☐

RESOLVED FURTHER, that any one of the persons designated above with a checked box beside his or her name may, from time to time, add or remove any individuals to and from the above list of persons authorized to act on behalf of Borrower.

RESOLVED FURTHER, that such individuals may, on behalf of Borrower:

Borrow Money. Borrow money from Silicon Valley Bank ("Bank").

Execute Loan Documents. Execute any loan documents Bank requires.

Grant Security. Grant Bank a security interest in any of Borrower's assets.

Negotiate Items. Negotiate or discount all drafts, trade acceptances, promissory notes, or other indebtedness in which Borrower has an interest and receive cash or otherwise use the proceeds.

Letters of Credit. Apply for letters of credit from Bank.

Foreign Exchange Contracts. Execute spot or forward foreign exchange contracts.

Further Acts. Designate other individuals to request advances, pay fees and costs and execute other documents or agreements (including documents or agreement that waive Borrowers right lo a jury trial) they believe to be necessary to effectuate such resolutions.

RESOLVED FURTHER, that all acts authorized by the above resolutions and any prior acts relating thereto are ratified.

5. The persons listed above are Borrower's officers or employees with their titles and signatures shown next to their names.

By: /s/ John Mendlein
Name: John Mendlein PhD
Title: Chief Executive Officer

*** *If the Secretary, Assistant Secretary or other certifying officer executing above is designated by the resolutions set forth in paragraph 4 as one of the authorized signing officers, this Certificate must also be signed by a second authorized officer or director of Borrower.*

I, the _____ of Borrower, hereby certify as to paragraphs 1 through 5 above, as of the date set forth above.
[print title]

By: _____
Name: _____
Title: _____

EXHIBIT D

COMPLIANCE CERTIFICATE

TO: SILICON VALLEY BANK Date:
FROM: ATYR PHARMA, INC.

The undersigned authorized officer of aTyr Pharma, Inc. ("Borrower") certifies that under the terms and conditions of the Loan and Security Agreement between Borrower and Bank (the "Agreement"), (1) Borrower is in complete compliance for the period ending with all required covenants except as noted below, (2) there are no Events of Default, (3) all representations and warranties in the Agreement are true and correct in all material respects on this date except as noted below; provided, however, that such materiality qualifier shall not be applicable to any representations and warranties that already are qualified or modified by materiality in the text thereof; and provided, further that those representations and warranties expressly referring to a specific date shall be true, accurate and complete in all material respects as of such date, (4) Borrower, and each of its Subsidiaries, has timely filed all required foreign, federal, state and material local tax returns and reports, and Borrower has timely paid all foreign, federal, state and material local taxes, assessments, deposits and contributions owed by Borrower except as otherwise permitted pursuant to the terms of Section 5.8 of the Agreement, and (5) no Liens have been levied or claims made against Borrower or any of its Subsidiaries relating to unpaid employee payroll or benefits of which Borrower has not previously provided written notification to Bank. Attached are the required documents supporting the certification. The undersigned certifies that these are prepared in accordance with GAAP consistently applied from one period to the next except as explained in an accompanying letter or footnotes. The undersigned acknowledges that no borrowings may be requested at any time or date of determination that Borrower is not in compliance with any of the terms of the Agreement, and that compliance is determined not just at the date this certificate is delivered. Capitalized terms used but not otherwise defined herein shall have the meanings given them in the Agreement.

Please indicate compliance status by circling Yes/No under "Complies" column.

Reporting Covenant	Required	Complies
Monthly financial statements (consolidated and consolidating Borrower and Subsidiaries; balance sheets and funds flow (including note amount) to/from RSPEs) with Compliance Certificate	Monthly within 30 days	Yes No
Quarterly financial statements (full combination of Borrower, Subsidiaries and RSPE's; true-up of funds flows (including note amount) to/from RSPE's) with Compliance Certificate	Quarterly within 30 days	Yes No
Annual financial statement (consolidated and consolidating Borrower and Subsidiaries; combined with RSPEs) (CPA Audited) with Compliance Certificate	FYE within 180 days	Yes No
Annual Board Approved Financial Projections	Earlier of 7 days of board approval or 60 days after FYE	Yes No

How much is Borrower's Consolidated Cash (i.e. combined with Related Special Purpose Entities): $_____

Aggregate RSPE Loans made in immediately preceding fiscal quarter: $_____ *(Maximum Permitted $2,000,000 per fiscal quarter)*
Has any RSPE failed to make payments of at least 85% of the applicable RSPE Loan within 90 days following funding of such RSPE Loan? ____Yes ____No. If Yes, please explain:_____

The following are the exceptions with respect to the certification above: (If no exceptions exist, state "No exceptions to note.")

aTyr Pharma, Inc.

By: _____
Name: _____
Title: _____

BANK USE ONLY

Received by: _____
AUTHORIZED SIGNER

Date: _____

Verified: _____
AUTHORIZED SIGNER

Date: _____

Compliance Status: Yes No

FIRST AMENDMENT
TO
LOAN AND SECURITY AGREEMENT

This First Amendment to Loan and Security Agreement (this "**Amendment**") is entered into as of July 24, 2013, by and between Silicon Valley Bank ("**Bank**") and aTyr Pharma, Inc., a Delaware corporation ("**Borrower**") whose address is 3545 John Hopkins Court, #250, San Diego, CA 92121.

RECITALS

A. Bank and Borrower have entered into that certain Loan and Security Agreement dated as of April 25, 2012 (as the same may from time to time be amended, modified, supplemented or restated, the "**Loan Agreement**").

B. Bank has extended credit to Borrower for the purposes permitted in the Loan Agreement.

C. Borrower has requested that Bank amend the Loan Agreement to (i) refinance the existing Indebtedness, (ii) provide additional growth capital financing, and (iii) make certain other revisions to the Loan Agreement as more fully set forth herein.

D. Bank has agreed to so amend certain provisions of the Loan Agreement, but only to the extent, in accordance with the terms, subject to the conditions and in reliance upon the representations and warranties set forth below.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing recitals and other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, and intending to be legally bound, the parties hereto agree as follows:

1. Definitions. Capitalized terms used but not defined in this Amendment shall have the meanings given to them in the Loan Agreement.

2. Amendments to Loan Agreement.

2.1 Section 2.1.2 (Supplemental Growth Capital Loan). A new Section 2.1.2 is added to the Loan Agreement as follows:

2.1.1 Supplemental Growth Capital Loan.

(a) Availability. Subject to the terms and conditions of this Agreement, Bank agrees to make advances to Borrower (each a "**Supplemental Growth Capital Advance**" and collectively the "**Supplemental Growth Capital Advances**"), from time to time, prior to the Supplemental Growth Capital Commitment Termination Date, in an aggregate amount not to exceed the Supplemental Growth Capital Loan Commitment.

(i) Five Million Dollars ($5,000,000) of the Supplemental Growth Capital Loan Commitment (the "**Supplemental First Tranche**") shall be funded in one (1) Supplemental Growth Capital Advance on or about the First Amendment Date, which Supplemental Growth Capital Advance shall be used to repay in full all Obligations with respect to the Growth Capital Advances. After repayment, the Supplemental Growth Capital Advance under the Supplemental First Tranche may not be reborrowed.

(ii) Subject to the terms of this Agreement and Borrower's satisfaction of the Supplemental Second Tranche Funding Condition, the remaining Five Million Dollars ($5,000,000) of the Supplemental Growth Capital Loan Commitment (the "**Supplemental Second Tranche**") shall be funded in one (1) Supplemental Growth Capital Advance on or prior to the Supplemental Growth Capital Commitment Termination Date. Funds will be available under the Supplemental Second Tranche as soon as Borrower delivers to Bank evidence satisfactory to Bank that Borrower has satisfies the Supplemental Second Tranche Funding Condition as of the date of such Supplemental Growth Capital Advance. After repayment, the Supplemental Growth Capital Advance under the Supplemental Second Tranche may not be reborrowed.

(b) Repayment of Supplemental Growth Capital Advances.

(i) Interest-Only Payments. For each Supplemental Growth Capital Advance, Borrower shall make monthly payments of interest-only commencing on the first (1st) Business Day of the first (1st) month following the month in which the Funding Date occurs with respect to such Supplemental Growth Capital Advance and continuing thereafter during the Supplemental Interest-Only Period, on the first (1st) Business Day of each successive month.

(ii) Principal and Interest Payments. For each Supplemental Growth Capital Advance outstanding as of the last day of the Supplemental Interest-Only Period, Borrower shall make thirty-six (36) consecutive equal monthly payments of principal and accrued but unpaid interest, commencing on the first (1st) Business Day of the first (1st) month after the Supplemental Interest-Only Period (the "**Supplemental Conversion Date**"), in principal amounts that would fully amortize the applicable Supplemental Growth Capital Advance, as of the Supplemental Conversion Date, over the Supplemental Repayment Period. The Supplemental Final Payment and all unpaid principal and accrued and unpaid interest on each Supplemental Growth Capital Advance are due and payable in full on the Supplemental Growth Capital Maturity Date.

(c) Voluntary Prepayment. Borrower shall have the option to prepay all Supplemental Growth Capital Advances in full, provided Borrower (i) shall provide written notice to Bank of its election to prepay the Supplemental Growth Capital Advances at least ten (10) days prior to such prepayment and (ii) pays, on the date of such prepayment, (a) all outstanding principal and accrued but unpaid interest, plus (b) the Supplemental Prepayment Fee, plus (c) the Supplemental Final Payment, plus (d) all other sums, including Bank Expenses, if any, that shall have become due and payable.

(d) Mandatory Prepayment Upon an Acceleration. If the Supplemental Growth Capital Advances are accelerated in accordance with the terms of this Agreement following the occurrence of an Event of Default, Borrower shall immediately pay to Bank an amount equal to the sum of (i) all outstanding principal and accrued but unpaid interest, plus (ii) the Supplemental Final Payment, plus (iii) all other sums, including Bank Expenses, if any, that shall have become due and payable in accordance with the terms of this Agreement.

2.2 Section 2.2 (Payment of Interest on the Credit Extensions). Section 2.2(a) is amended in its entirety and replaced with the following:

(a) Interest Rate.

(i) Supplemental First Tranche. Subject to Section 2.2(b), the principal amount outstanding for the Supplemental Growth Capital Advance under the Supplemental First Tranche shall accrue interest at a fixed per annum rate equal to five percent (5.00%), which shall be payable monthly in arrears.

(ii) Supplemental Second Tranche. Subject to Section 2.2(b), the principal amount outstanding for the Supplemental Growth Capital Advance under the Supplemental Second Tranche shall accrue interest at a per annum rate equal to the greater of (A) five percentage points (5.00%) above the Basic Rate or (B) five and one-half percent (5.50%), fixed on the Funding Date for such Supplemental Growth Capital Advance, which shall be payable monthly in arrears.

2.3 Section 2.3 (Fees). Section 2.3(a) is amended in its entirety and replaced with the following:

(a) Final Payment. The accrued portion of the Final Payment, which is equal to Thirty-Six Thousand Three Hundred Nineteen Dollars and Six Cents ($36,468.70) as of the First Amendment Date, shall be due and payable on the First Amendment Date;

2.4 Section 2.3 (Fees). Section 2.3 is amended by deleting the word "and" from the end of clause (b), replacing the period at the end of clause (c) with a semicolon, and adding new clauses (d) and (e) as follows:

(d) Supplemental Final Payment. The Supplemental Final Payment, when due hereunder; and

(e) Supplemental Prepayment Fee. The Supplemental Prepayment Fee, when due hereunder.

2.5 Section 6.6 (Operating Accounts). Section 6.6(a) is amended by deleting the reference to "eighty percent (80%)" and replacing it with "eighty-five percent (85%)"; and inserting a new sentence at the end of Section 6.6(a) that reads as follows: "Notwithstanding the foregoing, Borrower shall be deemed in compliance with this Section 6.6(a) if Borrower and the Related Special Purpose Entities maintain at least eighty-five percent (85%) of all Consolidated Cash with Bank or Bank's Affiliates."

2.6 Section 8.1 (Payment Default). Section 8.1 is amended by deleting the reference to "Growth Capital Maturity Date" and replacing it with "Supplemental Growth Capital Maturity Date."

2.7 Section 13 (Definitions). The following terms and their definitions set forth in Section 13.1 are amended in their entirety and replaced with the following:

"**Credit Extension**" is any Growth Capital Advance, Supplemental Growth Capital Advance or any other extension of credit by Bank for Borrower's benefit under this Agreement.

"**Maximum Aggregate RSPE Loan Amount**" is Two Million Five Hundred Thousand Dollars ($2,500,000) per fiscal quarter of Borrower.

2.8 Section 13 (Definitions). The following terms and their respective definitions are added to Section 13.1, in appropriate alphabetical order, as follows:

"**First Amendment**" is that certain First Amendment to Loan and Security Agreement by and between Bank and Borrower dated as of July 24, 2013 (the "**First Amendment Date**").

"**Supplemental Conversion Date**" is defined in Section 2.1.2(b)(ii).

"**Supplemental Final Payment**" is a payment (in addition to and not a substitution for the regular monthly payments of principal and accrued interest) due in accordance with Section 2.1.2 above, equal to the original principal amount of the applicable Supplemental Growth Capital Advance multiplied by the Supplemental Final Payment Percentage.

"**Supplemental Final Payment Percentage**" is (a) with respect to the Supplemental Growth Capital Advance under the Supplemental First Tranche, three percent (3.00%), and (b) with respect to the Supplemental Growth Capital Advance under the Supplemental Second Tranche, seven percent (7.00%).

"**Supplemental First Tranche**" is defined in Section 2.1.2(a)(i).

"**Supplemental Growth Capital Advance**" is defined in Section 2.1.2(a).

"**Supplemental Growth Capital Commitment Termination Date**" is June 30, 2014.

"**Supplemental Growth Capital Loan Commitment**" is Ten Million Dollars ($10,000,000).

"**Supplemental Growth Capital Maturity Date**" is June 1, 2017.

"**Supplemental Interest-Only Period**" means the period commencing on the first (1st) Business Day following a Funding Date of a Supplemental Growth Capital Advance and continuing through June 30, 2014.

"**Supplemental Prepayment Fee**" is an amount equal to Two Hundred Thousand Dollars ($200,000); *provided, however*, that Bank shall waive the Supplemental Prepayment Fee in its entirety if Bank closes on the refinance and re-documentation of the Supplemental Growth Capital Advances under any division of Bank or an affiliate of Bank (in its sole and exclusive discretion) prior to the Supplemental Growth Capital Maturity Date, even if additional lenders or debt partners participate in such refinancing (so long as Bank's portion in any such refinancing is at least the lesser of Ten Million Dollars ($10,000,000) or fifty percent (50%) of the aggregate loan commitment).

"**Supplemental Repayment Period**" is a period of time commencing on July 1, 2014 and continuing through the Supplemental Growth Capital Maturity Date.

"**Supplemental Second Tranche**" is defined in Section 2.1.2(a)(ii).

"**Supplemental Second Tranche Advance**" means the Supplemental Growth Capital Advance under the Supplemental Second Tranche.

"**Supplemental Second Tranche Funding Condition**" means, with respect to the Supplemental Second Tranche Advance, that either (a) as of the date of funding of the Supplemental Second Tranche Advance, the human clinical trials and dosing for the development of Borrower's lead program (ATYR1940) remain active and ongoing, or (b) on or prior to the date of funding of the Supplemental Second Tranche Advance, Borrower has closed on a collaboration agreement on one of Borrower's secondary assets (*i.e.*, any asset other than Resokine), with an upfront payment of not less than Fifteen Million Dollars ($15,000,000), including expense reimbursements, on terms reasonably acceptable to Bank.

3. Limitation of Amendments.

3.1 The amendments set forth in Section 2, above, are effective for the purposes set forth herein and shall be limited precisely as written and shall not be deemed to (a) be a consent to any amendment, waiver or modification of any other term or condition of any Loan Document, or (b) otherwise prejudice any right or remedy which Bank may now have or may have in the future under or in connection with any Loan Document.

3.2 This Amendment shall be construed in connection with and as part of the Loan Documents and all terms, conditions, representations, warranties, covenants and agreements set forth in the Loan Documents, except as herein amended, are hereby ratified and confirmed and shall remain in full force and effect.

4. Representations and Warranties. To induce Bank to enter into this Amendment, Borrower hereby represents and warrants to Bank as follows:

4.1 Immediately after giving effect to this Amendment (a) the representations and warranties contained in the Loan Documents are true, accurate and complete in all material respects as of the date hereof (except to the extent such representations and warranties relate to an earlier date, in which case they are true and correct in all material respects as of such date), and (b) no Event of Default has occurred and is continuing;

4.2 Borrower has the power and authority to execute and deliver this Amendment and to perform its obligations under the Loan Agreement, as amended by this Amendment;

4.3 The organizational documents of Borrower most recently delivered to Bank remain true, accurate and complete and have not been amended, supplemented or restated and are and continue to be in full force and effect;

4.4 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, have been duly authorized;

4.5 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, do not and will not contravene (a) any material law or regulation binding on or affecting Borrower, (b) any material contractual restriction with a Person binding on Borrower, (c) any order, judgment or decree of any court or other governmental or public body or authority, or subdivision thereof, binding on Borrower, or (d) the organizational documents of Borrower;

4.6 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, do not require any order, consent, approval, license, authorization or validation of, or filing, recording or registration with, or exemption by any governmental or public body or authority, or subdivision thereof, binding on either Borrower, except as already has been obtained or made; and

4.7 This Amendment has been duly executed and delivered by Borrower and is the binding obligation of Borrower, enforceable against Borrower in accordance with its terms, except as such enforceability may be limited by bankruptcy, insolvency, reorganization, liquidation, moratorium or other similar laws of general application and equitable principles relating to or affecting creditors' rights.

5. Integration. This Amendment and the Loan Documents represent the entire agreement about this subject matter and supersede prior negotiations or agreements. All prior agreements, understandings, representations, warranties, and negotiations between the parties about the subject matter of this Amendment and the Loan Documents merge into this Amendment and the Loan Documents.

6. Counterparts. This Amendment may be executed in any number of counterparts and all of such counterparts taken together shall be deemed to constitute one and the same instrument.

7. Effectiveness. This Amendment shall be deemed effective upon (a) the due execution and delivery to Bank of this Amendment by each party hereto, (b) the due execution and delivery to Bank of a Warrant to Purchase Stock in substantially the form attached hereto as Exhibit A, (c) Borrower's payment of the accrued portion of the Final Payment in accordance with Section 2.3(a) of the Loan Agreement, and (d) payment of Bank's reasonable legal fees and expenses in connection with the negotiation and preparation of this Amendment.

[Signature page follows.]

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be duly executed and delivered as of the date first written above.

BANK

Silicon Valley Bank

By: /s/ Kevin Wallace
Name: Kevin Wallace
Title: Vice President

BORROWER

aTyr Pharma, Inc.

By: /s/ John Mendlein
Name: John Mendlein
Title: CEO

[Signature Page to First Amendment to Loan and Security Agreement]

EXHIBIT A

WARRANT TO PURCHASE STOCK

Exhibit 21.1

SUBSIDIARIES OF REGISTRANT

Name	State or Other Jurisdiction of Incorporation or Organization	Names Under Which Subsidiary Does Business
Pangu BioPharma Limited	Hong Kong	Pangu BioPharma Limited

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

We consent to the reference to our firm under the caption "Experts" and to the use of our report dated April 3, 2015, in the Registration Statement on Form S-1 and related Prospectus of aTyr Pharma, Inc. for the registration of shares of its common stock.

/s/ Ernst & Young LLP

San Diego, CA
April 3, 2015