

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549**

FORM 8-K

CURRENT REPORT

Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934

Date of Report (Date of earliest event reported): February 8, 2023

ATYR PHARMA, INC.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction
of incorporation)

001-37378
(Commission File Number)

20-3435077
(IRS Employer
Identification No.)

3545 John Hopkins Court, Suite #250
San Diego, CA
(Address of Principal Executive Offices)

92121
(Zip Code)

Registrant's telephone number, including area code: (858) 731-8389

Not Applicable

(Former Name or Former Address, if Changed Since Last Report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligations of the registrant under any of the following provisions:

- Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
- Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
- Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
- Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, par value \$0.001 per share	LIFE	The Nasdaq Capital Market

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 or Rule 12b-2 of the Securities Exchange Act of 1934.

Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Item 8.01 Other Events.

Follow-On Public Offering

On February 8, 2023, aTyr Pharma, Inc. (the “Company”) entered into an underwriting agreement (the “Underwriting Agreement”) with RBC Capital Markets, LLC, as representative of the several underwriters named in Schedule I thereto (the “Underwriters”), to issue and sell to the Underwriters 22,225,000 shares of common stock of the Company (the “Shares”) in an underwritten public offering (the “Offering”) pursuant to an effective Registration Statement on Form S-3 (File No. 333-263585) and a related prospectus and prospectus supplement, in each case filed with the Securities and Exchange Commission (the “SEC”). The offering price to the public is \$2.25 per Share. In addition, the Company granted the Underwriters an option to purchase, for a period of 30 days, up to an additional 3,333,750 shares of common stock at the public offering price, less the underwriting discounts and commissions (the “Option”). The Company estimates that the gross proceeds from the Offering will be approximately \$50.0 million, before deducting underwriting discounts and commissions and estimated offering expenses. The Offering is scheduled to close on February 13, 2023, subject to the satisfaction of customary closing conditions.

The Underwriting Agreement contains customary representations, warranties, covenants and agreements by the Company, customary conditions to closing, indemnification obligations of the Company and the Underwriters, including for liabilities under the Securities Act of 1933, as amended, other obligations of the parties and termination provisions. The representations, warranties and covenants contained in the Underwriting Agreement were made only for purposes of such agreement and as of specific dates, were solely for the benefit of the parties to such agreement, and may be subject to limitations agreed upon by the contracting parties. A copy of the Underwriting Agreement is filed as Exhibit 1.1 to this Current Report on Form 8-K. The foregoing description of the Underwriting Agreement is qualified in its entirety by reference to such exhibit. A copy of the legal opinion of Cooley LLP as to the legality of the Shares (including shares of common stock issuable upon exercise of the Option) is filed as Exhibit 5.1 to this Current Report on Form 8-K.

In connection with the Offering described above, the Company provided the following recent update and additional risk factor:

Expansion of Efzofitimid Clinical Program with Phase 2 Study in New Indication Following FDA Clearance of IND Application

Following the recent clearance of an Investigational New Drug (IND) application by the FDA, and, pending receipt of the net proceeds from this offering, we plan to initiate a Phase 2 study of efzofitimid in patients with SSc-ILD in 2023. This planned Phase 2 study will be a randomized, double-blind placebo-controlled proof-of-concept study to evaluate the efficacy, safety and tolerability of efzofitimid in patients with SSc-ILD. We are planning for a 28-week study with three parallel cohorts randomized 2:2:1 to either 270 mg or 450 mg of efzofitimid or placebo dosed intravenously monthly for a total of six doses. It is expected the study will enroll 25 patients at multiple centers in the United States. The primary objective of the study will be to evaluate the efficacy of multiple doses of IV efzofitimid on pulmonary, cutaneous and systemic manifestations in patients with SSc-ILD. Secondary objectives will include safety and tolerability.

Efzofitimid has been shown to reduce lung and skin fibrosis in animal models of SSc and idiopathic pulmonary fibrosis. The pathology of SSc-ILD is driven by the same immune cells that are central to pulmonary sarcoidosis pathology, and NRP2 is upregulated on these cells. Efzofitimid has also been shown to reduce key pro-inflammatory markers that are central to this pathology in a clinical study in patients with pulmonary sarcoidosis.

Systemic sclerosis is a chronic, progressive, autoimmune disease characterized by inflammation and fibrosis of connective tissues throughout the body, including the skin and other internal organs. SSc that occurs in the lungs is called SSc-ILD. It is estimated that approximately 100,000 people in the United States are affected by SSc and 55-65% may develop ILD. SSc-ILD causes inflammation in the lungs and, if left untreated, can result in scarring, or fibrosis, that causes permanent loss of lung function. ILD is the primary cause of death in patients with SSc. Current treatment options for SSc-ILD are limited, mainly focus on slowing disease progression and are associated with significant toxicity.

Supplemental Risk Factor

The following risk factor supplements the risk factors described under “Item 1A. Risk Factors” in the Company’s Quarterly Report on Form 10-Q for the quarter ended September 30, 2022 (the “Form 10-Q”), filed with the SEC on November 14, 2022, and should be read in conjunction with the other risk factors presented in the Form 10-Q.

Although the Company has obtained orphan drug designation for efzofitimid for the treatment of sarcoidosis and systemic sclerosis in the United States and for the treatment of sarcoidosis in the European Union, or EU, the Company may not receive orphan drug designation for efzofitimid in other jurisdictions or for other indications that the Company may pursue, or for any other product candidates the Company may develop under any new applications for orphan drug designation that the Company may submit, and any orphan drug designations that the Company has received or may receive may not confer marketing exclusivity or other expected commercial benefits.

The FDA granted orphan drug designation to efzofitimid for the treatment of sarcoidosis in January 2022 and systemic sclerosis (also known as scleroderma) in April 2022. In January 2023, the European Commission, on the basis of the opinion of the European Medicines Agency, or EMA, Committee for Orphan Medicinal Products, or COMP, granted orphan drug designation to efzofitimid for the treatment of sarcoidosis. The Company may apply for orphan drug designation for efzofitimid for other indications and product candidates in the United States and the EU.

Under the Orphan Drug Act, the FDA may designate a drug or biologic product as an orphan drug if it is intended to treat a rare disease or condition, defined as a patient population of fewer than 200,000 in the United States, or a patient population greater than 200,000 in the United States where there is no reasonable expectation that the cost of developing the drug will be recovered from sales in the United States. In the EU, the EMA's COMP grants orphan drug designation to promote the development of products that are intended for the diagnosis, prevention, or treatment of a life-threatening or chronically debilitating condition affecting not more than five in 10,000 persons in the EU. Additionally, designation is granted for products intended for the diagnosis, prevention, or treatment of a life-threatening, seriously debilitating or serious and chronic condition when, without incentives, it is unlikely that sales of the drug in the EU would be sufficient to justify the necessary investment in developing the drug or biological product or where there is no satisfactory method of diagnosis, prevention, or treatment, or, if such a method exists, the medicine must be of significant benefit to those affected by the condition.

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. Obtaining an orphan drug designation can be difficult and the Company cannot assure you that it will be able to obtain orphan drug designation in other jurisdictions or for other indications, or rely on orphan drug or similar designations to exclude other companies from manufacturing or selling products using the same principal mechanisms of action for the same indications that the Company pursues 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 the Company is 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 the product marketed by the Company. Further, the marketing exclusivity would not prevent competitors from obtaining approval of the same product candidate as the Company's for indications other than those in which the Company has been granted orphan drug designation, or for the use of other types of products in the same indications as the Company's orphan product.

Forward-Looking Statements

This Current Report on Form 8-K contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements can be identified by the use of words such as "estimates," "expects," "plans," "will" and variations of such words or similar expressions. The Company intends these forward-looking statements to be covered by such safe harbor provisions for forward-looking statements and is making this statement for purposes of complying with those safe harbor provisions. These forward-looking statements include statements regarding the Company's expectations with respect to the completion of the Offering and the expected gross proceeds from the Offering, and the timing, design, objectives and enrolled participants in the Company's planned Phase 2 study of efzofitimid in patients with SSc-ILD. These forward-looking statements also reflect the Company's current views about its plans, intentions, expectations, strategies and prospects, which are based on the information currently available to it and on assumptions it has made. Although the Company believes that its plans, intentions, expectations, strategies and prospects, as reflected in or suggested by these forward-looking statements, are reasonable, the Company can give no assurance that the plans, intentions, expectations or strategies will be attained or achieved. All forward-looking statements are based on estimates and assumptions by the Company's management that, although it believes to be reasonable, are inherently uncertain. Furthermore, actual results may differ materially from those described in these forward-looking statements and will be affected by a variety of risks and factors that are beyond the Company's control including, without limitation, risks and uncertainties associated with market conditions, the satisfaction of customary closing conditions related to the Offering, risks associated with geopolitical and macroeconomic conditions, including the COVID-19 pandemic and the ongoing military conflict between Ukraine and Russia and related sanctions, risks associated with preclinical and clinical development, and regulatory risks, as well as those risks set forth in the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2022 filed with the SEC on November 14, 2022 and in the Company's other SEC filings.

Except as required by law, we assume no obligation to update publicly any forward-looking statements, whether as a result of new information, future events or otherwise.

Item 9.01 Financial Statements and Exhibits.

(d) Exhibits

Exhibit No.	Description
1.1	Underwriting Agreement by and between aTyr Pharma, Inc. and RBC Capital Markets, LLC
5.1	Opinion of Cooley LLP
23.1	Consent of Cooley LLP (included in Exhibit 5.1)
104	Cover Page Interactive Data File (embedded within the Inline XBRL document)

SIGNATURE

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

ATYR PHARMA, INC.

By: /s/ Jill M. Broadfoot
Jill M. Broadfoot
Chief Financial Officer

Date: February 9, 2023

22,225,000 Shares
ATYR PHARMA, INC.
Common Stock
UNDERWRITING AGREEMENT

February 8, 2023

RBC CAPITAL MARKETS, LLC

As Representative of the several
Underwriters named in Schedule I hereto

c/o RBC Capital Markets, LLC
Brookfield Place
200 Vesey Street, 8th Floor
New York, New York 10281

Ladies and Gentlemen:

aTyr Pharma, Inc., a Delaware corporation (the “**Company**”), proposes to sell to the several Underwriters named in Schedule I hereto (the “**Underwriters**”) an aggregate of 22,225,000 shares (the “**Firm Shares**”) of Common Stock, \$0.001 par value per share (the “**Common Stock**”), of the Company. The Company has also granted to the several Underwriters an option to purchase up to 3,333,750 additional shares of Common Stock, on the terms and for the purposes set forth in Section 3 hereof (the “**Option Shares**”). The Firm Shares and any Option Shares purchased pursuant to this Underwriting Agreement (this “**Agreement**”) are herein collectively called the “**Securities**.”

The Company hereby confirms its agreement with respect to the sale of the Securities to the several Underwriters, for whom RBC Capital Markets, LLC is acting as representative (the “**Representatives**”). To the extent there is only a single Representative, the term “Representatives” shall mean the singular, as the context requires.

1. **Registration Statement and Prospectus.** The Company has prepared and filed with the Securities and Exchange Commission (the “**Commission**”) a registration statement on Form S-3 (File No. 333-263585) under the Securities Act of 1933, as amended (the “**Securities Act**” or “**Act**”) and the rules and regulations (the “**Rules and Regulations**”) of the Commission thereunder, and such amendments to such registration statement as may have been required as of the date of this Agreement. Such registration statement has been declared effective by the Commission. Each part of such registration statement, including the amendments, exhibits and any schedules thereto, the documents incorporated by reference therein pursuant to Item 12 of Form S-3 under the Securities Act and the documents and information otherwise deemed to be a part thereof or included therein by Rule 430B under the Securities Act (the “**Rule 430B Information**”) or otherwise pursuant to the Rules and Regulations, as of the time the Registration Statement became effective, is herein called the “**Registration Statement**.” Any registration statement filed by the Company pursuant to Rule 462(b) under the Securities Act is called the “**Rule 462(b) Registration**”

Statement” and, from and after the date and time of filing of the Rule 462(b) Registration Statement, the term “Registration Statement” shall include the Rule 462(b) Registration Statement.

The prospectus in the form in which it has most recently been filed with the Commission on or prior to the date of this Agreement is herein called the “**Base Prospectus**.” Each preliminary prospectus supplement to the Base Prospectus (including the Base Prospectus as so supplemented), that describes the Securities and the offering thereof, that omitted the Rule 430B Information and that was used prior to the filing of the final prospectus supplement referred to in the following sentence is herein called a “**Preliminary Prospectus**.” Promptly after execution and delivery of this Agreement, the Company will prepare and file with the Commission a final prospectus supplement to the Base Prospectus relating to the Securities and the offering thereof in accordance with the provisions of Rule 430B and Rule 424(b) of the Rules and Regulations. Such final supplemental form of prospectus (including the Base Prospectus as so supplemented), in the form filed with the Commission pursuant to Rule 424(b) is herein called the “**Prospectus**.” Any reference herein to the Base Prospectus, any Preliminary Prospectus or the Prospectus shall be deemed to include the documents incorporated by reference therein pursuant to Item 12 of Form S-3 under the Securities Act as of the date of such prospectus.

For purposes of this Agreement, all references to the Registration Statement, the Rule 462(b) Registration Statement, the Base Prospectus, any Preliminary Prospectus, the Prospectus or any amendment or supplement to any of the foregoing shall be deemed to include the copy filed with the Commission pursuant to its Electronic Data Gathering, Analysis and Retrieval System or any successor system thereto (“**EDGAR**”). All references in this Agreement to financial statements and schedules and other information which is “described,” “contained,” “included” or “stated” in the Registration Statement, the Base Prospectus, any Preliminary Prospectus or the Prospectus (or other references of like import) shall be deemed to mean and include all such financial statements and schedules and other information which is incorporated by reference in or otherwise deemed by the Rules and Regulations to be a part of or included in the Registration Statement, the Base Prospectus, any Preliminary Prospectus or the Prospectus, as the case may be; and all references in this Agreement to amendments or supplements to the Registration Statement, the Base Prospectus, any Preliminary Prospectus or the Prospectus shall be deemed to mean and include any subsequent filing of any document under the Securities Exchange Act of 1934, as amended (the “**Exchange Act**”), which is deemed to be incorporated therein by reference therein or otherwise deemed by the Rules and Regulations to be a part thereof.

2. **Representations and Warranties of the Company.** The Company represents and warrants to, and agrees with, the several Underwriters as follows:

(a) Registration Statement and Prospectuses. No order preventing or suspending the use of any Preliminary Prospectus or the Prospectus (or any supplement thereto) has been issued by the Commission and no proceeding for that purpose has been initiated or is pending or, to the knowledge of the Company, threatened by the Commission. As of the time each part of the Registration Statement (or any post-effective amendment thereto) became or becomes effective (including each deemed effective date with respect to the Underwriters pursuant to Rule 430B or otherwise under the Securities Act), such part conformed or will conform in all material respects to the requirements of the Act and the Rules and Regulations. Upon its filing or first use within the meaning of the Rules and Regulations, each Preliminary Prospectus and the Prospectus (or any

supplement to either) conformed or will conform in all material respects to the requirements of the Act and the Rules and Regulations. The Registration Statement and any post-effective amendment thereto has become effective under the Securities Act. The Company has complied to the Commission's satisfaction with all requests of the Commission for additional or supplemental information. No stop order suspending the effectiveness of the Registration Statement, any post-effective amendment or any part thereof is in effect and no proceedings for such purpose have been instituted or are pending or, to the knowledge of the Company, are threatened by the Commission.

(b) ***Accurate Disclosure.*** Each Preliminary Prospectus, at the time of filing thereof or the time of first use within the meaning of the Rules and Regulations, did not contain an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading. Neither the Registration Statement nor any amendment thereto, at the effective time of each part thereof, at the First Closing Date (as defined below) or any Subsequent Closing Date (as defined below), contained, contains or will contain an untrue statement of a material fact or omitted, omits or will omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading. As of the Time of Sale (as defined below), neither (A) the Time of Sale Disclosure Package (as defined below) nor (B) any issuer free writing prospectus (as defined below), when considered together with the Time of Sale Disclosure Package, included an untrue statement of a material fact or omitted to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading. Neither the Prospectus nor any supplement thereto, as of its issue date, at the time of any filing with the Commission pursuant to Rule 424(b) of the Rules and Regulations, at the First Closing Date or at any Subsequent Closing Date, included, includes or will include an untrue statement of a material fact or omitted, omits or will omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading. The representations and warranties in this Section 2(b) shall not apply to statements in or omissions from any Preliminary Prospectus, the Registration Statement (or any amendment thereto), the Time of Sale Disclosure Package or the Prospectus (or any supplement thereto) made in reliance upon, and in conformity with, written information furnished to the Company by you, or by any Underwriter through you, specifically for use in the preparation of such document, it being understood and agreed that the only such information furnished by any Underwriter consists of the information described as such in Section 6(e).

Each reference to an “***issuer free writing prospectus***” herein means an issuer free writing prospectus as defined in Rule 433 of the Rules and Regulations.

“***Time of Sale Disclosure Package***” means the Preliminary Prospectus dated February 8, 2023, any free writing prospectus set forth on Schedule II and the information on Schedule III, all considered together.

Each reference to a “***free writing prospectus***” herein means a free writing prospectus as defined in Rule 405 of the Rules and Regulations.

“***Time of Sale***” means 7:30 p.m. (Eastern time) on the date of this Agreement.

(c) Issuer Free Writing Prospectuses. (A) Each issuer free writing prospectus does not include any information that conflicts with the information contained in the Registration Statement, any Preliminary Prospectus or the Prospectus. The foregoing sentence does not apply to statements in or omissions from any issuer free writing prospectus based upon and in conformity with written information furnished to the Company by you, or by any Underwriter through you, specifically for use therein; it being understood and agreed that the only such information furnished by any Underwriter consists of the information described as such in Section 6(e).

(B)(1) At the earliest time after the filing of the Registration Statement that the Company or another offering participant made a *bona fide* offer (within the meaning of Rule 164(h)(2) under the Securities Act) of the Securities and (2) at the date hereof, the Company was not, is not and will not be (as applicable) an “ineligible issuer,” as defined in Rule 405 under the Securities Act, including the Company or any subsidiary in the preceding three years not having been convicted of a felony or misdemeanor or having been made the subject of a judicial or administrative decree or order as described in Rule 405 of the Rules and Regulations (without taking account of any determination by the Commission pursuant to Rule 405 of the Rules and Regulations that it is not necessary that the Company be considered an ineligible issuer), nor an “excluded issuer” as defined in Rule 164 under the Securities Act.

(C) Each issuer free writing prospectus satisfied, as of its issue date and at all subsequent times to the Time of Sale, all other conditions to use thereof as set forth in Rules 164 and 433 under the Securities Act.

(d) Testing-the-Waters Materials. The Company (i) has not alone engaged in any Testing-the-Waters Communications (as defined below), other than Testing-the-Waters Communications with the prior consent of the Representatives with entities that are qualified institutional buyers within the meaning of Rule 144A under the Act or institutions that are accredited investors within the meaning of Rule 501 under the Act and (ii) has not authorized anyone other than the Representatives to engage in Testing-the-Waters Communications. The Company reconfirms that the Representatives have been authorized to act on its behalf in undertaking Testing-the-Waters Communications. The Company has not distributed any Written Testing-the-Waters Communications (as defined below) other than those listed on Schedule V hereto. “**Testing-the-Waters Communication**” means any oral or written communication with potential investors undertaken in reliance on Rule 163B under, the Act. “**Written Testing-the-Waters Communication**” means any Testing-the-Waters Communication that is a written communication within the meaning of Rule 405 under the Act. Any individual Written Testing-the-Waters Communication, at the Time of Sale, and at all times through the completion of the public offer and sale of the Securities did not conflict with the information contained in the Registration Statement or the Time of Sale Disclosure Package, complied in all material respects with the Act, and when taken together with the Time of Sale Disclosure Package as of the Time of Sale, did not contain any untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading.

(e) No Other Offering Materials. The Company has not distributed and will not distribute any prospectus or other offering material in connection with the offer and sale of the

Securities other than any Preliminary Prospectus, the Time of Sale Disclosure Package or the Prospectus or other materials permitted by the Act to be distributed by the Company; *provided, however*, that, except as set forth on Schedule II, the Company has not made and will not make any offer relating to the Securities that would constitute a free writing prospectus, except in accordance with the provisions of Section 4(o) of this Agreement and, except as set forth on Schedule V, the Company has not made and will not make any communication relating to the Securities that would constitute a Written Testing-the-Waters Communication, except in accordance with the provisions of Section 2(d) of this Agreement.

(f) *Financial Statements*. The financial statements of the Company, together with the related notes, set forth or incorporated by reference in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus comply in all material respects with the requirements of the Securities Act and the Exchange Act and fairly present in all material respects the financial condition of the Company and its consolidated subsidiaries as of the dates indicated and the results of operations and changes in cash flows for the periods therein specified in conformity with generally accepted accounting principles (“*GAAP*”) in the United States consistently applied throughout the periods involved; the supporting schedules included or incorporated by reference in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus present fairly in all material respects the information required to be stated therein; all non-GAAP financial information included in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus complies in all material respects with the requirements of Regulation G and Item 10 of Regulation S-K under the Act, to the extent applicable; and, except as disclosed in the Time of Sale Disclosure Package and the Prospectus, there are no material off-balance sheet arrangements or any other relationships with unconsolidated entities or other persons, that may have a material current or, to the Company’s knowledge, material future effect on the Company’s financial condition, results of operations, liquidity, capital expenditures, capital resources or significant components of revenue or expenses. No other financial statements or schedules are required to be included in the Registration Statement, the Time of Sale Disclosure Package or the Prospectus. To the Company’s knowledge, Ernst & Young LLP, which has expressed its opinion with respect to the financial statements and schedules incorporated by reference in the Registration Statement and included in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, is (x) an independent public accounting firm within the meaning of the Act and the Rules and Regulations, (y) a registered public accounting firm (as defined in Section 2(a)(12) of the Sarbanes-Oxley Act of 2002 (the “*Sarbanes-Oxley Act*”)) and (z) not in violation of the auditor independence requirements of the Sarbanes-Oxley Act.

(g) *Absence of Certain Events*. Except as contemplated in the Time of Sale Disclosure Package and in the Prospectus, subsequent to the respective dates as of which information is given in the Time of Sale Disclosure Package, neither the Company nor any of its subsidiaries has incurred any material liabilities or obligations, direct or contingent, or entered into any material transactions, or declared or paid any dividends or made any distribution of any kind with respect to its capital stock; and there has not been any change in the capital stock (other than a change in the number of outstanding shares of Common Stock due to the issuance of shares upon the exercise of outstanding options, restricted stock units or warrants or conversion of convertible securities), or any material change in the short-term or long-term debt (other than as a result of the conversion of convertible securities), or any issuance of options, restricted stock units, warrants, convertible securities or other rights to purchase the capital stock, of the Company or any of its

subsidiaries, or any Material Adverse Effect. “Material Adverse Effect” shall mean any material adverse change or effect that would be reasonably likely to cause a material adverse change or effect, in or affecting (A) the business, earnings, assets, liabilities, prospects, properties, condition (financial or otherwise), operations, general affairs, management, financial position, stockholders’ equity or results of operations of the Company and its subsidiaries, taken as a whole or (B) the ability of the Company to perform its obligations under this Agreement, including the issuance and sale of the Securities, or to consummate the transactions contemplated in the Time of Sale Disclosure Package and the Prospectus.

(h) Organization and Good Standing. Each of the Company and its subsidiaries has been duly organized and is validly existing as a corporation or other organization and is in good standing under the laws of its jurisdiction of organization. Each of the Company and its subsidiaries has full corporate power and authority to own its properties and conduct its business as currently being carried on and as described in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, and is duly qualified to do business as a foreign corporation in good standing in each jurisdiction in which it owns or leases real property or in which the conduct of its business makes such qualification necessary and in which the failure to so qualify would, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect.

(i) Absence of Proceedings. Except as set forth in the Time of Sale Disclosure Package and in the Prospectus, there is not pending or, to the knowledge of the Company, threatened or contemplated, any action, suit or proceeding (A) to which the Company or any of its subsidiaries is a party or (B) which has as the subject thereof any officer or director of the Company or any subsidiary, any employee benefit plan sponsored by the Company or any subsidiary or any property or assets owned or leased by the Company or any subsidiary before or by any court or Governmental Authority (as defined below), or any arbitrator, which would, individually or in the aggregate, reasonably be expected to result in any Material Adverse Effect or which is otherwise material in the context of the sale of the Securities. There are no current or, to the knowledge of the Company, pending, legal, governmental or regulatory actions, suits or proceedings (x) to which the Company or any of its subsidiaries is subject or (y) which has as the subject thereof any officer or director of the Company or any subsidiary, any employee plan sponsored by the Company or any subsidiary or any property or assets owned or leased by the Company or any subsidiary, that are required to be described in the Registration Statement, Time of Sale Disclosure Package and Prospectus by the Act or by the Rules and Regulations and that have not been so described.

(j) Disclosure of Legal Matters. There are no statutes, regulations, contracts or documents that are required to be described in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus or required to be filed as exhibits to the Registration Statement by the Securities Act or by the Rules and Regulations that have not been so described or filed.

(k) Authorization; No Conflicts; Authority. This Agreement has been duly authorized, executed and delivered by the Company, and constitutes a valid, legal and binding obligation of the Company, enforceable in accordance with its terms, except as rights to indemnity hereunder may be limited by federal or state securities laws and except as such enforceability may be limited by bankruptcy, insolvency, reorganization or similar laws affecting the rights of

creditors generally and subject to general principles of equity. The execution, delivery and performance of this Agreement and the consummation of the transactions herein contemplated will not (A) conflict with or result in a breach or violation of any of the terms or provisions of, or constitute a default under, or result in the creation or imposition of any lien, charge or encumbrance upon any property or assets of the Company or any of its subsidiaries pursuant to any indenture, mortgage, deed of trust, loan agreement or other agreement or instrument to which the Company or any of its subsidiaries is a party or by which the Company or any of its subsidiaries is bound or to which any of the property or assets of the Company or any of its subsidiaries is subject, (B) result in any violation of the provisions of the Company's charter or by-laws or (C) result in the violation of any law or statute or any judgment, order, rule, regulation or decree of any court or arbitrator or federal, state, local or foreign governmental agency or regulatory authority having jurisdiction over the Company or any of its subsidiaries or any of their properties or assets (each, a "**Governmental Authority**"), except in the case of clause (A) as would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect. No consent, approval, authorization or order of, or registration or filing with any Governmental Authority is required for the execution, delivery and performance of this Agreement or for the consummation of the transactions contemplated hereby, including the issuance or sale of the Securities by the Company, except such as may be required under the Act, the rules of the Financial Industry Regulatory Authority, Inc. ("**FINRA**") or state securities or blue sky laws; and the Company has full power and authority to enter into this Agreement and to consummate the transactions contemplated hereby, including the authorization, issuance and sale of the Securities as contemplated by this Agreement.

(l) Capitalization; the Securities; Registration Rights. All of the issued and outstanding shares of capital stock of the Company, including the outstanding shares of Common Stock, are duly authorized and validly issued, fully paid and nonassessable, have been issued in compliance with all applicable federal and state and foreign securities laws, were not issued in violation of or subject to any preemptive rights or other rights to subscribe for or purchase securities that have not been complied with or waived in writing (if so waived, a copy of which has been delivered to counsel to the Representatives), and the holders thereof are not subject to personal liability by reason of being such holders; the Securities which may be sold hereunder by the Company have been duly authorized and, when issued, delivered and paid for in accordance with the terms of this Agreement, will have been validly issued and will be fully paid and nonassessable, and the holders thereof will not be subject to personal liability by reason of being such holders; and the capital stock of the Company, including the Common Stock, conforms in all material respects to the description thereof in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus. Except as otherwise stated in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus, (A) there are no preemptive rights or other rights to subscribe for or to purchase, or any restriction upon the voting or transfer of, any shares of Common Stock pursuant to the Company's charter, by-laws or any agreement or other instrument to which the Company or any of its subsidiaries is a party or by which the Company or any of its subsidiaries is bound; (B) the offering or sale of the Securities as contemplated by this Agreement does not give rise to any rights for or relating to the registration of any shares of Common Stock or other securities of the Company (collectively, "**Registration Rights**") that have not been validly waived, and (C) any person to whom the Company has granted Registration Rights has agreed not to exercise such rights until after expiration of the Lock-Up Period (as defined below). All of the issued and outstanding shares of capital stock of each of the

Company's subsidiaries have been duly and validly authorized and issued and are fully paid and nonassessable, and, except as otherwise described in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus, the Company owns of record and beneficially, free and clear of any security interests, claims, liens, proxies, equities or other encumbrances, all of the issued and outstanding shares of such stock. The Company has an authorized and outstanding capitalization as set forth in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus as of the dates indicated therein.

(m) Stock Options. Except as described in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus, there are no options, warrants, agreements, contracts or other rights in existence to purchase or acquire from the Company or any subsidiary of the Company any shares of the capital stock of the Company or any subsidiary of the Company. The description of the Company's stock option, stock bonus and other stock plans or arrangements, including incentive plans (the "**Company Stock Plans**"), and the options (the "**Options**") or other rights granted thereunder, set forth in the Time of Sale Disclosure Package and the Prospectus accurately and fairly presents in all material respects the information required to be shown with respect to such plans, arrangements, options and rights. Each grant of an Option (A) was duly authorized no later than the date on which the grant of such Option was by its terms to be effective by all necessary corporate action, including, as applicable, approval by the board of directors of the Company (or a duly constituted and authorized committee thereof) and any required stockholder approval by the necessary number of votes or written consents, and the award agreement governing such grant (if any) was duly executed and delivered by each party thereto and (B) was made in accordance with the terms of the applicable Company Stock Plan, and all applicable laws and regulatory rules or requirements, including all applicable federal securities laws.

(n) Compliance with Laws. The Company and each of its subsidiaries holds, and is operating in compliance in all material respects with, all applicable franchises, grants, authorizations, licenses, permits, easements, consents, certificates and orders of any Governmental Authority or self-regulatory body required for the conduct of its business and all such franchises, grants, authorizations, licenses, permits, easements, consents, certifications and orders are valid and in full force and effect; and neither the Company nor any of its subsidiaries has received written notice of any revocation or modification of any such franchise, grant, authorization, license, permit, easement, consent, certification or order or has reason to believe that any such franchise, grant, authorization, license, permit, easement, consent, certification or order will not be renewed in the ordinary course; and the Company and each of its subsidiaries is in compliance in all material respects with all applicable federal, state, local and foreign laws, regulations, orders and decrees.

(o) Ownership of Assets. The Company and its subsidiaries have good and marketable title to all property (whether real or personal) described in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus as being owned by them, in each case free and clear of all liens, claims, security interests, other encumbrances or defects except as would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect or as are described in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus. The property held under lease by the Company and its subsidiaries is held by them under valid, subsisting and enforceable leases with only such exceptions with respect to

any particular lease as do not interfere in any material respect with the conduct of the business of the Company or its subsidiaries.

(p) ***Intellectual Property.*** The Company and each of its subsidiaries owns, possesses, or can acquire on reasonable terms, all Intellectual Property (as defined below) necessary for the conduct of the Company's and its subsidiaries' business as now conducted or as proposed to be conducted, as described in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus. Furthermore, (A) to the knowledge of the Company, there is no infringement, misappropriation or violation by third parties of any such Intellectual Property; (B) there is no pending or, to the knowledge of the Company, threatened, action, suit, proceeding or claim by others challenging the Company's or any of its subsidiaries' rights in or to any such Intellectual Property, and the Company is unaware of any facts which would form a reasonable basis for any such claim; (C) the Intellectual Property owned by the Company and its subsidiaries, and to the knowledge of the Company, the Intellectual Property licensed to the Company and its subsidiaries, has not been adjudged by a court of competent jurisdiction invalid or unenforceable, in whole or in part, and there is no pending or, to the knowledge of the Company, threatened action, suit, proceeding or claim by others challenging the validity or scope of any such Intellectual Property, and the Company is unaware of any facts which would form a reasonable basis for any such claim; (D) there is no pending or, to the knowledge of the Company, threatened action, suit, proceeding or claim by others that the Company or any of its subsidiaries infringes, misappropriates or otherwise violates any Intellectual Property or other proprietary rights of others, neither the Company or any of its subsidiaries has received any written notice of such claim and the Company is unaware of any fact which would form a reasonable basis for any such claim; (E) to the Company's knowledge, no employee of the Company or any of its subsidiaries is in or has ever been in violation of any term of any employment contract, patent disclosure agreement, invention assignment agreement, non-competition agreement, non-solicitation agreement, nondisclosure agreement or any restrictive covenant to or with a former employer where the basis of such violation relates to such employee's employment with the Company or any of its subsidiaries or actions undertaken by the employee while employed with the Company or any of its subsidiaries; (F) there is no prior art or public or commercial activity of which the Company is aware that may render any patent included in the Intellectual Property invalid or that would preclude the issuance of any patent from any patent application included in the Intellectual Property, which has not been disclosed to the U.S. Patent and Trademark Office; (G) to the Company's knowledge, the issued patents included in the Intellectual Property are valid and enforceable and the Company is unaware of any facts that would preclude the issuance of a valid and enforceable patent on any pending patent application included in the Intellectual Property; (H) the Company has taken reasonable steps necessary to secure the interests of the Company in the Intellectual Property that is owned or purported to be owned by the Company from all employees, consultants, agents or contractors that developed (in whole or in part) such Intellectual Property; (I) no government funding, facilities or resources of a university, college, other educational institution or research center was used in the development of any Intellectual Property that is owned or purported to be owned by the Company that would confer upon any governmental agency or body, university, college, other educational institution or research center any claim or right in or to any such Intellectual Property; and (J) to the Company's knowledge, none of the technology employed by the Company has been obtained or is being used by the Company in violation of the rights of any entity. "***Intellectual Property***" shall mean all patents, patent applications, trade and service marks, trade and service mark registrations, trade names,

copyrights, licenses, inventions, trade secrets, domain names, technology, know-how and other intellectual property in the United States and foreign jurisdictions.

(q) Health Care Authorizations. The Company has submitted and possesses, or qualifies for applicable exemptions to, such valid and current registrations, listings, approvals, clearances, licenses, certificates, authorizations or permits and supplements or amendments thereto issued or required by the appropriate state, federal or foreign regulatory agencies or bodies necessary to conduct their business (“**Permits**”), including, without limitation, all such Permits required by the U.S. Food and Drug Administration (the “**FDA**”), the U.S. Department of Health and Human Services (“**HHS**”), the U.S. Centers for Medicare & Medicaid Services (“**CMS**”), the European Medicines Agency (“**EMA**”), Health Canada or any other comparable state, federal or foreign agencies or bodies to which it is subject, and the Company has not received any written notice of proceedings relating to the revocation or modification of, or non-compliance with, any such Permit, except for such Permits, the lack of which would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect.

(r) Clinical Trials. The studies, tests and preclinical and clinical trials conducted by or on behalf of, or sponsored by, the Company, or in which the Company has participated, that are described in the Registration Statement, the Time of Sale Disclosure Package or the Prospectus, or the results of which are referred to in the Registration Statement, the Time of Sale Disclosure Package or the Prospectus, were and, if still pending, are being conducted in all material respects in accordance with protocols, procedures and controls pursuant to, where applicable, accepted professional and scientific standards for products or product candidates comparable to those being developed by the Company and all applicable statutes, rules and regulations of the FDA, the EMA, Health Canada and other comparable regulatory agencies outside of the U.S. to which they are subject, including, without limitation, 21 C.F.R. Parts 50, 54, 56, 58 and 312; the descriptions of the results of such studies, tests and trials contained in the Registration Statement, the Time of Sale Disclosure Package or the Prospectus do not contain any misstatement of a material fact or omit a material fact necessary to make such statements not misleading; the Company has no knowledge of any studies, tests or trials not described in the Time of Sale Disclosure Package and the Prospectus the results of which reasonably call into question in any material respect the results of the studies, tests and trials described in the Registration Statement, the Time of Sale Disclosure Package or Prospectus; and the Company has not received any written notices or other correspondence from the FDA, EMA, Health Canada or any other foreign, state or local governmental body exercising comparable authority or any Institutional Review Board or comparable authority requiring or threatening the termination, suspension or material modification of any studies, tests or preclinical or clinical trials conducted by or on behalf of, or sponsored by, the Company or in which the Company has participated, and, to the Company’s knowledge, there are no reasonable grounds for the same. Except as disclosed in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, there has not been any material violation of law or regulation by the Company in its respective product development efforts, submissions or reports to any regulatory authority that could reasonably be expected to require investigation, corrective action or enforcement action.

(s) Compliance with Health Care Laws. The Company and, to the Company’s knowledge, its directors, employees and agents (while acting in such capacity) are in material compliance with, all health care laws applicable to the Company, or any of its products or

activities, including, but not limited to, the federal Anti-Kickback Statute (42 U.S.C. Section 1320a-7b(b)), the Anti-Inducement Law (42 U.S.C. Section 1320a-7a(a)(5)), the civil False Claims Act (31 U.S.C. Section 3729 et seq.), the administrative False Claims Law (42 U.S.C. Section 1320a-7b(a)), the Stark law (42 U.S.C. Section 1395nn), the Health Insurance Portability and Accountability Act of 1996 (42 U.S.C. Section 1320d et seq.) as amended by the Health Information Technology for Economic and Clinical Health Act (42 U.S.C. Section 17921 et seq.) (collectively, “**HIPAA**”), the exclusion laws (42 U.S.C. Section 1320a-7), the Federal Food, Drug, and Cosmetic Act (21 U.S.C. Section 301 et seq.), the Controlled Substances Act (21 U.S.C. Section 801 et seq.), the Public Health Service Act (42 U.S.C. Section 201 et seq.), the Clinical Laboratory Improvement Amendments of 1988 (42 U.S.C. Section 263a), Medicare (Title XVIII of the Social Security Act), Medicaid (Title XIX of the Social Security Act), and the Patient Protection and Affordable Care Act of 2010, as amended by the Health Care and Education Reconciliation Act of 2010, the regulations promulgated pursuant to such laws, and any other state, federal or foreign law, accreditation standards, regulation, memorandum, opinion letter, or other issuance which imposes requirements on manufacturing, development, testing, labeling, advertising, marketing, promotion, distribution, reporting, kickbacks, patient or program charges, recordkeeping, claims process, documentation requirements, medical necessity, referrals, the hiring of employees or acquisition of services or supplies from those who have been excluded from government health care programs, quality, safety, privacy, security, licensure, accreditation or any other aspect of providing health care, clinical laboratory or diagnostics products or services (collectively, “**Health Care Laws**”). The Company has not received any written notification, correspondence or any other written or oral communication, including notification of any pending or threatened claim, suit, proceeding, hearing, enforcement, investigation, arbitration or other action from any governmental authority, including, without limitation, the FDA, the EMA, Health Canada, the U.S. Federal Trade Commission, the U.S. Drug Enforcement Administration (“**DEA**”), CMS, HHS’s Office of Inspector General, the U.S. Department of Justice and state Attorneys General or similar agencies of potential or actual non-compliance by, or liability of, the Company under any Health Care Laws, except, with respect to any of the foregoing, such as would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect. To the Company’s knowledge, there are no facts or circumstances that would reasonably be expected to give rise to material liability of the Company under any Health Care Laws. The statements with respect to Health Care Laws and the Company’s compliance therewith included in the Preliminary Prospectus, in the Time of Sale Disclosure Package and in the Prospectus fairly summarize in all material respects the matters therein described.

(t) *No Shutdowns or Prohibitions.* The Company has not had any product, clinical laboratory or manufacturing site (whether Company-owned or that of a third party manufacturer for the Company’s products) subject to a governmental authority (including FDA) shutdown or import or export prohibition, nor received any FDA Form 483 or other governmental authority notice of inspectional observations, “warning letters,” “untitled letters,” requests to make changes to the Company’s products, processes or operations, or similar correspondence or notice from the FDA or other governmental authority alleging or asserting material noncompliance with any applicable Health Care Laws; provided, however, that, with respect to third-party clinical laboratories or manufacturers, the foregoing is limited only to such regulatory actions or prohibitions that are directly related to the Company’s products or product candidates or any other service provided to the Company or that would result in a Material Adverse Effect. To the

Company's knowledge, neither the FDA nor any other governmental authority is considering such action.

(u) [Reserved].

(v) No Violations or Defaults. Except as disclosed in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, neither the Company nor any of its subsidiaries (A) is in violation of its charter or by-laws (or similar organizational documents), (B) is in default, and no event has occurred that, with notice or lapse of time or both, would constitute such a default, in the due performance or observance of any term, covenant, condition or other obligation contained in any indenture, mortgage, deed of trust, loan agreement, license or other agreement or instrument to which it is a party or by which it is bound or to which any of its properties or assets is subject, or (C) is in violation of any statute or any order, rule or regulation of any court or governmental agency or body having jurisdiction over it or its property or assets or has failed to obtain any license, permit, certificate, franchise or other governmental authorization or permit necessary to the ownership of its property or to the conduct of its business, except in the case of clauses (B) and (C), to the extent any such conflict, breach, violation or default would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect.

(w) Taxes. The Company and its subsidiaries have timely filed all federal, state, local and foreign income and franchise tax returns required to be filed and are not in default in the payment of any taxes which were payable pursuant to said returns or any assessments with respect thereto, other than any which the Company or any of its subsidiaries is contesting in good faith, in each case, except where the failure to so timely file or any such default would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect. To the knowledge of the Company, there is no pending dispute with any taxing authority relating to any of such returns, and the Company has no knowledge of any proposed liability for any tax to be imposed upon the properties or assets of the Company for which there is not an adequate reserve reflected in the Company's financial statements included in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus.

(x) Exchange Listing and Exchange Act Registration. The Common Stock is registered pursuant to Section 12(b) of the Exchange Act and is included or approved for listing on the Nasdaq Capital Market and the Company has taken no action designed to, or likely to have the effect of, terminating the registration of the Common Stock under the Exchange Act or delisting the Common Stock from the Nasdaq Capital Market nor has the Company received any written notification that the Commission or the Nasdaq Capital Market is contemplating terminating such registration or listing. The Company has complied in all material respects with the applicable requirements of the Nasdaq Capital Market for maintenance of inclusion of the Common Stock thereon. The Company has filed an application to include the Securities on the Nasdaq Capital Market. Except as previously disclosed to counsel for the Underwriters or as set forth in the Time of Sale Disclosure Package and the Prospectus, to the knowledge of the Company, no beneficial owners of the Company's capital stock or subordinated debt who, together with their associated persons and affiliates, hold in the aggregate 10% or more of such capital stock or subordinated debt, have any direct or indirect association or affiliate with a FINRA member.

(y) Ownership of Other Entities. Other than the subsidiaries of the Company listed in Exhibit 21.1 to the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2021, the Company, directly or indirectly, owns no capital stock or other equity or ownership or proprietary interest in any corporation, partnership, association, trust or other entity.

(z) Internal Controls. The Company and its subsidiaries maintain a system of "internal control over financial reporting" (as defined in Rule 13a-15(f) of the Exchange Act) sufficient to provide reasonable assurances that (A) transactions are executed in accordance with management's general or specific authorization; (B) transactions are recorded as necessary to permit preparation of financial statements in conformity with GAAP in the United States and to maintain accountability for assets; (C) access to assets is permitted only in accordance with management's general or specific authorization; (D) the recorded accountability for assets is compared with existing assets at reasonable intervals and appropriate action is taken with respect to any differences; and (E) interactive data in eXtensible Business Reporting Language included or incorporated by reference in the Registration Statement, the Prospectus and the Time of Sale Disclosure Package fairly presents the information called for in all material respects and is prepared in accordance with the Commission's rules and guidelines applicable thereto. Except as disclosed in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus, the Company's internal control over financial reporting is effective and none of the Company, its board of directors and audit committee is aware of any "significant deficiencies" or "material weaknesses" (each as defined by the Public Company Accounting Oversight Board) in its internal control over financial reporting, or any fraud, whether or not material, that involves management or other employees of the Company and its subsidiaries who have a significant role in the Company's internal controls; and since the end of the latest audited fiscal year, there has been no change in the Company's internal control over financial reporting (whether or not remediated) that has materially affected, or is reasonably likely to materially affect, the Company's internal control over financial reporting. The Company's board of directors has, subject to the exceptions, cure periods and the phase in periods specified in the applicable stock exchange rules ("**Exchange Rules**"), validly appointed an audit committee to oversee internal accounting controls whose composition satisfies the applicable requirements of the Exchange Rules and the Company's board of directors and/or the audit committee has adopted a charter that satisfies the requirements of the Exchange Rules.

(aa) No Brokers or Finders. Other than as contemplated by this Agreement, the Company has not incurred any liability for any finder's or broker's fee or agent's commission in connection with the execution and delivery of this Agreement or the consummation of the transactions contemplated hereby.

(bb) Insurance. The Company and each of its subsidiaries carries, or is covered by, insurance from reputable insurers in such amounts and covering such risks as it reasonably believes is adequate for the conduct of its business and the value of its properties and the properties of its subsidiaries and as is customary for companies engaged in similar businesses in similar industries; all policies of insurance and any fidelity or surety bonds insuring the Company or any of its subsidiaries or its business, assets, employees, officers and directors are in full force and effect; the Company and its subsidiaries are in compliance with the terms of such policies and instruments in all material respects; to the knowledge of the Company, there are no claims by the Company or any of its subsidiaries under any such policy or instrument as to which any insurance

company is denying liability or defending under a reservation of rights clause; neither the Company nor any of its subsidiaries has been refused any insurance coverage sought or applied for; and neither the Company nor any of its subsidiaries has reason to believe that it will not be able to renew its existing insurance coverage as and when such coverage expires or to obtain similar coverage from similar insurers as may be necessary to continue its business at a cost that would not, individually or in the aggregate, be reasonably expected to result in a Material Adverse Effect.

(cc) Investment Company Act. The Company is not, and after giving effect to the sale of the Securities in accordance with this Agreement and the application of proceeds as described in the Prospectus under the caption “Use of Proceeds,” will not be, an “investment company” within the meaning of the Investment Company Act of 1940, as amended.

(dd) Eligibility to use Form S-3. The conditions for use of Form S-3, set forth in the General Instructions thereto, have been satisfied with respect to the sale of the Securities to the several Underwriters pursuant to this Agreement.

(ee) Incorporated Documents. The documents incorporated by reference in the Time of Sale Disclosure Package and in the Prospectus, when they became effective or were filed with the Commission, as the case may be, conformed in all material respects to the requirements of the Securities Act or the Exchange Act, as applicable, and were filed on a timely basis with the Commission and none of such documents contained an untrue statement of a material fact or omitted to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading; any further documents so filed and incorporated by reference in the Time of Sale Disclosure Package or in the Prospectus, when such documents are filed with the Commission, will conform in all material respects to the requirements of the Exchange Act, and will not contain an untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading.

(ff) Sarbanes-Oxley Act. The Company is in compliance with all applicable provisions of the Sarbanes-Oxley Act and the rules and regulations of the Commission thereunder.

(gg) Disclosure Controls. The Company and its subsidiaries maintain an effective system of “disclosure controls and procedures” (as defined in Rule 13a-15(e) of the Exchange Act) that complies with the requirements of the Exchange Act and that has been designed to ensure that information required to be disclosed by the Company in reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the Commission’s rules and forms, including controls and procedures designed to ensure that such information is accumulated and communicated to the Company’s management as appropriate to allow timely decisions regarding required disclosure. The Company and its subsidiaries have carried out evaluations of the effectiveness of their disclosure controls and procedures as required by Rule 13a-15 of the Exchange Act.

(hh) Anti-Bribery Laws. Neither the Company nor any of its subsidiaries, nor any director or officer of the Company or any of its subsidiaries nor, to the knowledge of the Company, any employee, agent, affiliate or other person associated with or acting on behalf of the Company

or any of its subsidiaries has (A) used any corporate funds for any unlawful contribution, gift, entertainment or other unlawful expense relating to political activity; (B) made or taken an act in furtherance of an offer, promise or authorization of any direct or indirect unlawful payment or benefit to any foreign or domestic government official or employee, including of any government-owned or controlled entity or of a public international organization, or any person acting in an official capacity for or on behalf of any of the foregoing, or any political party or party official or candidate for political office; (C) violated or is in violation of any provision of the Foreign Corrupt Practices Act of 1977, as amended, or any applicable law or regulation implementing the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions, or committed an offence under the Bribery Act 2010 of the United Kingdom, or any other applicable anti-bribery or anti-corruption law; or (D) made, offered, agreed, requested or taken an act in furtherance of any unlawful bribe or other unlawful benefit, including, without limitation, any rebate, payoff, influence payment, kickback or other unlawful or improper payment or benefit. The Company and its subsidiaries have instituted, maintained and enforce, and will continue to maintain and enforce, policies and procedures designed to promote and ensure compliance with all applicable anti-bribery and anti-corruption laws.

(ii) Anti-Money Laundering Laws. The operations of the Company and its subsidiaries are and have been conducted at all times in compliance with applicable financial recordkeeping and reporting requirements, including those of the Currency and Foreign Transactions Reporting Act of 1970, as amended, the applicable money laundering statutes of all jurisdictions where the Company or any of its subsidiaries conducts business, the rules and regulations thereunder and any related or similar rules, regulations or guidelines, issued, administered or enforced by any governmental agency (collectively, the “**Anti-Money Laundering Laws**”), and no action, suit or proceeding by or before any court or governmental agency, authority or body or any arbitrator involving the Company or any of its subsidiaries with respect to the Anti-Money Laundering Laws is pending or, to the knowledge of the Company, threatened.

(jj) OFAC.

(A) Neither the Company nor any of its subsidiaries, nor any of their respective directors or officers, nor, to the Company’s knowledge, any employee, agent, affiliate or other person associated with or acting on behalf of the Company or any of its subsidiaries, is an individual or entity that is, or is owned or controlled by an individual or entity that is:

(1) the subject or the target of any sanctions administered or enforced by the U.S. Department of Treasury’s Office of Foreign Assets Control, the U.S. Department of State (including, without limitation, designation as a “specially designated national or “blocked person”), the United Nations Security Council, the European Union, His Majesty’s Treasury, or other relevant sanctions authority (collectively, “**Sanctions**”), nor

(2) located, organized or resident in a country or territory that is the subject of Sanctions (including, without limitation, Crimea, Cuba, Iran, North Korea and Syria) (each, a “**Sanctioned Country**”).

(B) Neither the Company nor any of its subsidiaries will, directly or indirectly, use the proceeds of the offering of the Securities hereunder, or lend, contribute or otherwise make available such proceeds to any subsidiary, joint venture partner or other individual or entity:

- (1) to fund or facilitate any activities or business of or with any individual or entity or in any country or territory that, at the time of such funding or facilitation, is the subject of Sanctions;
- (2) to fund or facilitate any activities of or a business in any Sanctioned Country; or
- (3) in any other manner that will result in a violation of Sanctions by any individual or entity (including any individual or entity participating in the offering, whether as underwriter, advisor, investor or otherwise).

(C) For the past five years, neither the Company nor any of its subsidiaries has knowingly engaged in, and is not now knowingly engaged in, nor will it knowingly engage in, any dealings or transactions with any individual or entity, or in any country or territory, that at the time of the dealing or transaction is or was the subject or the target of Sanctions or with any Sanctioned Country.

(kk) Compliance with Environmental Laws. Except as disclosed in the Time of Sale Disclosure Package and the Prospectus, neither the Company nor any of its subsidiaries is in violation of any statute, rule, regulation, decision or order of any Governmental Authority or any court, domestic or foreign, relating to the use, disposal or release of hazardous or toxic substances or relating to the protection or restoration of the environment or human exposure to hazardous or toxic substances (collectively, “**Environmental Laws**”), owns or operates any real property contaminated with any substance that is subject to any environmental laws, is liable for any off-site disposal or contamination pursuant to any Environmental Laws, or is subject to any claim relating to any Environmental Laws, which violation, contamination, liability or claim would individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect; and the Company is not aware of any pending investigation which might lead to such a claim. Neither the Company nor any of its subsidiaries anticipates incurring any material capital expenditures relating to compliance with Environmental Laws.

(ll) Compliance with Occupational Laws. The Company and each of its subsidiaries (A) is in compliance, in all material respects, with any and all applicable foreign, federal, state and local laws, rules, regulations, treaties, statutes and codes promulgated by any and all Governmental Authorities (including pursuant to the Occupational Health and Safety Act) relating to the protection of human health and safety in the workplace (“**Occupational Laws**”); (B) has received all permits, licenses or other approvals required of it under applicable Occupational Laws to conduct its business as currently conducted, except where any such failure to receive would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect; and (C) is in compliance, in all material respects, with all terms and conditions of such permit, license or approval. No action, proceeding, revocation proceeding, writ, injunction or claim is pending or, to the Company’s knowledge, threatened against the Company or any of its

subsidiaries relating to Occupational Laws, and the Company does not have knowledge of any facts, circumstances or developments relating to its operations or cost accounting practices that could reasonably be expected to form the basis for or give rise to such actions, suits, investigations or proceedings.

(mm) *ERISA and Employee Benefits Matters.* (A) To the knowledge of the Company, no “prohibited transaction” as defined under Section 406 of ERISA or Section 4975 of the Code and not exempt under ERISA Section 408 and the regulations and published interpretations thereunder has occurred with respect to any Employee Benefit Plan. At no time has the Company or any ERISA Affiliate maintained, sponsored, participated in, contributed to or has or had any material liability or obligation in respect of any Employee Benefit Plan subject to Part 3 of Subtitle B of Title I of ERISA, Title IV of ERISA, or Section 412 of the Code or any “multiemployer plan” as defined in Section 3(37) of ERISA or any multiple employer plan for which the Company or any ERISA Affiliate has incurred or could incur liability under Section 4063 or 4064 of ERISA. No Employee Benefit Plan provides or promises, or at any time provided or promised, retiree health, life insurance, or other retiree welfare benefits except as may be required by the Consolidated Omnibus Budget Reconciliation Act of 1985, as amended, or similar state law. Each Employee Benefit Plan is and has been operated in material compliance with its terms and all applicable laws, including but not limited to ERISA and the Code and, to the knowledge of the Company, no event has occurred (including a “reportable event” as such term is defined in Section 4043 of ERISA) and, to the Company’s knowledge, no condition exists that would subject the Company or any ERISA Affiliate to any material tax, fine, lien, penalty or liability imposed by ERISA, the Code or other applicable law. Each Employee Benefit Plan intended to be qualified under Code Section 401(a) is so qualified and has a favorable determination or opinion letter from the Internal Revenue Service upon which it can rely, and any such determination or opinion letter remains in effect and has not been revoked; to the knowledge of the Company, nothing has occurred since the date of any such determination or opinion letter that is reasonably likely to adversely affect such qualification; (B) with respect to each Foreign Benefit Plan, such Foreign Benefit Plan (1) if intended to qualify for special tax treatment, meets, in all material respects, the requirements for such treatment, and (2) if required to be funded, is funded to the extent required by applicable law, and with respect to all other Foreign Benefit Plans, adequate reserves therefor have been established on the accounting statements of the applicable Company or subsidiary; (C) the Company does not have any obligations under any collective bargaining agreement with any union and no organization efforts are underway with respect to Company employees. As used in this Agreement, “**Code**” means the Internal Revenue Code of 1986, as amended; “**Employee Benefit Plan**” means any “employee benefit plan” within the meaning of Section 3(3) of ERISA, including, without limitation, all stock purchase, stock option, stock-based severance, employment, change-in-control, medical, disability, fringe benefit, bonus, incentive, deferred compensation, employee loan and all other employee benefit plans, agreements, programs, policies or other arrangements, whether or not subject to ERISA, under which (1) any current or former employee, director or independent contractor of the Company or its subsidiaries has any present or future right to benefits and which are contributed to, sponsored by or maintained by the Company or any of its respective subsidiaries or (2) the Company or any of its subsidiaries has had or has any present or future obligation or liability; “**ERISA**” means the Employee Retirement Income Security Act of 1974, as amended; “**ERISA Affiliate**” means any member of the Company’s controlled group as defined in Code Section 414(b), (c), (m) or (o); and “**Foreign Benefit Plan**” means any Employee Benefit Plan established, maintained or contributed

to outside of the United States or which covers any employee working or residing outside of the United States.

(nn) *Business Arrangements.* Except as disclosed in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, neither the Company nor any of its subsidiaries has granted rights to develop, manufacture, produce, assemble, distribute, license, market or sell its products to any other person, except for non-exclusive rights granted to contractors or collaborators of the Company to enable them to perform their activities for, on behalf of, or with, the Company, and is not bound by any agreement that affects the exclusive right of the Company or such subsidiary to develop, manufacture, produce, assemble, distribute, license, market or sell its products.

(oo) *Labor Matters.* No labor problem or dispute with the employees of the Company or any of its subsidiaries exists or, to the knowledge of the Company, is threatened or imminent, and the Company is not aware of any existing or imminent labor disturbance by the employees of any of its or its subsidiaries' principal suppliers, contractors or customers, in each case that would, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect.

(pp) *Restrictions on Subsidiary Payments to the Company.* No subsidiary of the Company is currently prohibited, directly or indirectly, from paying any dividends to the Company, from making any other distribution on such subsidiary's capital stock, from repaying to the Company any loans or advances to such subsidiary from the Company or from transferring any of such subsidiary's property or assets to the Company or any other subsidiary of the Company, except as described in or contemplated by the Time of Sale Disclosure Package and the Prospectus.

(qq) *Statistical Information.* Any third-party statistical and market-related data included in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus are based on or derived from sources that the Company believes to be reliable and accurate in all material respects.

(rr) *Forward-looking Statements.* No forward-looking statement (within the meaning of Section 27A of the Act and Section 21E of the Exchange Act) contained in the Registration Statement, the Time of Sale Disclosure Package or the Prospectus has been made or reaffirmed without a reasonable basis or has been disclosed other than in good faith.

(ss) *Cybersecurity.* The Company and its subsidiaries' information technology assets and equipment, computers, systems, networks, hardware, software, websites, applications, and databases (collectively, "***IT Systems***") are adequate for, and operate and perform in all material respects as required in connection with the operation of the business of the Company and its subsidiaries as currently conducted, free and clear of all material bugs, errors, defects, Trojan horses, time bombs, malware and other corruptants except those that would not, individually or in the aggregate, reasonably be expected to result in Material Adverse Effect. The Company and its subsidiaries have implemented and maintained commercially reasonable physical, technical and administrative controls, policies, procedures, and safeguards designed to maintain and protect their material confidential information and the integrity, continuous operation, redundancy and security of all IT Systems and data, including Personal Data, used in connection with their businesses.

“**Personal Data**” means (A) a natural person’s name, street address, telephone number, e-mail address, photograph, social security number or tax identification number, driver’s license number, passport number, credit card number, bank information, or customer or account number; (B) any information which would qualify as “personally identifying information” under the Federal Trade Commission Act, as amended; (C) “personal data” as defined by GDPR (as defined below); (D) any information which would qualify as “protected health information” under HIPAA; and (E) any other piece of information that allows the identification of such natural person, or his or her family, or permits the collection or analysis of any data related to an identified person’s health or sexual orientation. There have been no breaches, violations, outages or unauthorized uses of or accesses to same, except for those that have been remedied without material cost or liability or the duty to notify any other person, nor any incidents under internal review or investigations relating to the same. The Company and its subsidiaries are presently in material compliance with all applicable laws or statutes and all judgments, orders, rules and regulations of any court or arbitrator or governmental or regulatory authority, internal policies and contractual obligations relating to the privacy and security of IT Systems and Personal Data and to the protection of such IT Systems and Personal Data from unauthorized use, access, misappropriation or modification.

(tt) Compliance with Data Privacy Laws. The Company and its subsidiaries are, and at all prior times were, in material compliance with all applicable state and federal data privacy and security laws and regulations, including without limitation HIPAA, and the Company and its subsidiaries have taken commercially reasonable actions to prepare to comply with, and since May 25, 2018, have been and currently are in compliance in all material respects with, the European Union General Data Protection Regulation (“**GDPR**”) (EU 2016/679) (collectively, the “**Privacy Laws**”). To ensure compliance with the Privacy Laws, the Company and its subsidiaries have in place, comply with, and take appropriate steps reasonably designed to ensure compliance in all material respects with their policies and procedures relating to data privacy and security and the collection, storage, use, disclosure, handling, and analysis of Personal Data (the “**Policies**”). The Company and its subsidiaries have at all times made all disclosures to users or customers required by applicable laws and regulatory rules or requirements, and none of such disclosures made or contained in any Policy have, to the knowledge of the Company, been inaccurate or in violation of any applicable laws and regulatory rules or requirements in any material respect. The Company further certifies that neither it nor any subsidiary: (A) has received notice of any actual or potential liability under or relating to, or actual or potential violation of, any of the Privacy Laws, and has no knowledge of any event or condition that would reasonably be expected to result in any such notice; (B) is currently conducting or paying for, in whole or in part, any investigation, remediation, or other corrective action pursuant to any Privacy Law; or (C) is a party to any order, decree, or agreement that imposes any obligation or liability under any Privacy Law.

(uu) eXtensible Business Reporting Language. The interactive data in eXtensible Business Reporting Language included or incorporated by reference in the Registration Statement fairly presents the information called for in all material respects and has been prepared in accordance with the Commission’s rules and guidelines applicable thereto.

3. **Purchase, Sale and Delivery of Securities.**

(a) Firm Shares. On the basis of the representations, warranties and agreements herein contained, but subject to the terms and conditions herein set forth, the Company agrees to

issue and sell the Firm Shares to the several Underwriters, and each Underwriter agrees, severally and not jointly, to purchase from the Company the number of Firm Shares set forth opposite the name of such Underwriter in Schedule I hereto. The purchase price for each Firm Share shall be \$2.10375 per share. The obligation of each Underwriter to the Company shall be to purchase from the Company that number of Firm Shares (to be adjusted by the Representatives to avoid fractional shares) which represents the same proportion of the number of Firm Shares to be sold by the Company pursuant to this Agreement as the number of Firm Shares set forth opposite the name of such Underwriter in Schedule I hereto represents to the total number of Firm Shares to be purchased by all Underwriters pursuant to this Agreement. In making this Agreement, each Underwriter is contracting severally and not jointly; except as provided in paragraph (b) of this Section 3 and in Section 8 hereof, the agreement of each Underwriter is to purchase only the respective number of Firm Shares specified in Schedule I.

The Firm Shares will be delivered by the Company by credit through full fast transfer, to you at an account designated at the Depository Trust Company by you for the accounts of the several Underwriters against payment of the purchase price therefor by wire transfer of same day funds payable to the order of the Company, at the offices of RBC Capital Markets, LLC, Brookfield Place, 200 Vesey Street, New York, New York, or such other location as may be mutually acceptable, at 9:00 a.m., Eastern time, on the second (or, if the Firm Shares are priced, as contemplated by Rule 15c6-1(c) under the Exchange Act, after 4:30 p.m. Eastern time, the third) full business day following the date hereof, or at such other time and date as you and the Company determine pursuant to Rule 15c6-1(a) under the Exchange Act, such time and date of delivery being herein referred to as the “**First Closing Date.**”

(b) Option Shares. On the basis of the representations, warranties and agreements herein contained, but subject to the terms and conditions herein set forth, the Company, hereby grants to the several Underwriters an option to purchase all or any portion of the Option Shares at the same purchase price as the Firm Shares. The option granted hereunder may be exercised in whole or in part at any time within 30 days after the effective date of this Agreement upon notice (confirmed in writing) by the Representatives to the Company setting forth the aggregate number of Option Shares as to which the several Underwriters are exercising the option and the date when the Option Shares are to be delivered, each such date (if other than the First Closing Date) being herein referred to as a “**Subsequent Closing Date**”; provided, however, that no Subsequent Closing Date shall be earlier than the second business day after the date on which the option shall have been exercised. The number of Option Shares to be purchased by each Underwriter shall be the same percentage of the total number of Option Shares to be purchased by the several Underwriters as the number of Firm Shares to be purchased by such Underwriter is of the total number of Firm Shares to be purchased by the several Underwriters, as adjusted by the Representatives in such manner as the Representatives deem advisable to avoid fractional shares. No Option Shares shall be sold and delivered unless the Firm Shares previously have been, or simultaneously are, sold and delivered.

The Option Shares will be delivered by the Company by credit through full fast transfer, to you at an account designated at the Depository Trust Company by you for the accounts of the several Underwriters against payment of the purchase price therefor by wire transfer of same day funds payable to the order of the Company, at the offices of at the offices of RBC Capital Markets,

LLC, Brookfield Place, 200 Vesey Street, New York, New York, or such other location as may be mutually acceptable at 9:00 a.m., Eastern time, on the applicable Subsequent Closing Date.

(c) Purchase by Representatives on Behalf of Underwriters. It is understood that you, individually and not as Representatives of the several Underwriters, may (but shall not be obligated to) make payment to the Company on behalf of any Underwriter for the Securities to be purchased by such Underwriter. Any such payment by you shall not relieve any such Underwriter of any of its obligations hereunder. Nothing herein contained shall constitute any of the Underwriters an unincorporated association or partner with the Company.

4. **Covenants.** The Company covenants and agrees with the several Underwriters as follows:

(a) Required Filings. During the period beginning on the date hereof and ending on such date as, in the opinion of counsel for the Underwriters, the Prospectus is no longer required by law to be delivered (assuming the absence of Rule 172 under the Securities Act), in connection with sales by an Underwriter or dealer (the "**Prospectus Delivery Period**"), prior to amending or supplementing the Registration Statement including any Rule 462(b) Registration Statement, the Time of Sale Disclosure Package or the Prospectus, the Company shall furnish to the Representatives for review a copy of each such proposed amendment or supplement, and the Company shall not file any such proposed amendment or supplement to which the Representatives or counsel to the Underwriters reasonably object. Subject to this Section 4(a), immediately following execution of this Agreement, the Company will prepare the Prospectus containing the Rule 430B Information and other selling terms of the Securities, the plan of distribution thereof and such other information as may be required by the Securities Act or the Rules and Regulations or as the Representatives and the Company may deem appropriate, and if requested by the Representatives, an issuer free writing prospectus containing the selling terms of the Securities and such other information as the Company and the Representatives may deem appropriate, and will file or transmit for filing with the Commission, in accordance with Rule 424(b) or Rule 433, as the case may be, copies of the Prospectus and each issuer free writing prospectus.

(b) Notification of Certain Commission Actions. After the date of this Agreement, the Company shall promptly advise the Representatives in writing (A) of the receipt of any comments of, or requests for additional or supplemental information from, the Commission, (B) of the time and date of any filing of any post-effective amendment to the Registration Statement or any amendment or supplement to any Preliminary Prospectus, the Time of Sale Disclosure Package or the Prospectus, (C) of the time and date that any post-effective amendment to the Registration Statement becomes effective, (D) of the issuance by the Commission of any stop order suspending the effectiveness of the Registration Statement or any post-effective amendment thereto or of any order preventing or suspending its use or the use of any Preliminary Prospectus, the Time of Sale Disclosure Package, the Prospectus or any issuer free writing prospectus, or (E) of any proceedings to remove, suspend or terminate from listing or quotation the Common Stock from any securities exchange upon which it is listed for trading or included or designated for quotation, or of the threatening or initiation of any proceedings for any of such purposes. If the Commission shall enter any such stop order at any time, the Company will use its best efforts to obtain the lifting of such order at the earliest possible moment. Additionally, the Company agrees that it shall comply with the provisions of Rules 424(b), 430A and 430B, as

applicable, under the Securities Act and will use its reasonable efforts to confirm that any filings made by the Company under Rule 424(b), Rule 433 or Rule 462 were received in a timely manner by the Commission (without reliance on Rule 424(b)(8) or Rule 164(b)).

(c) Continued Compliance with Securities Laws. (A) During the Prospectus Delivery Period, the Company will comply as far as it is able with all requirements imposed upon it by the Securities Act, as now and hereafter amended, and by the Rules and Regulations, as from time to time in force, and by the Exchange Act so far as necessary to permit the continuance of sales of or dealings in the Securities as contemplated by the provisions hereof, the Time of Sale Disclosure Package and the Prospectus. If during such period any event occurs as a result of which the Prospectus (or if the Prospectus is not yet available to prospective purchasers, the Time of Sale Disclosure Package) would include an untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances then existing, not misleading, or if during such period it is necessary or appropriate in the opinion of the Company or its counsel or the Representatives or counsel to the Underwriters to amend the Registration Statement or supplement the Prospectus (or, if the Prospectus is not yet available to prospective purchasers, the Time of Sale Disclosure Package) to comply with the Securities Act or to file under the Exchange Act any document which would be deemed to be incorporated by reference in the Prospectus in order to comply with the Securities Act or the Exchange Act, the Company promptly will (x) notify you of such untrue statement or omission, (y) amend the Registration Statement or supplement the Prospectus (or, if the Prospectus is not yet available to prospective purchasers, the Time of Sale Disclosure Package) or file such document (at the expense of the Company) so as to correct such statement or omission or effect such compliance, and (z) notify you when any amendment to the Registration Statement is filed or becomes effective or when any supplement to the Prospectus (or, if the Prospectus is not yet available to prospective purchasers, the Time of Sale Disclosure Package) is filed.

(B) If at any time following issuance of an issuer free writing prospectus there occurred or occurs an event or development as a result of which such issuer free writing prospectus conflicted or would conflict with the information contained in the Registration Statement, the Preliminary Prospectus or the Prospectus or included or would include an untrue statement of a material fact or omitted or would omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances prevailing at that subsequent time, not misleading, the Company (x) has promptly notified or promptly will notify the Representatives of such conflict, untrue statement or omission, (y) has promptly amended or will promptly amend or supplement, at its own expense, such issuer free writing prospectus to eliminate or correct such conflict, untrue statement or omission, and (z) has notified or promptly will notify the Representatives when such amendment or supplement was or is filed with the Commission where so required to be filed.

(C) If immediately prior to the third anniversary of the initial effective date of the Registration Statement, any of the Securities remain unsold by the Underwriters, the Company will prior to that third anniversary file, if it has not already done so, a new shelf registration statement relating to the Securities, in a form reasonably satisfactory to the Representatives, will use its best efforts to cause such registration statement to be declared effective within 180 days after that third anniversary, and will take all other action necessary or appropriate to permit the public offering and sale of the Securities to continue

as contemplated in the expired registration statement relating to the Securities. References herein to the Registration Statement shall include such new shelf registration statement.

(d) Blue Sky Qualifications. The Company shall take or cause to be taken all necessary action to qualify the Securities for sale under the securities laws of such jurisdictions as you reasonably designate and to continue such qualifications in effect so long as required for the distribution of the Securities, except that the Company shall not be required in connection therewith to qualify as a foreign corporation (where not otherwise required) or to execute a general consent to service of process in any jurisdiction (where not otherwise required).

(e) Provision of Documents. The Company will furnish, at its own expense, to the Underwriters and counsel for the Underwriters copies of the Registration Statement (which will include all consents and exhibits filed therewith), and to the Underwriters and any dealer each Preliminary Prospectus, the Time of Sale Disclosure Package, the Prospectus, any issuer free writing prospectus, and all amendments and supplements to such documents, in each case as soon as available and in such quantities as you may from time to time reasonably request.

(f) Rule 158. The Company will make generally available to its security holders as soon as practicable, but in no event later than 15 months after the end of the Company's current fiscal quarter, an earnings statement (which need not be audited) covering a 12-month period that shall satisfy the provisions of Section 11(a) of the Securities Act and Rule 158 of the Rules and Regulations. Any report, communication or financial statement furnished or filed with the Commission that is publicly available on EDGAR shall be deemed to have been furnished to such security holders at the time furnished or filed with the Commission.

(g) Payment and Reimbursement of Expenses. The Company, whether or not the transactions contemplated hereunder are consummated or this Agreement is terminated, will pay or cause to be paid (A) all expenses (including transfer taxes allocated to the respective transferees) incurred in connection with the delivery to the Underwriters of the Securities, (B) all expenses and fees (including, without limitation, fees and expenses of the Company's accountants and counsel but, except as otherwise provided below, not including fees of the Underwriters' counsel) in connection with the preparation, printing, filing, delivery, and shipping of the Registration Statement (including the financial statements therein and all amendments, schedules, and exhibits thereto), the Securities, each Preliminary Prospectus, the Time of Sale Disclosure Package, the Prospectus, any issuer free writing prospectus and any amendment thereof or supplement thereto, and the printing, delivery, and shipping of this Agreement and other underwriting documents, including Blue Sky Memoranda (covering the states and other applicable jurisdictions), (C) all filing fees and fees and disbursements of the Underwriters' counsel incurred in connection with the qualification of the Securities for offering and sale by the Underwriters or by dealers under the securities or blue sky laws of the states and other jurisdictions which you shall designate, (D) the fees and expenses of the transfer agent or registrar, (E) the filing fees and fees and disbursements of Underwriters' counsel incident to any required review and approval by FINRA of the terms of the sale of the Securities, (F) listing fees, if any, (G) the cost and expenses of the Company relating to investor presentations or any "roadshow" undertaken in connection with marketing of the Securities, (H) the reasonable fees and disbursements of counsel to the Underwriters in connection with the transactions contemplated in this Agreement and (I) all other costs and expenses of the Company incident to the performance of its obligations hereunder that are not otherwise

specifically provided for herein; provided, however, that such costs and expenses provided for in clauses (C), (E) and (H) shall not exceed \$100,000 in the aggregate. If this Agreement is terminated by the Representatives pursuant to Section 9 hereof or if the sale of the Securities provided for herein is not consummated by reason of any failure, refusal or inability on the part of the Company to perform any agreement on its or their part to be performed, or because any other condition of the Underwriters' obligations hereunder required to be fulfilled by the Company is not fulfilled, the Company will reimburse the several Underwriters for all out-of-pocket accountable disbursements (including but not limited to fees and disbursements of counsel, printing expenses, travel expenses, postage, facsimile and telephone charges) incurred by the Underwriters in connection with their investigation, preparing to market and marketing the Securities or in contemplation of performing their obligations hereunder; provided, however, that in the event any such termination is effected after the First Closing Date but prior to any Subsequent Closing Date with respect to the purchase of any Option Shares, the Company shall only reimburse the Underwriters for all of their out-of-pocket expenses, including the reasonable fees and disbursements of counsel for the Underwriters, incurred after the First Closing Date in connection with the proposed purchase of any such Option Shares.

(h) Use of Proceeds. The Company will apply the net proceeds from the sale of the Securities to be sold by it hereunder for the purposes set forth in the Time of Sale Disclosure Package and in the Prospectus.

(i) Company Lock-Up. The Company will not, without the prior written consent of RBC Capital Markets, LLC, from the date of execution of this Agreement and continuing to and including the date 60 days after the date of the Prospectus (the "**Lock-Up Period**"), (A) offer, sell, contract to sell, pledge, grant any option to purchase, make any short sale or otherwise transfer or dispose of, directly or indirectly, or file with the Commission a registration statement under the Act relating to any securities of the Company that are substantially similar to the Securities, including but not limited to any options or warrants to purchase shares of Common Stock or any securities that are convertible into or exchangeable for, or that represent the right to receive, Common Stock or any such substantially similar securities, or publicly disclose the intention to make any offer, sale, pledge, disposition or filing or (B) 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 any such other securities, whether any such transaction described in clause (A) or (B) above is to be settled by delivery of Common Stock or such other securities, in cash or otherwise, other than (1) the Securities to be sold hereunder, (2) the issuance of shares of Common Stock and the granting of stock options, restricted stock units or other equity awards pursuant to Company Stock Plans existing on the date of this Agreement and described in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, (3) the issuance of shares of Common Stock pursuant to any contingent consideration arrangement disclosed in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, (4) facilitating the establishment of a trading plan pursuant to Rule 10b5-1 under the Exchange Act for the transfer of shares of Common Stock, provided that such plan shall not provide for the transfer of Common Stock during the Lock-Up Period and to the extent a public announcement or filing under the Exchange Act is required or voluntarily made regarding the establishment of such plan, such announcement or filing shall include a statement to the effect that no transfer of Common Stock may be made under such plan during the Lock-Up Period, (5) the filing of one or more registration statements on Form S-8 relating to any Company Stock Plans, (6) beginning on and including the

date 46 days after the date of the Prospectus, offers and sales made pursuant to the Open Market Sale Agreement, dated April 22, 2022, between the Company and Jefferies LLC (the “**Sale Agreement**”) and (7) the sale or issuance of, or entry into an agreement providing for the sale or issuance of, Common Stock or securities convertible into or exercisable or exchangeable for shares of Common Stock in connection with (a) the acquisition of the securities, business, technology, property or other assets of another person or entity, or pursuant to any employee benefit or other equity compensation plan (or any obligations thereunder) assumed in connection with any such acquisition, (b) joint ventures, (c) commercial relationships or (d) other strategic transactions, provided that each recipient of Common Stock, or securities convertible into or exercisable or exchangeable for Common Stock, pursuant to this clause (7) shall execute a lock-up agreement substantially in the form of Exhibit A hereto. Notwithstanding anything to the contrary contained in this paragraph, the Company shall be permitted to keep in effect the Sale Agreement and the Common Stock Purchase Agreement, dated September 11, 2020, between the Company and Aspire Capital Fund, LLC; provided no sales or transfers are effectuated thereunder for the duration of the Lock-Up Period, except as expressly permitted elsewhere in this paragraph.

(j) Stockholder Lock-Ups. The Company has caused to be delivered to you prior to the date of this Agreement a letter, in the form of Exhibit A hereto (the “**Lock-Up Agreement**”), from each individual listed on Schedule IV. The Company will enforce the terms of each Lock-Up Agreement and issue stop-transfer instructions to the transfer agent for the Common Stock with respect to any transaction or contemplated transaction that would constitute a breach of or default under the applicable Lock-Up Agreement.

(k) No Market Stabilization or Manipulation. The Company has not taken and will not take, directly or indirectly, any action designed to or which might reasonably be expected to cause or result in, or which has constituted, the stabilization or manipulation of the price of any security of the Company to facilitate the sale or resale of the Securities

(l) SEC Reports. During the Prospectus Delivery Period, the Company will file on a timely basis with the Commission such periodic and special reports as required by the Rules and Regulations.

(m) Internal Controls. The Company and its subsidiaries will maintain such controls and other procedures, including without limitation those required by Sections 302 and 906 of the Sarbanes-Oxley Act and the applicable regulations thereunder, that are designed to ensure that information required to be disclosed by the Company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the Commission’s rules and forms, including without limitation, controls and procedures designed to ensure that information required to be disclosed by the Company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the Company’s management, including its principal executive officer and its principal financial officer, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure, to ensure that material information relating to Company, including its subsidiaries, is made known to them by others within those entities.

(n) Sarbanes-Oxley. The Company and its subsidiaries will comply with all applicable provisions of the Sarbanes-Oxley Act.

(o) Free Writing Prospectuses. The Company represents and agrees that, unless it obtains the prior written consent of the Representatives, and each Underwriter severally represents and agrees that, unless it obtains the prior written consent of the Company and the Representatives, it has not made and will not make any offer relating to the Securities that would constitute an issuer free writing prospectus or that would otherwise constitute a free writing prospectus required to be filed with the Commission; provided that the prior written consent of the parties hereto shall be deemed to have been given in respect of the free writing prospectuses included in Schedule II. Any such free writing prospectus consented to by the Company and the Representatives is hereinafter referred to as a “**Permitted Free Writing Prospectus.**” The Company represents that it has treated or agrees that it will treat each Permitted Free Writing Prospectus as an issuer free writing prospectus, and has complied and will comply with the requirements of Rules 164 and 433 of the Rules and Regulations applicable to any Permitted Free Writing Prospectus. The Company agrees not to take any action that would result in the Company being required to file with the Commission under Rule 433(d) a free writing prospectus prepared by or on behalf of the Company that otherwise would not be required to be filed by the Company thereunder, but for the action of the Company. Each Underwriter severally represents and agrees that, (A) unless it obtains the prior written consent of the Company and the Representatives, it has not distributed, and will not distribute any Written Testing-the-Waters Communication other than those listed on Schedule V, and (B) any Testing-the-Waters Communication undertaken by it was with entities that are qualified institutional buyers with the meaning of Rule 144A under the Act or institutions that are accredited investors within the meaning of Rule 501 under the Act.

5. Conditions of Underwriters’ Obligations. The obligations of the several Underwriters hereunder are subject to the accuracy, as of the date hereof and at each of the First Closing Date and any Subsequent Closing Date (each, a “**Closing Date**”) (as if made at such Closing Date), of and compliance with all representations, warranties and agreements of the Company contained herein, to the performance by the Company of its obligations hereunder and to the following additional conditions:

(a) Required Filings; Absence of Certain Commission Actions. If filing of the Prospectus, or any amendment or supplement thereto, or any issuer free writing prospectus, is required under the Securities Act or the Rules and Regulations, the Company shall have filed the Prospectus (or such amendment or supplement) or such issuer free writing prospectus with the Commission in the manner and within the time period so required (without reliance on Rule 424(b)(8) or Rule 164(b)); the Registration Statement shall remain effective; no stop order suspending the effectiveness of the Registration Statement or any part thereof, any Rule 462(b) Registration Statement, or any amendment thereof, nor suspending or preventing the use of the Time of Sale Disclosure Package, the Prospectus or any issuer free writing prospectus shall have been issued; no proceedings for the issuance of such an order shall have been initiated or threatened; any request of the Commission for additional information (to be included in the Registration Statement, the Time of Sale Disclosure Package, the Prospectus, any issuer free writing prospectus or otherwise) shall have been complied with to your reasonable satisfaction.

(b) Continued Compliance with Securities Laws. No Underwriter shall have advised the Company in writing that (i) the Registration Statement or any amendment thereof or supplement thereto contains an untrue statement of a material fact which, in your opinion, is material or omits to state a material fact which, in your opinion, is required to be stated therein or

necessary to make the statements therein not misleading, or (ii) the Time of Sale Disclosure Package or the Prospectus, or any amendment thereof or supplement thereto, or any issuer free writing prospectus contains an untrue statement of fact which, in your opinion, is material, or omits to state a fact which, in your opinion, is material and is required to be stated therein, or necessary to make the statements therein, in the light of the circumstances under which they are made, not misleading.

(c) *Absence of Certain Events.* Except as contemplated in the Time of Sale Disclosure Package and in the Prospectus, subsequent to the respective dates as of which information is given in the Time of Sale Disclosure Package, neither the Company nor any of its subsidiaries shall have incurred any material liabilities or obligations, direct or contingent, or entered into any material transactions, in either case other than in the ordinary course of business, or declared or paid any dividends or made any distribution of any kind with respect to its capital stock; and there shall not have been any change in the capital stock (other than a change in the number of outstanding shares of Common Stock due to the issuance of shares upon the exercise of outstanding options or warrants, vesting and settlement of restricted stock units, or conversion of convertible securities), or any material change in the short-term or long-term debt of the Company (other than as a result of the conversion of convertible securities), or any issuance of options, warrants, convertible securities or other rights to purchase the capital stock of the Company or any of its subsidiaries, or any Material Adverse Effect (whether or not arising in the ordinary course of business), or any loss by strike, fire, flood, earthquake, accident or other calamity, whether or not covered by insurance, incurred by the Company or any subsidiary, the effect of which, in any such case described above, in your judgment, makes it impractical or inadvisable to offer or deliver the Securities on the terms and in the manner contemplated in the Time of Sale Disclosure Package and in the Prospectus.

(d) *No Downgrade.* On or after the Time of Sale (i) no downgrading shall have occurred in the rating accorded any of the Company's securities by any "nationally recognized statistical organization," as that term is defined by the Commission for purposes of Rule 436(g)(2) under the Securities Act, and (ii) no such organization shall have publicly announced that it has under surveillance or review, with possible negative implications, its rating of any of the Company's securities.

(e) *Opinion of Company Counsel.* On each Closing Date, there shall have been furnished to you, as Representatives of the several Underwriters, the opinion and negative assurance letter of Cooley LLP, counsel for the Company, dated such Closing Date and addressed to you in form and substance reasonably satisfactory to the Representatives and the Underwriters' counsel.

(f) *Opinion of Intellectual Property Counsel.* On each Closing Date, there shall have been furnished to you, as Representatives of the several Underwriters, the opinion of Cooley LLP, intellectual property counsel for the Company, dated such Closing Date and addressed to you in form and substance reasonably satisfactory to the Representatives and the Underwriters' counsel.

(g) *Opinion of Underwriters' Counsel.* On each Closing Date, there shall have been furnished to you, as Representatives of the several Underwriters, the opinion and negative

assurance statement of Covington & Burling LLP, counsel for the several Underwriters, dated such Closing Date and addressed to you, with respect to the formation of the Company, the validity of the Securities, the Registration Statement, the Time of Sale Disclosure Package, the Prospectus and other related matters as you reasonably may request, and such counsel shall have received such papers and information as they request to enable them to pass upon such matters.

(h) Comfort Letter. On the date hereof, on the effective date of any post-effective amendment to the Registration Statement filed after the date hereof and on each Closing Date you, as Representatives of the several Underwriters, shall have received an accountant's "comfort" letter of Ernst & Young LLP, dated such date and addressed to you, in form and substance reasonably satisfactory to you.

(i) Officers' Certificate. On each Closing Date, there shall have been furnished to you, as Representatives of the Underwriters, a certificate, dated such Closing Date and addressed to you, signed by the chief executive officer and by the chief financial officer of the Company, to the effect that:

(i) The representations and warranties of the Company in this Agreement are true and correct as if made at and as of such Closing Date, and the Company has complied with all the agreements and satisfied all the conditions on its part to be performed or satisfied at or prior to such Closing Date;

(ii) No stop order or other order suspending the effectiveness of the Registration Statement or any part thereof or any amendment thereof or the qualification of the Securities for offering or sale nor suspending or preventing the use of the Time of Sale Disclosure Package, the Prospectus or any issuer free writing prospectus, has been issued, and no proceeding for that purpose has been instituted or, to the best of their knowledge, is contemplated by the Commission or any state or regulatory body; and

(iii) Affirms the accuracy of the matters set forth in subsection (c) of this Section 5.

(j) Lock-Up Agreement. The Underwriters shall have received all of the Lock-Up Agreements referenced in Section 4 and the Lock-Up Agreements shall remain in full force and effect.

(k) FINRA No Objections. FINRA shall have raised no objection to the fairness and reasonableness of the underwriting terms and arrangements.

(l) Other Documents. The Company shall have furnished to you and counsel for the Underwriters such additional documents, certificates and evidence as you or they may have reasonably requested.

(m) Exchange Listing. The Securities to be delivered on such Closing Date have been approved for listing on the Nasdaq Capital Market.

All such opinions, certificates, letters and other documents will be in compliance with the provisions hereof only if they are reasonably satisfactory in form and substance to you and counsel

for the Underwriters. The Company will furnish you with such conformed copies of such opinions, certificates, letters and other documents as you shall reasonably request.

6. ***Indemnification and Contribution.***

(a) *Indemnification by the Company.* The Company agrees to indemnify and hold harmless each Underwriter, its affiliates, directors and officers and each person, if any, who controls such Underwriter within the meaning of Section 15 of the Act or Section 20 of the Exchange Act, from and against any losses, claims, damages or liabilities, joint or several, to which such Underwriter may become subject, under the Act or otherwise (including in settlement of any litigation if such settlement is effected with the written consent of the Company), insofar as such losses, claims, damages or liabilities (or actions in respect thereof) arise out of or are based upon: (A) an untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, including any information deemed to be a part of the Registration Statement at the time of effectiveness and at any subsequent time pursuant to the Rules and Regulations, if applicable, any Preliminary Prospectus, the Time of Sale Disclosure Package, the Prospectus, or any amendment or supplement thereto, any issuer free writing prospectus, any issuer information that the Company has filed or is required to file pursuant to Rule 433(d) of the Rules and Regulations, any roadshow materials, or any Testing-the-Waters Communication, (B) the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading, or (C) any investigation or proceeding by any Governmental Authority, commenced or threatened (whether or not any Underwriter is a target of or party to such investigation or proceeding), and will reimburse each Underwriter for any legal or other expenses reasonably incurred by it in connection with investigating or defending against such loss, claim, damage, liability or action as such expenses are incurred; provided, however, that the Company will not be liable in any such case to the extent, but only to the extent, that any such loss, claim, damage, liability or action arises out of or is based upon an untrue statement or alleged untrue statement or omission or alleged omission made in reliance upon and in conformity with written information furnished to the Company by you, or by any Underwriter through you, specifically for use in the preparation thereof; it being understood and agreed that the only information furnished by an Underwriter consists of the information described as such in Section 6(e).

(b) *Indemnification by the Underwriters.* Each Underwriter will, severally and not jointly, indemnify and hold harmless the Company, its affiliates, directors and officers and each person, if any, who controls the Company within the meaning of Section 15 of the Act and Section 20 of the Exchange Act, from and against any losses, claims, damages or liabilities to which the Company may become subject, under the Act or otherwise (including in settlement of any litigation, if such settlement is effected with the written consent of such Underwriter), insofar as such losses, claims, damages or liabilities (or actions in respect thereof) arise out of or are based upon an untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, any Preliminary Prospectus, the Time of Sale Disclosure Package, the Prospectus, or any amendment or supplement thereto, or any issuer free writing prospectus, or any issuer information that the Company has filed or is required to file pursuant to Rule 433(d) of the Rules and Regulations, any roadshow materials, or any Testing-the-Waters Communication, or arise out of or are based upon the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading, in each case to the extent, but only to the extent, that such untrue statement or alleged untrue statement or

omission or alleged omission was made in reliance upon and in conformity with written information furnished to the Company by you, or by such Underwriter through you, specifically for use in the preparation thereof (it being understood and agreed that the only information furnished by an Underwriter consists of the information described as such in Section 6(e)), and will reimburse the Company for any legal or other expenses reasonably incurred by the Company in connection with investigating or defending against any such loss, claim, damage, liability or action as such expenses are incurred.

(c) Notice and Procedures. Promptly after receipt by an indemnified party under subsection (a), (b) or (c) above of notice of the commencement of any action, such indemnified party shall, if a claim in respect thereof is to be made against the indemnifying party under such subsection, notify the indemnifying party in writing of the commencement thereof; but the omission so to notify the indemnifying party shall not relieve the indemnifying party from any liability that it may have to any indemnified party except to the extent such indemnifying party has been materially prejudiced by such failure (through the forfeiture of substantive rights or defenses). In case any such action shall be brought against any indemnified party, and it shall notify the indemnifying party of the commencement thereof, the indemnifying party shall be entitled to participate in, and, to the extent that it shall wish, jointly with any other indemnifying party similarly notified, to assume the defense thereof, with counsel satisfactory to such indemnified party, and after notice from the indemnifying party to such indemnified party of the indemnifying party's election so to assume the defense thereof, the indemnifying party shall not be liable to such indemnified party under such subsection for any legal or other expenses subsequently incurred by such indemnified party in connection with the defense thereof other than reasonable costs of investigation; provided, however, that if, in the sole judgment of the Representatives, it is advisable for the Underwriters to be represented as a group by separate counsel, the Representatives shall have the right to employ a single counsel (in addition to local counsel) to represent the Representatives and all Underwriters who may be subject to liability arising from any claim in respect of which indemnity may be sought by the Underwriters under subsection (a) or (b) of this Section 6, in which event the reasonable fees and expenses of such separate counsel shall be borne by the indemnifying party or parties and reimbursed to the Underwriters as incurred. An indemnifying party shall not be obligated under any settlement agreement relating to any action under this Section 6 to which it has not agreed in writing. In addition, no indemnifying party shall, without the prior written consent of the indemnified party (which consent shall not be unreasonably withheld or delayed), effect any settlement of any pending or threatened proceeding unless such settlement includes an unconditional release of such indemnified party for all liability on claims that are the subject matter of such proceeding and does not include a statement as to, or an admission of, fault, culpability or a failure to act by or on behalf of an indemnified party. Notwithstanding the foregoing, if at any time an indemnified party shall have requested an indemnifying party to reimburse the indemnified party for fees and expenses of counsel pursuant to this Section 6(c), such indemnifying party agrees that it shall be liable for any settlement effected without its written consent if (i) such settlement is entered into more than 45 days after receipt by such indemnifying party of the aforesaid request and (ii) such indemnifying party shall not have reimbursed such indemnified party in accordance with such request prior to the date of such settlement.

(d) Contribution: Limitations on Liability: Non-Exclusive Remedy. If the indemnification provided for in this Section 6 is unavailable or insufficient to hold harmless an

indemnified party under subsection (a), (b) or (c) above, then each indemnifying party shall contribute to the amount paid or payable by such indemnified party as a result of the losses, claims, damages or liabilities referred to in subsection (a), (b) or (c) above, (i) in such proportion as is appropriate to reflect the relative benefits received by the Company on the one hand and the Underwriters on the other from the offering of the Securities or (ii) if the allocation provided by clause (i) above is not permitted by applicable law, in such proportion as is appropriate to reflect not only the relative benefits referred to in clause (i) above but also the relative fault of the Company on the one hand and the Underwriters on the other in connection with the statements or omissions that resulted in such losses, claims, damages or liabilities, as well as any other relevant equitable considerations. The relative benefits received by the Company on the one hand and the Underwriters on the other shall be deemed to be in the same proportion as the total net proceeds from the offering (before deducting expenses) received by the Company bear to the total underwriting discounts and commissions received by the Underwriters, in each case as set forth in the table on the cover page of the Prospectus. The relative fault shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission or alleged omission to state a material fact relates to information supplied by the Company or the Underwriters and the parties' relevant intent, knowledge, access to information and opportunity to correct or prevent such untrue statement or omission. The Company and the Underwriters agree that it would not be just and equitable if contributions pursuant to this subsection (d) were to be determined by pro rata allocation (even if the Underwriters were treated as one entity for such purpose) or by any other method of allocation which does not take account of the equitable considerations referred to in the first sentence of this subsection (d). The amount paid by an indemnified party as a result of the losses, claims, damages or liabilities referred to in the first sentence of this subsection (d) shall be deemed to include any legal or other expenses reasonably incurred by such indemnified party in connection with investigating or defending against any action or claim which is the subject of this subsection (d). Notwithstanding the provisions of this subsection (d), no Underwriter shall be required to contribute any amount in excess of the amount by which the total underwriting discounts and commissions received by such Underwriter with respect to the Securities purchased by it hereunder exceeds the amount of any damages that such Underwriter has otherwise been required to pay by reason of such untrue or alleged untrue statement or omission or alleged omission. No person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Act) shall be entitled to contribution from any person who was not guilty of such fraudulent misrepresentation. The Underwriters' obligations in this subsection (d) to contribute are several in proportion to their respective underwriting obligations and not joint. The remedies provided for in this Section 6 are not exclusive and shall not limit any rights or remedies that might otherwise be available to any indemnified party at law or in equity.

(e) Information Provided by the Underwriters. The Underwriters severally confirm and the Company acknowledges that the statements with respect to the public offering of the Securities by the Underwriters set forth under the heading "Price Stabilization, Short Positions and Penalty Bids" under the caption "Underwriting" in the Time of Sale Disclosure Package and in the Prospectus are correct and constitute the only information concerning such Underwriters furnished in writing to the Company by or on behalf of the Underwriters specifically for inclusion in the Registration Statement, any Preliminary Prospectus, the Time of Sale Disclosure Package, the Prospectus or any issuer free writing prospectus.

7. ***Representations and Agreements to Survive Delivery.*** All representations, warranties, and agreements of the Company herein or in certificates delivered pursuant hereto, including but not limited to the agreements of the several Underwriters and the Company contained in Section 6 hereof, shall remain operative and in full force and effect regardless of any investigation made by or on behalf of any Underwriter or any controlling person thereof, or the Company or any of its officers, directors, or controlling persons, and shall survive delivery of, and payment for, the Securities to and by the Underwriters hereunder and any termination of this Agreement.

8. ***Substitution of Underwriters.***

(a) ***Obligation to Purchase Under Certain Circumstances.*** If any Underwriter or Underwriters shall fail to take up and pay for the amount of Firm Shares agreed by such Underwriter or Underwriters to be purchased hereunder, upon tender of such Firm Shares in accordance with the terms hereof, and the amount of Firm Shares not purchased does not aggregate more than 10% of the total amount of Firm Shares set forth in Schedule I hereto, the remaining Underwriters shall be obligated to take up and pay for (in proportion to their respective underwriting obligations hereunder as set forth in Schedule I hereto except as may otherwise be determined by you) the Firm Shares that the withdrawing or defaulting Underwriters agreed but failed to purchase.

(b) ***Termination Under Certain Circumstances.*** If any Underwriter or Underwriters shall fail to take up and pay for the amount of Firm Shares agreed by such Underwriter or Underwriters to be purchased hereunder, upon tender of such Firm Shares in accordance with the terms hereof, and the amount of Firm Shares not purchased aggregates more than 10% of the total amount of Firm Shares set forth in Schedule I hereto, and arrangements satisfactory to you for the purchase of such Firm Shares by other persons are not made within 36 hours thereafter, this Agreement shall terminate. In the event of any such termination the Company shall not be under any liability to any Underwriter (except to the extent provided in Section 4(g) and Section 6 hereof) nor shall any Underwriter (other than an Underwriter who shall have failed, otherwise than for some reason permitted under this Agreement, to purchase the amount of Firm Shares agreed by such Underwriter to be purchased hereunder) be under any liability to the Company (except to the extent provided in Section 6 hereof).

(c) ***Postponement of Closing.*** If Firm Shares to which a default relates are to be purchased by the non-defaulting Underwriters or by any other party or parties, the Representatives or the Company shall have the right to postpone the First Closing Date for not more than seven business days in order that the necessary changes in the Registration Statement, in the Time of Sale Disclosure Package, in the Prospectus or in any other documents, as well as any other arrangements, may be effected. As used herein, the term "Underwriter" includes any person substituted for an Underwriter under this Section 8.

(d) ***No Relief from Liability.*** No action taken pursuant to this Section shall relieve any defaulting Underwriter from liability, if any, in respect of such default.

9. ***Termination of this Agreement.***

(a) Right to Terminate. You, as Representatives of the several Underwriters, shall have the right to terminate this Agreement by giving notice to the Company as hereinafter specified at any time at or prior to the First Closing Date, and the option referred to in Section 3(b), if exercised, may be cancelled at any time prior to the applicable Subsequent Closing Date, if (A) the Company shall have failed, refused or been unable, at or prior to such Closing Date, to perform in any material respect any agreement on its part to be performed hereunder, (B) any condition of the Underwriters' obligations hereunder is not fulfilled, (C) trading in the Company's Common Stock shall have been suspended by the Commission or the Nasdaq Stock Market or trading in securities generally on the Nasdaq Stock Market or New York Stock Exchange shall have been suspended, (D) minimum or maximum prices for trading shall have been fixed, or maximum ranges for prices for securities shall have been required, on the Nasdaq Stock Market or New York Stock Exchange, by such exchange or by order of the Commission or any other Governmental Authority having jurisdiction, (E) a banking moratorium shall have been declared by federal or New York state authorities or a material disruption in commercial banking or securities settlement or clearance services in the United States, or (F) there shall have occurred any attack on, outbreak or escalation of hostilities or act of terrorism involving the United States, any declaration by the United States of a national emergency or war, any change in financial markets, any substantial change or development involving a prospective substantial change in United States or international political, financial or economic conditions, or any other calamity or crisis that, in your judgment, is material and adverse and makes it impractical or inadvisable to proceed with the completion of the sale of and payment for the Securities. Any such termination shall be without liability of any party to any other party except that the provisions of Section 4(g) and Section 6 hereof shall at all times be effective and shall survive such termination.

(b) Notice of Termination. If you elect to terminate this Agreement as provided in this Section, the Company shall be notified promptly by you by telephone, confirmed by letter.

10. **Default by the Company.**

(a) Default by the Company. If the Company shall fail at the First Closing Date to sell and deliver the number of Securities which it is obligated to sell hereunder, then this Agreement shall terminate without any liability on the part of any Underwriter or, except as provided in Section 4(g) and Section 6 hereof, any non-defaulting party.

(b) No Relief from Liability. No action taken pursuant to this Section shall relieve the Company so defaulting from liability, if any, in respect of such default.

11. **Notices.** Except as otherwise provided herein, all communications hereunder shall be in writing and, if to the Underwriters, shall be mailed via overnight delivery service or hand delivered via courier to the Representatives c/o RBC Capital Markets, LLC, Brookfield Place, 200 Vesey Street, 8th Floor, New York, New York 10281-8098, Attention: Transaction Management, Facsimile No.: (212) 428-6308; if to the Company, shall be mailed or delivered to it at aTyr Pharma, Inc., 3545 John Hopkins Court, Suite #250, San Diego, CA 92121, Attention: Sanjay S. Shukla, M.D., M.S., President and Chief Executive Officer, with a copy to Cooley LLP, 10265 Science Center Drive, San Diego, California 92121, Attention: Charles J. Bair. Any party to this Agreement may change such address for notices by sending to the parties to this Agreement written notice of a new address for such purpose.

12. ***Persons Entitled to Benefit of Agreement.*** This Agreement shall inure to the benefit of and be binding upon the parties hereto and their respective successors and assigns and the controlling persons, officers and directors referred to in Section 6. Nothing in this Agreement is intended or shall be construed to give to any other person, firm or corporation any legal or equitable remedy or claim under or in respect of this Agreement or any provision herein contained. The term “successors and assigns” as herein used shall not include any purchaser, as such purchaser, of any of the Securities from any of the several Underwriters.

13. ***Absence of Fiduciary Relationship.*** The Company acknowledges and agrees that: (A) the Representatives have been retained solely to act as an underwriter in connection with the sale of the Securities and that no fiduciary, advisory or agency relationship between the Company and the Representatives have been created in respect of any of the transactions contemplated by this Agreement, irrespective of whether the Representatives have advised or are advising the Company on other matters; (B) the price and other terms of the Securities set forth in this Agreement were established by the Company following discussions and arms-length negotiations with the Representatives and the Company is capable of evaluating and understanding and understands and accepts the terms, risks and conditions of the transactions contemplated by this Agreement; (C) it has been advised that the Representatives and their affiliates are engaged in a broad range of transactions which may involve interests that differ from those of the Company and that the Representatives have no obligation to disclose such interest and transactions to the Company by virtue of any fiduciary, advisory or agency relationship; (D) it has been advised that the Representatives are acting, in respect of the transactions contemplated by this Agreement, solely for the benefit of the Representatives and the other Underwriters, and not on behalf of the Company; (E) it waives to the fullest extent permitted by law, any claims it may have against the Representatives for breach of fiduciary duty or alleged breach of fiduciary duty in respect of any of the transactions contemplated by this Agreement and agrees that the Representatives shall have no liability (whether direct or indirect) to the Company in respect of such a fiduciary duty claim on behalf of or in right of the Company, including stockholders, employees or creditors of the Company.

14. ***Recognition of the U.S. Special Resolution Regimes.***

(a) In the event that any Underwriter that is a Covered Entity becomes subject to a proceeding under a U.S. Special Resolution Regime, the transfer from such Underwriter of this Agreement, and any interest and obligation in or under this Agreement, will be effective to the same extent as the transfer would be effective under the U.S. Special Resolution Regime if this Agreement, and any such interest and obligation, were governed by the laws of the United States or a state of the United States.

(b) In the event that any Underwriter that is a Covered Entity or a BHC Act Affiliate of such Underwriter becomes subject to a proceeding under a U.S. Special Resolution Regime, Default Rights under this Agreement that may be exercised against such Underwriter are permitted to be exercised to no greater extent than such Default Rights could be exercised under the U.S. Special Resolution Regime if this Agreement were governed by the laws of the United States or a state of the United States.

(c) As used in this section:

“**BHC Act Affiliate**” has the meaning assigned to the term “affiliate” in, and shall be interpreted in accordance with, 12 U.S.C. § 1841(k);

“**Covered Entity**” means any of the following: (i) a “covered entity” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 252.82(b); (ii) a “covered bank” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 47.3(b); or (iii) a “covered FSI” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 382.2(b);

“**Default Right**” has the meaning assigned to that term in, and shall be interpreted in accordance with, 12 C.F.R. §§ 252.81, 47.2 or 382.1, as applicable; and

“**U.S. Special Resolution Regime**” means each of (i) the Federal Deposit Insurance Act and the regulations promulgated thereunder and (ii) Title II of the Dodd-Frank Wall Street Reform and Consumer Protection Act and the regulations promulgated thereunder.

15. **Governing Law; Waiver of Jury Trial.** This Agreement and any transaction contemplated by this Agreement and any claim, controversy or dispute arising under or related thereto shall be governed by and construed in accordance with the laws of the State of New York without regard to principles of conflict of laws that would result in the application of any other law than the laws of the State of New York. The Company (on its behalf and, to the extent permitted by applicable law, on behalf of its stockholders and affiliates) and each of the Underwriters hereby irrevocably waives, to the fullest extent permitted by applicable law, any and all right to trial by jury in any legal proceeding arising out of or relating to this Agreement or the transactions contemplated hereby.

16. **Submission to Jurisdiction, Etc.** Each party hereby submits to the exclusive jurisdiction of the U.S. federal and New York state courts sitting in the Borough of Manhattan, City of New York, in any suit or proceeding arising out of or relating to this Agreement or the transactions contemplated hereby. The parties hereby irrevocably and unconditionally waive any objection to the laying of venue of any lawsuit, action or other proceeding in such courts, and hereby further irrevocably and unconditionally waive and agree not to plead or claim in any such court that any such lawsuit, action or other proceeding brought in any such court has been brought in an inconvenient forum. The Company further agrees to take any and all actions as may be necessary to maintain such designation and appointment of such agent in full force and effect for a period of five years from the date of this Agreement.

17. **Counterparts.** This Agreement may be executed in one or more counterparts and, if executed in more than one counterpart, the executed counterparts shall each be deemed to be an original and all such counterparts shall together constitute one and the same instrument. Counterparts may be delivered via facsimile or electronic mail (including, without limitation, “pdf”, “tif” or “jpg”) and any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes.

18. **General Provisions.** This Agreement constitutes the entire agreement of the parties to this Agreement and supersedes all prior written or oral and all contemporaneous oral agreements, understandings and negotiations with respect to the subject matter hereof. This Agreement may not be amended or modified unless in writing by all of the parties hereto, and no

condition herein (express or implied) may be waived unless waived in writing by each party whom the condition is meant to benefit. The Section headings herein are for the convenience of the parties only and shall not affect the construction or interpretation of this Agreement.

[Signature Page Follows]

Please sign and return to the Company the enclosed duplicates of this letter whereupon this letter will become a binding agreement between the Company and the several Underwriters in accordance with its terms.

Very truly yours,

aTyr Pharma, Inc.

By: /s/ Jill M. Broadfoot_____

Name: Jill M. Broadfoot

Title: Chief Financial Officer

Confirmed as of the date first
above mentioned, on behalf of
itself and the other several
Underwriters named in Schedule I
hereto.

RBC Capital Markets, LLC

By: /s/ Timothy Chung_____

Name: Timothy Chung

Title: Director

SCHEDULE I

<u>Underwriter</u>	<u>Number of Firm Shares (1)</u>
RBC Capital Markets, LLC	20,002,500
H.C. Wainwright & Co., LLC	2,222,500
Total	<hr/> 22,225,000

(1) The Underwriters may purchase up to an additional 3,333,750 Option Shares, to the extent the option described in Section 3(b) of the Agreement is exercised, in the proportions and in the manner described in the Agreement.

SCHEDULE II
Certain Permitted Free Writing Prospectuses

None.

SCHEDULE III
Pricing Information

Number of Firm Shares: 22,225,000
Number of Option Shares: 3,333,750
Price to Public Per Share: \$2.25
Underwriting Discount Per Share: \$0.14625

SCHEDULE IV
List of Individuals Executing Lock-Up Agreements

Officers

Sanjay S. Shukla, M.D., M.S.

Jill M. Broadfoot

Nancy E. Denyes

Non-Employee Directors

John K. Clarke

Timothy P. Coughlin

Jane A. Gross, Ph.D.

Svetlana Lucas, Ph.D.

Paul Schimmel, Ph.D.

Sara Zaknoen, M.D.

SCHEDULE V
Written Testing-the-Waters Communications

None.

EXHIBIT A
Form of Lock-Up Agreement

[·], 2023
RBC Capital Markets, LLC
As representative of the underwriters named
in Schedule I to the Underwriting Agreement
referred to below

c/o RBC Capital Markets, LLC
Brookfield Place
200 Vesey Street, 8th Floor
New York, New York 10281

Dear Sirs:

As an inducement to the underwriters (the “**Underwriters**”) to execute an underwriting agreement (the “**Underwriting Agreement**”) providing for a public offering (the “**Offering**”) of common stock (the “**Common Stock**”), of aTyr Pharma, Inc. and any successor (by merger or otherwise) thereto (the “**Company**”), the undersigned hereby agrees that without the prior written consent of RBC Capital Markets, LLC (the “**Representative**”) during the period specified in the second succeeding paragraph (the “**Lock-Up Period**”) of this agreement (this “**Agreement**”), the undersigned will not: (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, make any short sale or otherwise transfer or dispose of, directly or indirectly, any shares of Common Stock or any securities convertible into, exercisable or exchangeable for or that represent the right to receive Common Stock (including without limitation, Common Stock which may be deemed to be beneficially owned by the undersigned in accordance with the rules and regulations of the Securities and Exchange Commission and securities which may be issued upon exercise of a stock option or warrant) whether now owned or hereafter acquired (the “**Undersigned’s Securities**”); (2) enter into any swap or other agreement that transfers, in whole or in part, any of the economic consequences of ownership of the Undersigned’s 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; (3) make any demand for or exercise any right with respect to the registration of any Common Stock or any security convertible into or exercisable or exchangeable for Common Stock except for a registration statement on Form S-8; or (4) publicly disclose the intention to do any of the foregoing.

The undersigned agrees that the foregoing restrictions preclude the undersigned from engaging in any hedging or other transaction which is designed to or which reasonably could be expected to lead to or result in a sale or disposition of the Undersigned’s Securities even if such Securities would be disposed of by someone other than the undersigned. Such prohibited hedging or other transactions would include without limitation any short sale or any purchase, sale or grant of any right (including without limitation any put or call option) with respect to any of the Undersigned’s Securities or with respect to any security that includes, relates to, or derives any significant part of its value from the Undersigned’s Securities.

The Lock-Up Period will commence on the date of this Agreement and continue and include the date 60 days after the date of the final prospectus supplement used to sell Common Stock in the Offering pursuant to the Underwriting Agreement.

Notwithstanding the foregoing, the undersigned may transfer the Undersigned's Securities (i) as a *bona fide* gift or gifts, (ii) to any immediate family member or to any trust for the direct or indirect benefit of the undersigned or the immediate family of the undersigned, (iii) if the undersigned is a corporation, partnership, limited liability company, trust or other business entity (1) to another corporation, partnership, limited liability company, trust or other business entity that is a direct or indirect affiliate (as defined in Rule 405 promulgated under the Securities Act of 1933, as amended) of the undersigned or (2) via distributions of shares of Common Stock or any security convertible into or exercisable for Common Stock to limited partners, limited liability company members or stockholders of the undersigned, (iv) if the undersigned is a trust, to the beneficiary of such trust, (v) by testate succession or intestate succession, (vi) to a nominee or custodian of a person or entity to whom a disposition or transfer would be permissible under clauses (ii)-(v) above, (vii) pursuant to the Underwriting Agreement, (viii) by operation of law or by an order of a court or regulatory agency, such as pursuant to a qualified domestic order or in connection with a divorce settlement or (ix) with the prior written consent of the Representative on behalf of the Underwriters; *provided*, in the case of clauses (i)-(vi) and (viii), that (x) such transfer shall not involve a disposition for value, (y) the transferee agrees in writing with the Representative to be bound by the terms of this Agreement, and (z) no filing by any party under Section 16(a) of the Securities Exchange Act of 1934, as amended (the "**Exchange Act**"), shall be required or shall be made voluntarily in connection with such transfer. For purposes of this Agreement, "immediate family" shall mean any relationship by blood, marriage or adoption, nor more remote than first cousin.

In addition, the foregoing restrictions shall not apply to (i) the exercise of stock options granted pursuant to the Company's equity incentive plans or warrants or other rights to acquire shares of Common Stock of the Company, or any security convertible into or exercisable for shares of Common Stock of the Company in accordance with their terms (including the vesting or settlement of restricted stock units); *provided* that they shall apply to any of the Undersigned's Securities issued upon such exercise or vesting and settlement, as the case may be, or (ii) the establishment of any contract, instruction or plan (a "**Plan**") that satisfies all of the requirements of Rule 10b5-1(c)(1)(i)(B) under the Exchange Act; *provided* that no sales of the Undersigned's Securities shall be made pursuant to such a Plan prior to the expiration of the Lock-Up Period (as such may have been extended pursuant to the provisions hereof), and such a Plan may only be established if no public announcement of the establishment or existence thereof and no filing with the Securities and Exchange Commission or other regulatory authority in respect thereof or transactions thereunder or contemplated thereby, by the undersigned, the Company or any other person, shall be required, and no such announcement or filing is made voluntarily, by the undersigned, the Company or any other person, prior to the expiration of the Lock-Up Period (as such may have been extended pursuant to the provisions hereof).

Notwithstanding the foregoing, and subject to the conditions in this paragraph, the undersigned may also transfer the Undersigned's Securities without the prior written consent of the Representative if any such transfers are made by the undersigned: (i) to satisfy tax withholding or cashless exercise obligations of the undersigned in connection with the vesting, settlement or

exercise of equity awards outstanding as of the date of the final prospectus supplement for the Offering by the undersigned pursuant to the Company's equity incentive plans; (ii) pursuant to the sale of, or an offer to purchase, all or substantially all of the outstanding Common Stock, whether pursuant to a merger, tender offer or otherwise; or (iii) in connection with the repurchase of the Undersigned's Securities by the Company pursuant to any contractual arrangement in effect on the date of this Agreement that provides for the repurchase of such securities, or in connection with the termination of the undersigned's services to the Company; *provided*, however, that in the case of any transfer described in clause (i) of this paragraph, it shall be a condition to the transfer that if the undersigned is required to file a report under Section 16(a), the undersigned shall include a statement in such report to the effect that such transfer is being made for tax withholding or cashless exercise obligations; and *provided* further that in the case of any conversion or sale described in clause (ii) of this paragraph, in the event that such transaction is abandoned, the Undersigned's Securities shall remain subject to the restrictions hereunder. Furthermore, the undersigned may transfer shares of Common Stock purchased by the undersigned in the Offering or in the open market following the Offering if and only if (i) such transfers are not required to be reported in any public report or filing with the Securities and Exchange Commission, or otherwise and (ii) the undersigned does not otherwise voluntarily effect any public filing or report regarding such transfers (other than a filing under Section 13 of the Exchange Act that is required to be filed during the Lock-Up Period).

The undersigned also agrees and consents to the entry of stop transfer instructions with the Company's transfer agent and registrar against the transfer of the Undersigned's Securities or Common Stock held by the undersigned's immediate family, if any, except in compliance with the foregoing restrictions. In furtherance of the foregoing, the Company and its transfer agent and registrar are hereby further authorized to decline to make any transfer of shares of Common Stock if such transfer would constitute a violation or breach of this Agreement.

The undersigned hereby represents and warrants that the undersigned: (i) has full power and authority to enter into this Agreement and that upon request, the undersigned will execute any additional documents necessary to ensure the validity or enforcement of this Agreement, and (ii) now has, and except as contemplated by this Agreement, for the duration of this Agreement will have, good and marketable title to the Undersigned's Securities, free and clear of all liens, encumbrances, and claims whatsoever. All authority herein conferred or agreed to be conferred and any obligations of the undersigned shall be binding upon the successors, assigns, heirs or personal representatives of the undersigned.

The undersigned understands that the undersigned shall be released from all obligations under this Agreement if (i) the Company notifies the Underwriters that it does not intend to proceed with the Offering, (ii) the Underwriting Agreement does not become effective, or if the Underwriting Agreement (other than the provisions thereof which survive termination) shall terminate or be terminated prior to payment for and delivery of the Common Stock to be sold thereunder, or (iii) the Offering is not completed by March 1, 2023.

The undersigned understands that the Underwriters are entering into the Underwriting Agreement and proceeding with the Offering in reliance upon this Agreement.

This Agreement shall be governed by, and construed in accordance with, the laws of the State of New York.

Very truly yours,

Printed Name of Holder

By:
Signature

Printed Name of Person Signing (and indicate capacity of person signing if signing as custodian, trustee, or on behalf of an entity)

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Charles J. Bair
+1 858 550 6142
cbair@cooley.com

February 9, 2023

aTyr Pharma, Inc.
3545 John Hopkins Court, Suite #250
San Diego, CA 92121

Ladies and Gentlemen:

We have acted as counsel to aTyr Pharma, Inc., a Delaware corporation (the "**Company**"), in connection with the offering by the Company of up to 25,558,750 shares (the "**Shares**") of the Company's common stock, par value \$0.001, including up to 3,333,750 Shares that may be sold pursuant to the exercise of an option to purchase additional Shares, pursuant to a Registration Statement on Form S-3 (Registration Statement No. 333-263585) (the "**Registration Statement**"), filed with the Securities and Exchange Commission (the "**Commission**") under the Securities Act of 1933, as amended (the "**Securities Act**"), the prospectus included in the Registration Statement (the "**Base Prospectus**"), and the prospectus supplement relating to the Shares dated February 8, 2023, and filed with the Commission pursuant to Rule 424(b) under the Securities Act (together with the Base Prospectus, the "**Prospectus**").

In connection with this opinion, we have examined and relied upon the Registration Statement and the Prospectus, the Company's certificate of incorporation and bylaws, each as currently in effect, and originals or copies certified to our satisfaction of such records, documents, certificates, memoranda and other instruments as in our judgment are necessary or appropriate to enable us to render the opinion expressed below. We have assumed the genuineness of all signatures; the authenticity of all documents submitted to us as originals; the conformity to originals of all documents submitted to us as copies; and the accuracy, completeness and authenticity of certificates of public officials and the due authorization, execution and delivery of all documents by all persons other than the Company where authorization, execution and delivery are a prerequisite to the effectiveness thereof. As to certain factual matters, we have relied upon a certificate of an officer of the Company and have not independently verified such matters.

Our opinion is expressed solely with respect to the General Corporation Law of the State of Delaware. We express no opinion to the extent that any other laws are applicable to the subject matter hereof and express no opinion and provide no assurance as to compliance with any federal or state securities law, rule or regulation.

On the basis of the foregoing, and in reliance thereon, we are of the opinion that the Shares, when sold and issued in accordance with the Registration Statement and the Prospectus, will be validly issued, fully paid and nonassessable.

In connection with this opinion, we have examined and relied upon such records, documents, certificates, opinions, memoranda and other instruments as in our judgment are necessary or appropriate to enable us to render the opinion expressed below. As to certain factual matters, we have relied upon a certificate of an officer of the Company and have not independently verified such matters.



aTyr Pharma, Inc.
February 9, 2023
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We consent to the reference to our firm under the caption "Legal Matters" in the Prospectus and to the filing of this opinion as an exhibit to a Current Report on Form 8-K to be filed with the Commission for incorporation by reference into the Registration Statement. In giving such consent, we do not thereby admit that we are in the category of persons whose consent is required under Section 7 of the Securities Act or the rules and regulations of the Commission thereunder.

This opinion is expressed as of the date hereof, and we disclaim any responsibility to advise you of any changes in the facts stated or assumed herein or of any changes in applicable law.

Sincerely,

Cooley LLP

By: /s/ Charles J. Bair
Charles J. Bair

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