UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

DIVISION OF
CORPORATION FINANCE

January 20, 2015

Via E-mail
John D. Mendlein, Ph.D.
Chief Executive Officer and Executive Chairman
aTyr Pharma, Inc.
3545 John Hopkins Court, Suite #250
San Diego, CA 92121

Re: aTyr Pharma, Inc.
Draft Registration Statement on Form S-1
Submitted December 22, 2014
CIK No. 0001339970

Dear Dr. Mendlein:

We have reviewed your draft registration statement and have the following comments. In some of our comments, we may ask you to provide us with information so we may better understand your disclosure.

Please respond to this letter by providing the requested information and either submitting an amended draft registration statement or publicly filing your registration statement on EDGAR. If you do not believe our comments apply to your facts and circumstances or do not believe an amendment is appropriate, please tell us why in your response.

After reviewing the information you provide in response to these comments and your amended draft registration statement or filed registration statement, we may have additional comments.

Prospectus Summary, page 1

1. Please revise the table on pages pages 2 and 80 to reflect only the current stage of development for each product candidate and indication. Accordingly, please eliminate columns for anticipated next milestone due to the uncertainty of such events. Anticipated milestone and other future events are properly discussed in the text where they can be placed in an appropriate context.

2. Please revise your pipeline table under the column labeled "Pathway" and in the text included within the arrows to identify the applicable pathway, drug candidate, and indication. Alternatively, if you have not yet identified an indication for the arrow labeled "Resolaris 4th Indication" or a drug candidate for the arrow labeled "iModFc non-RMIC" or "Liver," or a pathway for the arrow labeled "Lung," please eliminate these programs from the pipeline table on pages 2 and 80.

Risks Associated with Our Business, page 4

3. We note your risk factor disclosure that the FDA has placed a full clinical hold on your IND to evaluate Resolaris for adult patients with FSHD and that this hold prohibits you from continuing clinical trials of Resolaris in the United States. In the sections of your prospectus summary and business section where you discuss the expected timing of your receipt of initial results for your Phase 1b/2 trial of Resolaris, please expand your disclosure to discuss the clinical hold, the specific issues highlighted by the FDA, any material actions that you have taken or plan to take in response to the FDA's communications, any updates from the FDA with respect your response to the clinical hold, and how the clinical hold impacts your planned development of Resolaris for adult patients with FSHD.

Risk Factors
We face potential product liability, and, if successful claims are brought…, page 43

4. Please quantify the amount of product liability insurance you carry and whether the amount of your coverage is typical for a company in your industry.

Use of Proceeds, page 53

5. Please disclose how far in the clinical development of Resolaris you expect the proceeds from this offering will enable you to proceed by indication. In this regard, we note that your development of Resolaris in Adults with FSHD is your most advanced product candidate. You should disclose whether you expect the applicable proceeds will be sufficient to fully fund each planned clinical trial or state what aspects of such trials you will be able to accomplish using the applicable proceeds.

Management's Discussion and Analysis of Financial Condition and Results of Operations
Stock-Based Compensation, page 66

6. We may have additional comments on your accounting for equity issuances including stock compensation and beneficial conversion features. Once you have an estimated offering price, please provide us an analysis explaining the reasons for the differences between recent valuations of your common stock leading up to the IPO and the estimated offering price.

Business, page 77

7. Please provide a brief summary for each drug candidate included on your pipeline table on pages 2 and 80. For example, we note that you have not provided a discussion of the "discoveries" labeled Resolaris 4th Indication, Liver, or Lung.

8. Please discuss your plans to apply for orphan designation for Resolaris for any applicable indications in the U.S. or European Union.

9. Please discuss the terms of Pangu BioPharma's joint research agreement with HKUST R and D Corporation Limited. Please include all of the material terms agreed to by the parties. This includes, but is not limited to:
   - the material services provided;
   - payment terms;
   - the duration of the agreement; and
   - the material termination provisions.

Phase 1b/2 Clinical Trial, page 93

10. We note on page 12 that your Phase 1b/2 trial of Resolaris is designed to show efficacy. Please expand your disclosure to include the trials primary and secondary endpoints for the trial in adult patients with FSHD.

Our Advisors, page 114

11. Please briefly discuss the function of your scientific advisory board and therapeutic advisory board as well as the specific responsibilities of the advisory board members and the frequency of advisory board meetings.

Executive and Director Compensation, page 124

12. Please update your executive and director compensation disclosure to reflect compensation information as of the registrant's last completed fiscal year ended December 31, 2014. You should also continue to include 2013 executive compensation information in your Summary Compensation Table. Please refer to Instruction 1 to Item 402(n) of Regulation S-K.

Principal Stockholders, page 134

13. Please update your table on page 134 as of the most recent practicable date.

Description of Capital Stock
Warrants, page 139

14. We note that you entered into a loan and security agreement with Comerica Bank in September 2007. Please expand your disclosure to clarify whether this agreement has terminated. If this agreement is outstanding, please expand your disclosure to discuss the material terms of this loan and security agreement. Additionally, please file this agreement as an exhibit pursuant to Item 601(b)(10) of Regulation S-K. Alternatively,

please provide us with an analysis supporting your determination that this agreement is not material to the company.

Shares Eligible for Future Sale, page 143

15. Please state the number of shares of common stock, upon completion of this offering that will be restricted securities under Rule 144.

16. Please state the number of shares that are subject to a lock-up.

Notes to Consolidated Financial Statements
Preferred Stock Warrant Liabilities, page F-10

17. You disclose that you will carry the warrants to purchase various shares of redeemable convertible preferred stock as liabilities until such time as the warrant are no longer outstanding or the underlying securities are no longer redeemable outside your control, including the completion of your IPO. On page 139 you disclose that the various warrants contain provisions for the adjustment of the warrant exercise price and number of shares issuable for certain dilutive issuances. Please explain to us how the exercise terms of these warrants can be adjusted after the completion of your IPO and why these provisions do not also trigger liability accounting. In your response, please tell us specifically whether the provision in Article IV Section B.4(c) of your existing Certificate of Incorporation will carry over in your post-IPO Certificate and, if so, how this provision complies with the guidance in ASC 815-40-55-42 and 55-43. In this regard, it appears that the formula provided in this section adjusts for any issuance below the previous exercise price of the warrants and is not limited to the dilutive effect of future issuances below the then-current fair value.

Exhibit

18. Please file the join research agreement between Pangu BioPharma and HKUST R and D Corporation Limited as exhibits pursuant to Item 601(b)(10) of Regulation S-K. Alternatively, please provide us with an analysis supporting your determination that the agreement is not material to the company.

Other Comments

19. Please file all exhibits as soon as practicable. We may have further comments upon examination of these exhibits.

20. Prior to its use please provide us proofs of all graphic, visual or photographic information you will provide in the printed prospectus. Please note that we may have comments regarding this material.

21. Please supplementally provide us with copies of all written communications, as defined in Rule 405 under the Securities Act, that you, or anyone authorized to do so on your behalf, present to potential investors in reliance on Section 5(d) of the Securities Act, whether or not they retain copies of the communications.

You may contact Mark Brunhofer at (202) 551-3638 if you have questions regarding comments on the financial statements and related matters. Please contact Matthew Jones at (202) 551-3786, Bryan Pitko at (202) 551-3203 or me at (202) 551-3715 with any other questions.

Sincerely,

/s/ *Bryan J. Pitko* for

Jeffrey P. Riedler
Assistant Director

cc: Kingsley L. Taft
Maggie L. Wong
Mitzi Chang
Goodwin Procter LLP
3 Embarcadero Center, 24th Floor
San Francisco, CA 94111