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

**FORM S-3  
REGISTRATION STATEMENT  
UNDER  
THE SECURITIES ACT OF 1933**

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**ATYR PHARMA, INC.**

(Exact name of registrant as specified in its charter)

**Delaware**

(State or other jurisdiction of incorporation or organization)

**20-3435077**

(I.R.S. Employer Identification Number)

**3545 John Hopkins Court, Suite #250  
San Diego, CA 92121  
(858) 731-8389**

(Address, including zip code, and telephone number, including area code of registrant's principal executive offices)

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**Sanjay S. Shukla, M.D., M.S.  
President and Chief Executive Officer  
aTyr Pharma, Inc.**

**3545 John Hopkins Court, Suite 250  
San Diego, CA 92121  
(858) 731-8389**

(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:

**Sean M. Clayton  
Alexa M. Ekman  
Cooley LLP  
4401 Eastgate Mall  
San Diego, CA 92121  
(858) 550-6000**

**Sanjay S. Shukla, M.D., M.S.  
President and Chief Executive Officer  
aTyr Pharma, Inc.  
3545 John Hopkins Court, Suite 250  
San Diego, CA 92121  
(858) 731-8389**

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**From time to time after the effective date of this Registration Statement**  
(Approximate date of commencement of proposed sale to the public)

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If the only securities being registered on this Form are being offered pursuant to dividend or interest reinvestment plans, please check the following box:

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If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, other than securities offered only in connection with dividend or interest reinvestment plans, check the following box:

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, please check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering.  333-258725

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

If this Form is a registration statement pursuant to General Instruction I.D. or a post-effective amendment thereto that shall become effective upon filing with the Commission pursuant to Rule 462(e) under the Securities Act, check the following box.

If this Form is a post-effective amendment to a registration statement filed pursuant to General Instruction I.D. filed to register additional securities or additional classes of securities pursuant to Rule 413(b) under the Securities Act, check the following box.

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

Large accelerated filer   
Non-accelerated filer

Accelerated filer   
Smaller reporting company   
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 7(a)(2)(B) of Securities Act.

**CALCULATION OF REGISTRATION FEE**

<b>Title of each class of securities to be registered</b>	<b>Proposed Maximum Aggregate Offering Price (1)</b>	<b>Amount of Registration Fee (2)</b>
Common Stock, par value \$0.001 per share	\$11,250,000	\$1,228

(1) The registrant previously registered securities at an aggregate offering price not to exceed \$75,000,000 on a Registration Statement on Form S-3 (File No. 333-258725), which was filed by the registrant on August 11, 2021 and declared effective on August 23, 2021 (the "Prior Registration Statement"). In accordance with Rule 462(b) under the Securities Act of 1933, as amended (the "Securities Act"), an additional amount of securities having a proposed maximum aggregate offering price of \$11,250,000 is hereby registered, which includes shares issuable upon the exercise of the underwriters' option to purchase additional shares, representing no more than 20% of the maximum aggregate offering price of unsold securities under the Prior Registration Statement. In no event will the maximum aggregate offering price of all securities issued pursuant to this Registration Statement and the Prior Registration Statement exceed that registered under such Registration Statements.

(2) Calculated pursuant to Rule 457(o) under the Securities Act of 1933, as amended, or the Securities Act.

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**This Registration Statement shall become effective upon filing in accordance with Rule 462(b) under the Securities Act.**

#### **EXPLANATORY NOTE AND INCORPORATION OF CERTAIN INFORMATION BY REFERENCE**

Pursuant to Rule 462(b) under the Securities Act of 1933, as amended, aTyr Pharma, Inc. (the “Registrant”) is filing this Registration Statement on Form S-3 (this “Registration Statement”) with the Securities and Exchange Commission (the “Commission”). This Registration Statement relates to the public offering of securities contemplated by the Registration Statement on Form S-3 (File No. 333-258725) (the “Prior Registration Statement”), which the Registrant filed with the Commission on August 11, 2021, and which the Commission declared effective on August 23, 2021.

The Registrant is filing this Registration Statement for the sole purpose of increasing the aggregate amount of securities offered by the Registrant by a proposed aggregate offering price of \$11,250,000, which includes shares that may be sold by the Registrant in the event the underwriters exercise their option to purchase additional shares of the Registrant’s common stock. The additional securities that are being registered for issuance and sale are in an amount and at a price that together represent no more than 20% of the maximum aggregate offering price of unsold securities under the Prior Registration Statement. The information set forth in the Prior Registration Statement and all exhibits to the Prior Registration Statement are hereby incorporated by reference into this Registration Statement.

The required opinion and consents are listed on the Exhibit Index below and filed herewith or incorporated by reference herein.

#### **EXHIBIT INDEX**

<b>Exhibit Number</b>	<b>Description</b>
<a href="#">5.1</a>	<a href="#">Opinion of Cooley LLP</a> (incorporated by reference to Exhibit 5.1 to the Prior Registration Statement).
<a href="#">23.1</a>	<a href="#">Consent of Ernst &amp; Young LLP, independent registered public accounting firm.</a>
<a href="#">23.2</a>	<a href="#">Consent of Cooley LLP (included in Exhibit 5.1).</a>
<a href="#">24.1</a>	<a href="#">Power of Attorney</a> (incorporated by reference to Exhibit 24.1 to the Prior Registration Statement).

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## SIGNATURES

Pursuant to the requirements of the Securities Act, the Registrant has duly caused this Registration Statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of San Diego, State of California, on the 15th day of September, 2021.

### ATYR PHARMA, INC.

By: /s/ Sanjay S. Shukla  
Sanjay S. Shukla, M.D., M.S.  
President and Chief Executive Officer

Pursuant to the requirements of the Securities Act, this Registration Statement has been signed by the following persons in the capacities and on the dates indicated.

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Sanjay S. Shukla</u> Sanjay S. Shukla, M.D., M.S.	President, Chief Executive Officer and Director <i>(Principal Executive Officer)</i>	September 15, 2021
<u>/s/ Jill M. Broadfoot</u> Jill M. Broadfoot	Chief Financial Officer <i>(Principal Financial Officer and Principal Accounting Officer)</i>	September 15, 2021
<u>*</u> John K. Clarke	Chairman of the Board of Directors	September 15, 2021
<u>*</u> Timothy P. Coughlin	Director	September 15, 2021
<u>*</u> Jane A. Gross, Ph.D.	Director	September 15, 2021
<u>*</u> Svetlana Lucas, Ph.D.	Director	September 15, 2021
<u>*</u> Paul Schimmel, Ph.D.	Director	September 15, 2021
<u>*</u> Sara Zaknoen, M.D.	Director	September 15, 2021

\* By: /s/ Sanjay S. Shukla  
Sanjay S. Shukla, M.D., M.S.  
Attorney-in-Fact

**Consent of Independent Registered Public Accounting Firm**

We consent to the incorporation by reference in the Registration Statement on Form S-3 filed pursuant to Rule 462(b) of the Securities Act of 1933 of the reference to our firm under the caption "Experts" and to the incorporation by reference of our report dated March 23, 2021, with respect to the consolidated financial statements of aTyr Pharma, Inc. incorporated by reference in the Registration Statement on Form S-3 (No. 333-258725) and related Prospectus and Prospectus Supplement of aTyr Pharma, Inc. for the registration of its common stock.

/s/ Ernst & Young LLP

San Diego, California  
September 15, 2021