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

SCHEDULE 14A INFORMATION

Proxy Statement Pursuant to Section 14(a) of the Securities Exchange Act of 1934
(Amendment No.)

Filed by the Registrant ☒ Filed by a Party other than the Registrant ☐

Check the appropriate box:

☐ Preliminary Proxy Statement
☐ **Confidential, for Use of the Commission Only (as permitted by Rule 14a-6(e)(2))**
☐ Definitive Proxy Statement
☒ Definitive Additional Materials
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ATYR PHARMA, INC.
(Name of Registrant as Specified In Its Charter)

(Name of Person(s) Filing Proxy Statement, if other than the Registrant)

Payment of Filing Fee (Check the appropriate box):

☒ No fee required.
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(1) Title of each class of securities to which transaction applies:

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(3) Per unit price or other underlying value of transaction computed pursuant to Exchange Act Rule 0-11 (set forth the amount on which the filing fee is calculated and state how it was determined):

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☐ Fee paid previously with preliminary materials.
☐ Check box if any part of the fee is offset as provided by Exchange Act Rule 0-11(a)(2) and identify the filing for which the offsetting fee was paid previously. Identify the previous filing by registration statement number, or the Form or Schedule and the date of its filing.

(1) Amount Previously Paid:

(2) Form, Schedule or Registration Statement No.:

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(4) Date Filed:

March 2017

To our stockholders,

On behalf of our employees and Board of Directors, we thank you for your support in 2016. Our team accomplished many of our goals in the past year and our 2016 achievements powerfully support our vision to create long-term value for aTyr stockholders while navigating near term challenges. We believe Physiocrine biology provides a new source of immunology targets with strong therapeutic potential. Our letter today summarizes our accomplishments and focus areas for 2017, all of which enable our mission:

> *To relentlessly pursue transformational science and the development of meaningful medicines for patients with severe diseases where others fall short. Using our knowledge of Physiocrine biology, we aim to bring innovative therapies to the market for the benefit of patients, their caregivers, our stockholders and the entire healthcare industry.*

Focus on Immune Pathways

The Physiocrine biology we work on represents a newly discovered set of immunological pathways. Previous discoveries of immunological pathways created important therapeutic franchises of our industry to date, such as Enbrel, Humira, Remicade, Opdivo and Keytruda. Through our research efforts, we believe that certain Physiocrines evolved over millions of years to promote homeostasis in complex organisms, such as humans, by orchestrating the immune system, as well as other processes in the same biological neighborhood, including fibrosis and remodeling. We believe disruption of immune homeostasis is an underappreciated target in many diseases and contributes to the pathophysiology associated with a number of important genetic and immunology-based diseases. By focusing on immune pathways in disease, we believe our programs possess the potential to restore patients to a healthier state, achieve homeostatic balance and ultimately lead to improved clinical outcomes across a wide range of therapeutic areas.

We have generated three immunology-based investigational therapeutic programs in three different therapeutic areas:

- *Resolaris™* for the treatment of rare myopathies with an immune component;
- *Stalaris™* for the treatment of rare pulmonary diseases with an immune component; and
- *Project ORCA* for a currently undisclosed therapeutic area distinct from our first two programs.

To protect our pipeline we built an intellectual property estate comprising over 175 patents or allowed patent applications that we own or exclusively license, including over 300 potential Physiocrine-based protein compositions.

First Clinical Trial Data of Our New Immunology Target from Muscular Dystrophy Patients

Our research and clinical groups teamed up in 2016 to create an impactful year for the advancement of Resolaris, our first naturally occurring Physiocrine program in the clinic. We announced clinical data from four separate Phase 1b/2 clinical trials enrolling patients with adult limb girdle muscular dystrophy 2B (LGMD2B), adult facioscapulohumeral muscular dystrophy (FSHD), or early onset FSHD. As of year-end, we had treated a total of 44 patients with Resolaris for a total drug exposure of 185 patient months.

In patients with genetic myopathies with aberrant protein expression there is an increased likelihood of an unproductive immune response with the potential to further harm diseased muscle tissue. We believe Resolaris, a naturally occurring protein secreted by muscle, may provide benefit mechanistically in two ways:

- By modulating activated T-cells in the tissue by conferring characteristics closer to that of resting T-cells; and
- By helping the muscle cells maintain muscle cell health.

By modulating the invading T-cells in this manner, while maintaining muscle cell health, we may potentially restore homeostasis to patients' muscle tissues and allow these diseased muscles the opportunity to more properly heal from the damage induced by their disease.

Below is a summary of the signals of clinical activity we observed in our Resolaris clinical trials to date:

- **Adult LGMD2B Patients –**Ten adult LGMD2B patients were administered Resolaris in an intra-patient, dose-escalation Phase 1b/2 clinical trial. 78% of the LGMD patients showed an improvement in their muscle function based on manual muscle test (MMT) scores.
- **Adult FSHD Patients –**We announced data from three separate clinical trials treating adult FSHD patients with Resolaris in 2016. Approximately 50% of patients demonstrated an increase in muscle function based on MMT scores across multiple studies. In addition, a decrease in disease burden, as measured by the Individualized Neuromuscular Quality of Life (INQoL) assessment, was observed in a majority of FSHD patients administered Resolaris across multiple studies.
- **Early Onset FSHD Patients –**We recently announced interim data from our intra-patient, dose-escalation Phase 1b/2 clinical trial for Resolaris in patients with early onset FSHD. Three of the four (75%) patients showed an improvement in their muscle function based on MMT scores in this open-label trial.

The clinical data we have announced are supportive of Resolaris as an immuno-modulator of activated T-cells. The clinical data show Resolaris to be generally well-tolerated with no signs of general immunosuppression and we observed promising signals of clinical activity in improved muscle function across multiple indications.

2016 also brought more firsts for Resolaris. We announced that Resolaris received Fast Track designation by the FDA for the treatment of LGMD2B and FSHD, the first known therapeutic candidate to receive the designation for these diseases. In addition, Resolaris received orphan drug designation from the FDA and the European Commission for the treatment of LGMD. Resolaris previously received the designations from both the FDA and the European Commission for FSHD.

We plan to complete our ongoing trial in early onset FSHD and our two ongoing long-term safety extension studies, with data announcements forthcoming. Our goal for Resolaris is to commence a larger, randomized, placebo-controlled efficacy trial for patients with a rare myopathy with an immune component following the execution of a strategic partnership for Resolaris or one of our other programs.

Second Physiocrine-based Program Anticipated in the Clinic in 2017

Stalaris represents a new modality for treating diseases with Physiocrines. Our scientists successfully engineered the first fusion protein with a Physiocrine to provide designed properties to enhance the immuno-modulatory aspects of a Physiocrine in vivo. This fusion protein, which utilizes the Fc region of an antibody, also potentially represents a novel Fc-Physiocrine platform for future Physiocrine-based therapies.

We have identified several severe and progressive lung diseases that share immune-pathophysiology features that have the potential to be impacted by our demonstrated Stalaris activities. Our goal is to bring our second molecule, Stalaris, into the clinic in the second half of 2017 with a Phase I study.

Growing Pipeline Representing New Hope for Patients Beyond Muscle & Lung Diseases

Through our research and discovery efforts, we created a third program based on our proprietary immunological pathways involving Physiocrine biology in a distinct therapeutic area, code named “Project ORCA.”

Our goal is to announce details surrounding Project ORCA by the end of 2017.

Building Our Bridge from High Impact Science to the Future of Medicine

The success of our Physiocrine biology R&D efforts has given us a number of opportunities in multiple disease areas. As a result, we believe it is in the best interest of our stockholders and patients to pursue and evaluate potential business relationships to strategically advance our programs through the expertise of or funding from appropriate partners.

We expect that our current financial position will allow us to fund operations into the third quarter of 2018 without additional external financing or partnerships. We anticipate this cash runway will allow us to fund the company through several value inflection points.

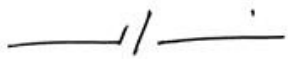
We look forward to 2017 with continued focus on the following goals to create value for our stockholders:

- Partner one or more programs;
- Advance our pipeline with two molecules in the clinic, Resolaris and Stalaris; and
- Declare a 3rd IND candidate from our Physiocrine discovery engine.

To accomplish these goals we have assembled a strong management team with deep industry experience. We continued to strengthen our executive management team with core competencies in drug development and research in 2016 with Grove Matsuoka as Senior Vice President, Programs and Planning, and David King, Ph.D., as Senior Vice President, Research.

As stockholders, please join me in recognizing the accomplishments of our employees to date. We have a tremendous responsibility to all stakeholders in aTyr and therefore want to extend our sincere gratitude to our patients, our employees, clinicians, healthcare workers, Board members and stockholders as we continue to translate our Physiocrine discoveries in immunology into potential medicines of the future for meaningful outcomes to patients and stockholders.

Sincerely,



John D. Mendlein, Ph.D.
Chief Executive Officer