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

POST-EFFECTIVE AMENDMENT NO. 2
TO
FORM S-1

REGISTRATION STATEMENT UNDER
THE SECURITIES ACT OF 1933

RITTER PHARMACEUTICALS, INC.

(Exact name of Registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation or organization)

2834
(Primary Standard Industrial
Classification Code Number)

26-3474527
(I.R.S. Employer
Identification Number)

**1880 Century Park East #1000
Los Angeles, CA 90067
(310) 203-1000**

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

**Michael D. Step
Chief Executive Officer
Ritter Pharmaceuticals, Inc.
1880 Century Park East #1000
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(310) 203-1000**

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

Copies to:

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Approximate date of commencement of proposed sale to the public: From time to time after the effective date of this registration statement.

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

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

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

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

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

Large accelerated filer	<input type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/> (Do not check if a smaller reporting company)	Smaller reporting company	<input checked="" type="checkbox"/>

The Registrant is an "emerging growth company," as defined in Section 2(a) of the Securities Act. This registration statement complies with the requirements that apply to an issuer that is an emerging growth company.

EXPLANATORY NOTE

This Post-Effective Amendment No. 2 (this “Post-Effective Amendment”) to the Registration Statement on Form S-1 (File No. 333-208818) (the “Registration Statement”), as declared effective by the Securities and Exchange Commission (the “SEC”) on February 11, 2016, is being filed to include the information contained in the Company’s Annual Report on Form 10-K for the fiscal year ended December 31, 2015 that was filed with the SEC on March 21, 2016 and the Company’s Quarterly Report on Form 10-Q for the fiscal quarter ended March 31, 2016 that was filed with the SEC on May 9, 2016, and to make certain other updates contained herein.

The information included in this filing updates the Registration Statement and the prospectus contained therein. No additional securities are being registered under this Post-Effective Amendment. All applicable registration fees were paid at the time of the original filing of the Registration Statement.

The information in this preliminary prospectus is not complete and may be changed. The selling stockholder may not sell these securities until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell these securities and it is not soliciting an offer to buy these securities in any jurisdiction where the offer or sale is not permitted.

PRELIMINARY PROSPECTUS

SUBJECT TO COMPLETION

DATED JUNE 1, 2016



**1,577,699 Shares
Common Stock**

This prospectus relates to the sale of up to 1,577,699 shares of our common stock by Aspire Capital Fund, LLC, or Aspire Capital. Aspire Capital is also referred to in this prospectus as the selling stockholder. The prices at which the selling stockholder may sell the shares will be determined by the prevailing market price for the shares or in negotiated transactions. We will not receive proceeds from the sale of the shares by the selling stockholder. However, we have received proceeds of \$1.0 million, and may receive additional proceeds of up to \$9.0 million, for an aggregate of \$10.0 million, from the sale of our common stock to the selling stockholder, pursuant to a common stock purchase agreement entered into with the selling stockholder on December 18, 2015.

The selling stockholder is an “underwriter” within the meaning of the Securities Act of 1933, as amended. We will pay the expenses of registering these shares, but all selling and other expenses incurred by the selling stockholder will be paid by the selling stockholder.

Our common stock is listed on the Nasdaq Capital Market under the ticker symbol “RTTR.” On May 31, 2016 the last reported sale price per share of our common stock was \$1.65 per share.

You should read this prospectus and any prospectus supplement, together with additional information described under the headings “Incorporation of Certain Documents by Reference” and “Where You Can Find More Information,” carefully before you invest in any of our securities.

Investing in our securities involves a high degree of risk. See “Risk Factors” on page 8 of this prospectus.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or passed upon the adequacy or accuracy of this prospectus. Any representation to the contrary is a criminal offense.

The date of this prospectus is _____, 2016.

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Neither we nor the selling stockholder has authorized anyone to provide any information or to make any representations other than as contained in this prospectus or incorporated by reference herein. We and the selling stockholder take no responsibility for, and provide no assurance as to the reliability of, any information that others may give you. This prospectus is an offer to sell only the shares offered hereby, but only under circumstances and in jurisdictions where it is lawful to do so. The information contained in this prospectus and incorporate by reference herein is current only as of its date.

For investors outside of the United States: Neither we nor the selling stockholder have done anything that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. You are required to inform yourselves about, and to observe any restrictions relating to, this offering and the distribution of this prospectus outside of the United States.

PROSPECTUS SUMMARY

This summary highlights certain information about us, this offering and selected information contained in the prospectus. This summary is not complete and does not contain all of the information that you should consider before deciding whether to invest in our common stock. For a more complete understanding of our company and this offering, we encourage you to read and consider the more detailed information in the prospectus and incorporated by reference herein, including "Risk Factors" and the financial statements and related notes. Unless we specify otherwise, all references in this prospectus to "Ritter Pharmaceuticals," "we," "our," "us" and "our company" refer to Ritter Pharmaceuticals, Inc.

Our Business

Ritter Pharmaceuticals, Inc. develops novel therapeutic products that modulate the human gut microbiome to treat gastrointestinal diseases. We are advancing human gut health research by exploring the metabolic capacity of the gut microbiota and translating the functionality of prebiotic-based therapeutics into applications intended to have a meaningful impact on a patient's health. "Prebiotics" is a general term used to refer to chemicals that induce the growth and/or activity of commensal microorganisms that contribute to the well-being of their host.

Our first novel microbiome modulator, RP-G28, an orally administered, high purity galacto-oligosaccharide (a carbohydrate found naturally, at least in small amounts, in plants, consisting of three to ten simple sugars linked together), is currently under development for the reduction of symptoms associated with lactose intolerance. RP-G28, is designed to stimulate the growth of lactose-metabolizing bacteria in the colon, thereby effectively adapting the gut microbiome to assist in digesting the lactose that reaches the large intestine. RP-G28 has the potential to become the first drug approved by the U.S. Food and Drug Administration, or FDA, for the reduction of symptoms associated with lactose intolerance. RP-G28 has been studied in a Phase 2a clinical trial and is a first-in-class compound.

Our Market Opportunity

Lactose intolerance is a common condition attributed to insufficient levels of the enzyme lactase, which is needed to properly digest lactose, a complex sugar found in milk and milk-containing foods. People with lactose intolerance who ingest lactose-containing foods may experience painful and embarrassing digestive symptoms.

Lactose intolerance is a widespread condition affecting over one billion people worldwide and over 40 million people in the United States (or 15% of the U.S. population), with an estimated nine million of those individuals demonstrating moderate to severe symptoms [NIH Consensus Statement, LIH, Vol. 27, #2 (February 2010); Objective Insights, "Market Research Analysis and Forecasts on Lactose Intolerance and RP-G28," p. 4 and 7 (June 2012)].

In the United States alone, we believe lactose intolerance is a large and underserved market. Current annual spending on over-the-counter lactose intolerance aids in the United States has been estimated at approximately \$2.45 billion [Zpryme Research & Consulting, "The Digestive Health Prescription Drug Market," (May 2009)]. However, these options are limited and there is no long-term treatment available.

The most common therapeutic approach is dairy avoidance, which physicians recommend to the majority of their patients. However, dairy avoidance may lead to inadequate calcium and vitamin D intake, which can predispose individuals to decreased bone accrual, osteoporosis, and other adverse health outcomes. The 2010 National Institutes of Health conference on lactose intolerance highlighted the long-term consequences of dairy avoidance demonstrating both the importance of treating the condition and the need to find improved solutions for patients.

Our Leading Product Candidate — RP-G28

We completed a double-blinded, randomized, multi-center, placebo-controlled Phase 2a clinical study of RP-G28. The purpose of the study was to assess the effectiveness, safety and tolerability of RP-G28 compared to a placebo when administered to subjects with symptoms associated with lactose intolerance.

An additional goal was to establish proof-of-concept that treatment with RP-G28 facilitates improved lactose metabolism via the adaptation of intestinal bacteria metabolism (i.e., colonic adaptation). The study evaluated RP-G28 in 62 patients with lactose intolerance over a treatment period of 35 consecutive days. Post-treatment, subjects reintroduced dairy into their diets and were followed for an additional 30 days. The results of our Phase 2a study were published in Nutrition Journal in a manuscript entitled, "Improving lactose digestion and symptoms of lactose intolerance with a novel galacto-oligosaccharide (RP-G28): a randomized, double-blind clinical trial."

Key findings of the Phase 2a study include:

- RP-G28 was well tolerated, with no significant adverse events reported.
- The combined data suggest that RP-G28 exerted a positive therapeutic effect and clinically meaningful benefits to patients on treatment, though not all results were statistically significant.
- Positive trends were seen when the entire per protocol study population was analyzed, including some statistically significant subgroup analysis.
- Treated subjects reported increased tolerance to lactose and dairy foods: reduced lactose intolerance symptoms (gas, bloating, cramping and abdominal pain) were reported in subjects on RP-G28, a durable reduction in abdominal pain ($p=0.019$) was reported, and treated patients were 6 times more likely to describe themselves as lactose tolerant ($p=0.039$). We believe these results are signals of a clinically meaningful benefit to patients treated with RP-G28. P-value is a conventional statistical method for measuring the statistical significance of clinical results. In clinical trials, the “p-value” is the probability that the result was obtained by chance. By convention, a “p-value” that is less than 0.05 is considered statistically significant.
- Principal Component Analysis (PCA), a multivariate method that helps transform a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components, thereby reducing the dimensions of a complex dataset, also showed statistically significant shifts in the microbiome of subjects fed RP-G28, compared to placebo, at 66 days.

In sum, positive trends were seen when the entire per protocol study population was analyzed, including some statistically significant subgroup analysis. We believe these positive trends along with the benign safety profile seen in the Phase 2a study support continued drug development of RP-G28. We held a Type C meeting with the FDA’s Division of Gastroenterology and Inborn Errors Products on February 20, 2013. The purpose of the meeting was to obtain the FDA’s feedback on the planned Phase 2 program and Phase 3 programs, inform the FDA of our ongoing development plans, gain feedback on relevant clinical trial design and end points related to patient meaningful benefits, and to inform the FDA of the status of our product characterization. We believe that this meeting was a significant step forward in streamlining the pathway to initial U.S. approval of RP-G28 to reduce symptoms and frequency of symptomatic episodes associated with lactose intolerance.

Following analysis of the Phase 2a clinical trial, discussions with the FDA about the clinical development plan, and further discussions with our regulatory consultants, we intend to conduct our planned Phase 2b clinical trial as an adaptive design Phase 2b/3 clinical trial. A trial that is designed as an adaptive seamless clinical trial refers to a trial that combines the objectives of what are typically separate trials into a single uninterrupted trial with multiple objectives. We believe this trial could serve as one of two pivotal trials should the resulting data and the FDA be supportive of this trial as a pivotal trial. Neither the FDA nor any other comparable governmental agency has considered the Phase 2b/3 study or our current development plan for RP-G28, and we do not intend to request a meeting with the FDA to discuss these matters. Regulatory authorities in the United States and Europe have both published guidance documents on the use and implementation of adaptive design trials. In addition, the regulations governing INDs are extensive and involve numerous notification requirements including that, generally, an IND supplement must be submitted to and cleared by the FDA before a sponsor or an investigator may make any change to the investigational plan that may affect its scientific soundness or the rights, safety or welfare of human subjects. We intend to comply with these requirements. We believe we will need to submit an IND supplement containing amended protocols for a Phase 2b/3 adaptive trial to FDA for review. These amended protocols must also be approved by the IRB with responsibility for review and approval of the Phase 2b/3 study.

The Phase 2b/3 clinical trial that we intend to conduct is being designed as a multi-center double-blinded, placebo controlled clinical trial of approximately 300 subjects to determine the maximum tolerated dose and optimal dose-escalation schedule for RP-G28. The trial is going to assess patients with moderate to severe abdominal pain as measured by a pain Likert scale after a lactose challenge, in which lactose intolerance symptoms and hydrogen production via hydrogen breath test will be assessed for five hours post-lactose dose, as well as several additional secondary endpoints.

We have not consulted with the FDA about our intent to use abdominal pain as a primary endpoint for the Phase 2b/3 pivotal clinical trial. During our Type C Meeting with the FDA in February 2013, we had proposed that future studies with RP-G28 in subjects with lactose intolerance would utilize a total lactose intolerance symptom score, measured by a patient reporting instrument that we were going to develop, as the primary, stand-alone endpoint. However, based on RP-G28’s mechanism of action, data from the Phase 2a clinical study, further research conducted after the Type C Meeting in 2013 along with FDA guidance and products under the review of the Division of Gastroenterology and Inborn Errors Products, we subsequently decided to use abdominal pain as the primary endpoint for a Phase 2b/Phase 3 study. We believe that evaluation of abdominal pain is a reliable clinical assessment of treatment response and treatment benefit in a lactose intolerant patient.

Our Competitive Strengths

Market Opportunity

RP-G28 has the potential to become the first approved drug in the United States and Europe for the reduction of symptoms associated with lactose intolerance.

Renowned Scientific Team and Management Team

Our leadership team has extensive biotechnology/pharmaceutical expertise in discovering, developing, licensing and commercializing therapeutic products. We have attracted a scientific team comprised of innovative researchers who are renowned in their knowledge and understanding of the host-microbiome in the field of lactose intolerance and gastroenterology.

Substantial Patent Portfolio and Product Exclusivity

We have an issued patent in the United Kingdom directed to compositions of non-digestible carbohydrates, and we have issued patents in the United States directed to methods of using such compositions for the treatment of lactose intolerance and symptoms. Additional worldwide patent applications are pending. The patent applications include claims covering compositions, methods, formulations and packaging.

In addition, in July 2015 we acquired the rights, title and interest to certain patents and related patent applications with claims covering a process for producing ultra high purity galacto-oligosaccharide active pharmaceutical ingredients, including RP-G28, from our supplier. See “Business—Clinical Supply and Cooperation Agreement with Ricerche Sperimentali Montale and Inalco SpA” for additional details regarding the second amendment to the exclusive supply agreement and our exercise of the exclusive option.

Our Growth Strategy

In order to achieve our objective of developing safe and effective applications to treat conditions associated with microbiome dysfunctions, our near-term and long-term strategies include the following:

- complete an adaptive design Phase 2b/3 clinical trial and any additional pivotal studies of RP-G28 for the reduction of symptoms associated with lactose intolerance;
- seek regulatory approval of RP-G28 for the reduction of symptoms associated with lactose intolerance if the clinical trials are successful, initially in the United States and subsequently in the rest of the world;
- develop and commercialize RP-G28 either by ourselves or in collaboration with others throughout the world;
- explore the use of RP-G28 for additional potential therapeutic indications and orphan indications;
- establish the Company as a leader in developing therapeutics that modulate the human gut microbiome;
- continue to develop a robust and defensible patent portfolio, including patents we own and those we plan to in-license in the future; and
- continue to optimize our product development and manufacturing capabilities both internally and through outside manufacturers.

Risks Relating to Our Business

We are an early stage pharmaceutical company, and our business and ability to execute our business strategy are subject to a number of risks of which you should be aware before you decide to buy our common stock. In particular, you should consider the risks discussed in the “Risk Factors” section of this prospectus and documents incorporated by reference herein, including, but not limited to, the following:

- We have incurred net losses in each year since our inception. We expect to incur net losses and negative operating cash flow for the foreseeable future, and may never achieve or maintain profitability.
- We will require substantial additional funding to complete the development and commercialization of RP-G28 and to fund our operations generally and such funding may not be available on acceptable terms or at all.

- We are substantially dependent on the success of our only product candidate, RP-G28, which is under clinical development. We cannot be certain that RP-G28 will receive regulatory approval or be successfully commercialized even if we receive regulatory approval.
- Future clinical trials of RP-G28, or other product candidates, may not be successful. If we are unable to obtain required marketing approvals for, commercialize, obtain and maintain patent protection for or gain sufficient market acceptance by physicians, patients and healthcare payers of RP-G28, or other product candidates, or experience significant delays in doing so, our business will be materially harmed and our ability to generate revenue will be materially impaired.
- RP-G28 and any other product candidates we may develop in the future will be subject to ongoing regulatory requirements and any violations of these requirements could negatively affect our business and results of operation.
- Any delay or disruption in the manufacture and supply of RP-G28 (including delays related to required regulatory approvals) may negatively impact our operations.
- We will be substantially dependent on third-party manufacturers to manufacture our products and key ingredients in sufficient quantities and on a timely basis, while complying with extensive FDA and European Medicines Agency, or EMA, requirements.
- We may not be able to manage our business effectively if we are unable to attract and retain key personnel and consultants.
- If we are unable to maintain valid and enforceable intellectual property rights or if our intellectual property rights are inadequate for RP-G28 and our product candidates, our competitive position could be harmed.
- We could face competition from other biotechnology and pharmaceutical companies and our operating results will suffer if we fail to compete effectively.

Implications of Being an Emerging Growth Company

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

- being permitted to provide only two years of audited financial statements in addition to any required unaudited interim financial statements with correspondingly reduced “Management’s Discussion and Analysis of Financial Condition and Results of Operations” disclosure;
- reduced disclosure obligations regarding executive compensation arrangements;
- not being required to hold a non-binding advisory vote on executive compensation or golden parachute arrangements; and
- exemption from the auditor attestation requirement in the assessment of our internal control over financial reporting.

We have elected to use the extended transition period for complying with new or revised accounting standards under Section 102(b)(1) of the JOBS Act. This election allows us to delay the adoption of new or revised accounting standards that have different effective dates for public and private companies until those standards apply to private companies. As a result of this election, our financial statements may not be comparable to companies that comply with public company effective dates.

We will remain an emerging growth company until the earlier of (i) the last day of the fiscal year (a) following the fifth anniversary of the date we completed our initial public offering, which was June 29, 2015, (b) in which we have total annual gross revenue of at least \$1.0 billion, or (c) in which we are deemed to be a large accelerated filer, which means the market value of our common stock that is held by non-affiliates exceeded \$700.0 million as of the prior June 30th, and (ii) the date on which we have issued more than \$1.0 billion in non-convertible debt during the prior three-year period. We may choose to take advantage of some but not all of these exemptions. We have taken advantage of reduced reporting requirements in this prospectus. Accordingly, the information contained herein may be different than the information you receive from other public companies in which you hold stock.

We refer to the Jumpstart Our Business Startups Act of 2012 in this prospectus as the “JOBS Act,” and references in this prospectus to “emerging growth company” have the meaning associated with that term as used in the JOBS Act.

Notwithstanding the above, we are also currently a “smaller reporting company” meaning that we are not an investment company, an asset-backed issuer, or a majority-owned subsidiary of a parent company that is not a smaller reporting company and have a public float of less than \$75 million and annual revenues of less than \$50 million during the most recently completed fiscal year. In the event that we are still considered a smaller reporting company at such time as we cease to be an emerging growth company, the disclosure we will be required to provide in our filings with the Securities and Exchange Commission, or SEC, will increase, but will still be less than it would be if we were not considered either an emerging growth company or a smaller reporting company. Specifically, similar to emerging growth companies, smaller reporting companies are able to provide simplified executive compensation disclosures in their filings; are exempt from the provisions of Section 404(b) of the Sarbanes-Oxley Act of 2002 (the “Sarbanes-Oxley Act”) requiring that independent registered public accounting firms provide an attestation report on the effectiveness of their internal control over financial reporting; and have certain other decreased disclosure obligations in their SEC filings, including, among other things, only being required to provide two years of audited financial statements in their annual reports.

Corporate Information

We were formed as a Nevada limited liability company on March 29, 2004 under the name Ritter Natural Sciences, LLC. On September 16, 2008, we converted into a Delaware corporation under the name Ritter Pharmaceuticals, Inc. Our principal executive offices are located at 1880 Century Park East, #1000, Los Angeles, CA 90067, and our telephone number is (310) 203-1000. Our website address is www.ritterpharmaceuticals.com. The information contained on, or that can be accessed through, our website is not part of this prospectus.

We previously marketed a product under the Lactagen trademark. This prospectus may contain references to our trademark and to trademarks belonging to other entities. Solely for convenience, trademarks and trade names referred to in this prospectus, including logos, artwork and other visual displays, may appear without the ® or TM symbols, but such references are not intended to indicate, in any way, that we will not assert, to the fullest extent under applicable law, our rights or the rights of the applicable licensor to these trademarks and trade names. We do not intend our use or display of other companies’ trade names or trademarks to imply a relationship with, or endorsement or sponsorship of us by, any other company.

THE OFFERING

Common Stock being Offered by the Selling Stockholder 1,577,699 shares

Common Stock Outstanding 8,584,661 shares

Common Stock Outstanding After the Offering 9,473,496 shares

Use of Proceeds The selling stockholder will receive all of the proceeds from the sale of the shares offered for sale by it under this prospectus. We will not receive proceeds from the sale of the shares by the selling stockholder. However, we have received proceeds of \$1.0 million, and may receive up to \$9.0 million additional proceeds, for an aggregate of \$10.0 million from the sale of our common stock to the selling stockholder under the common stock purchase agreement described below. Any proceeds from the selling stockholder that we receive under the purchase agreement are expected to be used for working capital and general corporate purposes, including research and development activities.

NASDAQ Capital Market Symbol RTTR

Risk Factors Investing in our securities involves a high degree of risk. You should carefully review and consider the “Risk Factors” section of this prospectus for a discussion of factors to consider before deciding to invest in shares of our common stock.

The number of shares of our common stock to be outstanding following this offering is based on an aggregate of 8,584,661 shares outstanding as of April 11, 2016 and includes the 500,000 Initial Purchase Shares and 188,864 Commitment Shares described below, but excludes:

- 1,962,877 shares of common stock issuable upon exercise of outstanding options as of April 11, 2016, at a weighted average exercise price of \$7.01 per share, of which 791,824 shares are vested as of such date;
- 145,448 shares of common stock reserved for future issuance under the 2015 Equity Incentive Plan; and
- 578,323 shares of common stock issuable upon exercise of warrants outstanding as of April 11, 2016.

The information in this prospectus gives effect to the 1-for-7.15 reverse stock split of our common stock which was effected on June 17, 2015.

Common Stock Issued and Issuable to the Selling Stockholder

On December 18, 2015, we entered into a common stock purchase agreement, or the Purchase Agreement, with Aspire Capital Fund, LLC, an Illinois limited liability company, or Aspire Capital or the selling stockholder, which provides that, upon the terms and subject to the conditions and limitations set forth therein, Aspire Capital is committed to purchase up to an aggregate of \$10.0 million of our shares of common stock over the approximately 30-month term of the Purchase Agreement. In consideration for entering into the Purchase Agreement, concurrently with the execution of the Purchase Agreement, we issued to Aspire Capital 188,864 shares of our common stock as a commitment fee, or the Commitment Shares. Upon execution of the Purchase Agreement, the Company agreed to sell to Aspire Capital 500,000 shares of common stock, or the Initial Purchase Shares, at \$2.00 per share for proceeds of \$1.0 million. Concurrently with entering into the Purchase Agreement, we also entered into a registration rights agreement with Aspire Capital, or the Registration Rights Agreement, in which we agreed to file one or more registration statements, including the registration statement of which this prospectus is a part, as permissible and necessary to register under the Securities Act of 1933, as amended, or the Securities Act, the sale of the shares of our common stock that have been and may be issued to Aspire Capital under the Purchase Agreement.

As of April 11, 2016 there were 8,584,661 shares of our common stock outstanding (of which 5,267,606 shares were held by non-affiliates including Aspire Capital) which includes the 500,000 Initial Purchase Shares and the 188,864 Commitment Shares that have already been issued to Aspire Capital, but excludes the 888,835 shares of common stock that we may issue to Aspire Capital after this registration statement is declared effective under the Securities Act. If all of such 1,577,699 shares of our common stock offered hereby were issued and outstanding as of the date hereof, such shares would represent 16.7% of the total common stock outstanding or 25.6% of the non-affiliate shares of common stock outstanding as of December 30, 2015.

The aggregate number of shares that we may issue to Aspire Capital under the Purchase Agreement may in no case exceed 1,577,699 shares of our common stock (which is equal to approximately 19.99% of the common stock outstanding on the date of the Purchase Agreement), unless (i) stockholder approval is obtained to issue more, in which case this 1,577,699 share limitation will not apply, or (ii) stockholder approval has not been obtained and at any time the 1,577,699 share limitation is reached and at all times thereafter the average price paid for all shares issued under the Purchase Agreement (including the Commitment Shares and the Initial Purchase Shares) is equal to or greater than \$1.75, the Minimum Price, a price equal to the closing sale price of our common stock on the business date of the execution of the Purchase Agreement; provided that at no point in time shall Aspire Capital (together with its affiliates) beneficially own more than 19.99% of our common stock.

Pursuant to the Purchase Agreement and the Registration Rights Agreement, we have registered 1,577,699 shares of our common stock under the Securities Act, which includes the Commitment Shares and the Initial Purchase Shares that have already been issued to Aspire Capital, and 888,835 shares of common stock which we may issue to Aspire Capital after this registration statement is declared effective under the Securities Act. All 1,577,699 shares of common stock are being offered pursuant to this prospectus.

After the SEC has declared effective the registration statement of which this prospectus is a part, on any trading day on which the closing sale price of our common stock exceeds \$0.50, we have the right, in our sole discretion, to present Aspire Capital with a purchase notice, or each a Purchase Notice, directing Aspire Capital (as principal) to purchase up to 100,000 shares of our common stock per trading day, up to \$9.0 million of our common stock in the aggregate at a per share price, or the Purchase Price, calculated by reference to the prevailing market price of our common stock (as more specifically described below).

In addition, on any date on which we submit a Purchase Notice for 100,000 shares to Aspire Capital and the closing sale price of our stock is equal to or greater than \$0.50 per share of Common Stock, we also have the right, in our sole discretion, to present Aspire Capital with a volume-weighted average price purchase notice, or each a VWAP Purchase Notice, directing Aspire Capital to purchase an amount of stock equal to up to 30% of the aggregate shares of the Company's common stock traded on the Nasdaq Capital Market on the next trading day, or the VWAP Purchase Date, subject to a maximum number of shares we may determine, or the VWAP Purchase Share Volume Maximum, and a minimum trading price, or the VWAP Minimum Price Threshold (as more specifically described below). The purchase price per Purchase Share pursuant to such VWAP Purchase Notice, or the VWAP Purchase Price, is calculated by reference to the prevailing market price of our common stock (as more specifically described below).

The Purchase Agreement provides that the Company and Aspire Capital shall not effect any sales under the Purchase Agreement on any purchase date where the closing sale price of our common stock is less than \$0.50 per share, or the Floor Price. This Floor Price and the respective prices and share numbers in the preceding paragraphs will be appropriately adjusted for any reorganization, recapitalization, non-cash dividend, stock split, reverse stock split or other similar transaction. There are no trading volume requirements or restrictions under the Purchase Agreement, and we will control the timing and amount of any sales of our common stock to Aspire Capital. Aspire Capital has no right to require any sales by us, but is obligated to make purchases from us as we direct in accordance with the Purchase Agreement. There are no limitations on use of proceeds, financial or business covenants, restrictions on future fundings, rights of first refusal, participation rights, penalties or liquidated damages in the Purchase Agreement. Aspire Capital may not assign its rights or obligations under the Purchase Agreement. The Purchase Agreement may be terminated by us at any time, at our discretion, without any penalty or cost to us.

RISK FACTORS

Investing in our common stock involves a high degree of risk. You should carefully consider the risk set forth under 'Risk Factors' in Item 1A of Part I of our Annual Report on Form 10-K for the year ended December 31, 2015, which is incorporated by reference in this prospectus, as well as the other information in this prospectus and incorporated by reference herein, including our financial statements and related notes, before deciding whether to invest in shares of our common stock. The occurrence of any of the adverse developments described in the risk factors could materially and adversely harm our business, financial condition, results of operations or prospects. In that case, the trading price of our common stock could decline, and you may lose all or part of your investment.

CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS AND INDUSTRY DATA

This prospectus contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. All statements other than statements of historical facts contained in this prospectus, including statements regarding our strategy, future operations, future financial position, future revenue, projected costs, prospects, plans, objectives of management and expected market growth are forward-looking statements. These statements involve known and unknown risks, uncertainties and other important factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements.

The words ‘anticipate,’ ‘believe,’ ‘could,’ ‘estimate,’ ‘expect,’ ‘intend,’ ‘may,’ ‘plan,’ ‘potential,’ ‘predict,’ ‘project,’ ‘should,’ ‘target,’ ‘will,’ ‘would’ and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. These forward-looking statements include, among other things, statements about:

- our ability to sell shares of common stock to Aspire Capital pursuant to the Purchase Agreement and our ability to register and maintain the registration of the shares issued and issuable thereunder;
- our ability to obtain additional financing;
- the accuracy of our estimates regarding expenses, future revenues and capital requirements;
- the success and timing of our preclinical studies and clinical trials;
- our ability to obtain and maintain regulatory approval of RP-G28 and any other product candidates we may develop, and the labeling under any approval we may obtain;
- regulatory developments in the United States and other countries;
- the performance of third-party manufacturers;
- our plans to develop and commercialize our product candidates;
- our ability to obtain and maintain intellectual property protection for our product candidates;
- the successful development of our sales and marketing capabilities;
- the potential markets for our product candidates and our ability to serve those markets;
- the rate and degree of market acceptance of any future products;
- the success of competing drugs that are or become available; and
- the loss of key scientific or management personnel.

These forward-looking statements are only predictions and we may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements, so you should not place undue reliance on our forward-looking statements. Actual results or events could differ materially from the plans, intentions and expectations disclosed in the forward-looking statements we make. We have based these forward-looking statements largely on our current expectations and projections about future events and trends that we believe may affect our business, financial condition and operating results. We have included important factors in the cautionary statements included in this prospectus, particularly in the ‘Risk Factors’ section, that could cause actual future results or events to differ materially from the forward-looking statements that we make. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures or investments we may make.

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

This prospectus contains estimates made, and other statistical data published, by independent parties and by us relating to market size and growth and other data about our industry. We obtained the industry and market data in this prospectus from our own research as well as from industry and general publications, surveys and studies conducted by third parties. This data involves a number of assumptions and limitations and contains projections and estimates of the future performance of the industries in which we operate that are subject to a high degree of uncertainty. We caution you not to give undue weight to such projections, assumptions and estimates.

THE ASPIRE CAPITAL TRANSACTION

General

On December 18, 2015, we entered into the Purchase Agreement which provides that, upon the terms and subject to the conditions and limitations set forth therein, Aspire Capital is committed to purchase up to an aggregate of \$10.0 million of our shares of common stock over the term of the Purchase Agreement. Upon execution of the Purchase Agreement, the Company agreed to sell to Aspire Capital 500,000 Initial Purchase Shares for proceeds of \$1.0 million. In consideration for entering into the Purchase Agreement, concurrently with the execution of the Purchase Agreement, we issued to Aspire Capital 188,864 Commitment Shares. Concurrently with entering into the Purchase Agreement, we also entered into the Registration Rights Agreement, in which we agreed to file one or more registration statements as permissible and necessary to register under the Securities Act, the sale of the shares of our common stock that have been and may be issued to Aspire Capital under the Purchase Agreement.

As of April 11, 2016 there were 8,584,661 shares of our common stock outstanding (of which 5,267,606 shares were held by non-affiliates including Aspire Capital), which includes the 500,000 Initial Purchase Shares and 188,864 Commitment Shares that have already been issued to Aspire Capital, but excludes the 888,835 shares which we may issue to Aspire Capital after this registration statement is declared effective under the Securities Act. If all 1,577,699 shares of our common stock issuable to Aspire Capital had been issued and outstanding as of December 30, 2015, such shares would have represented 16.7% of the total common stock outstanding, or 25.6% of the non-affiliate shares of common stock outstanding, as of April 11, 2016. The number of shares of our common stock ultimately offered for sale by Aspire Capital is dependent upon the number of shares purchased by Aspire Capital under the Purchase Agreement.

The aggregate number of shares that we may issue to Aspire Capital under the Purchase Agreement may in no case exceed 1,577,699 shares of our common stock (which is equal to approximately 19.99% of the common stock outstanding on the date of the Purchase Agreement), unless (i) shareholder approval is obtained to issue more, in which case this 1,577,699 share limitation, will not apply, or (ii) shareholder approval has not been obtained and at any time the 1,577,699 share limitation is reached and at all times thereafter the average price paid for all shares issued under the Purchase Agreement (including the Commitment Shares) is equal to or greater than \$1.75, the Minimum Price, a price equal to the closing sale price of our common stock on the business date of the execution of the Purchase Agreement; provided that at no one point in time shall Aspire Capital (together with its affiliates) beneficially own more than 19.99% of our common stock.

Pursuant to the Purchase Agreement and the Registration Rights Agreement, we have registered 1,577,699 shares of our common stock under the Securities Act, which includes the Initial Purchase Shares and the Commitment Shares that have already been issued to Aspire Capital and 888,835 shares of common stock that we may issue to Aspire Capital after this registration statement is declared effective under the Securities Act. All 1,577,699 shares of common stock are being offered pursuant to this prospectus. Under the Purchase Agreement, we have the right but not the obligation to issue more than the 1,577,699 shares of common stock included in this prospectus to Aspire Capital. As of the date hereof, we do not have any plans or intent to issue to Aspire Capital any shares of common stock in addition to the 1,577,699 shares of common stock offered hereby.

After the SEC has declared effective the registration statement of which this prospectus is a part, on any trading day on which the closing sale price of our common stock is not less than \$0.50 per share, or the Floor Price, we have the right, in our sole discretion, to present Aspire Capital with a Purchase Notice, directing Aspire Capital (as principal) to purchase up to 100,000 shares of our common stock per business day, up to \$9.0 million of our common stock in the aggregate over the term of the Purchase Agreement, at a Purchase Price calculated by reference to the prevailing market price of our common stock over the preceding 12-business day period (as more specifically described below); however, no sale pursuant to a Purchase Notice may exceed \$500,000 per trading day.

In addition, on any date on which we submit a Purchase Notice to Aspire Capital for 100,000 shares and the closing price of our common stock is not less than the Floor Price per share, we also have the right, in our sole discretion, to present Aspire Capital with a VWAP Purchase Notice directing Aspire Capital to purchase an amount of stock equal to up to 30% of the aggregate shares of the Company's common stock traded on the Nasdaq Capital Market on the next trading day, subject to the VWAP Purchase Share Volume Maximum and the VWAP Minimum Price Threshold. The VWAP Purchase Price is calculated by reference to the prevailing market price of our common stock (as more specifically described below).

The Purchase Agreement provides that neither we nor Aspire Capital will effect any sales under the Purchase Agreement on any purchase date where the closing sale price of our common stock is less than the Floor Price. There are no trading volume requirements or restrictions under the Purchase Agreement, and we will control the timing and amount of any sales of our common stock to Aspire Capital. Aspire Capital has no right to require any sales by us, but is obligated to make purchases from us as we direct in accordance with the Purchase Agreement. There are no limitations on use of proceeds, financial or business covenants, restrictions on future financings, rights of first refusal, participation rights, penalties or liquidated damages in the Purchase Agreement. Aspire Capital may not assign its rights or obligations under the Purchase Agreement. The Purchase Agreement may be terminated by us at any time, at our discretion, without any penalty or cost to us.

Purchase Of Shares Under The Common Stock Purchase Agreement

Under the terms of the Purchase Agreement, on any trading day selected by us on which the closing sale price of our common stock exceeds the Floor Price, we may direct Aspire Capital to purchase up to 100,000 shares of our common stock per trading day. The Purchase Price of such shares is equal to the lesser of:

- the lowest sale price of our common stock on the purchase date; or
- the arithmetic average of the three lowest closing sale prices for our common stock during the ten consecutive trading days ending on the trading day immediately preceding the purchase date.

In addition, on any date on which we submit a Purchase Notice to Aspire Capital for purchase of 100,000 shares and on which the closing price of our common stock exceeds the Floor Price, we also have the right to direct Aspire Capital to purchase an amount of stock equal to up to 30% of the aggregate shares of our common stock traded on the Nasdaq Capital Market on the next trading day, subject to the VWAP Purchase Share Volume Maximum and the VWAP Minimum Price Threshold, which is equal to the greater of (a) 80% of the closing price of the Company's common stock on the business day immediately preceding the VWAP Purchase Date or (b) such higher price as set forth by the Company in the VWAP Purchase Notice. The VWAP Purchase Price of such shares is the lower of:

- the Closing Sale Price on the VWAP Purchase Date; or
- 97% of the volume-weighted average price for our common stock traded on the Nasdaq Capital Market:
 - on the VWAP Purchase Date, if the aggregate shares to be purchased on that date have not exceeded the VWAP Purchase Share Volume Maximum; or
 - during that portion of the VWAP Purchase Date until such time as the sooner to occur of (i) the time at which the aggregate shares traded on the Nasdaq Capital Market exceed the VWAP Purchase Share Volume Maximum or (ii) the time at which the sale price of the Company's common stock falls below the VWAP Minimum Price Threshold.

The Purchase Price will be adjusted for any reorganization, recapitalization, non-cash dividend, stock split, or other similar transaction occurring during the trading day(s) used to compute the Purchase Price. We may deliver multiple Purchase Notices and VWAP Purchase Notices to Aspire Capital from time to time during the term of the Purchase Agreement, so long as the most recent purchase has been completed.

Minimum Share Price

Under the Purchase Agreement, we and Aspire Capital may not effect any sales of shares of our common stock under the Purchase Agreement on any trading day that the closing sale price of our common stock is less than the Floor Price.

Events of Default

Generally, Aspire Capital may terminate the Purchase Agreement upon the occurrence of any of the following, among other, events of default:

- the effectiveness of any registration statement that is required to be maintained effective pursuant to the terms of the Registration Rights Agreement between us and Aspire Capital lapses for any reason (including, without limitation, the issuance of a stop order) or is unavailable to Aspire Capital for sale of our shares of common stock, and such lapse or unavailability continues for a period of ten consecutive business days or for more than an aggregate of thirty business days in any 365-day period, which is not in connection with a post-effective amendment to any such registration statement; in connection with any post-effective amendment to such registration statement that is required to be declared effective by the SEC such lapse or unavailability may continue for a period of no more than 40 consecutive business days;
- the suspension from trading or failure of our common stock to be listed on our principal market for a period of three consecutive business days;
- the delisting of our common stock from our principal market, provided our common stock is not immediately thereafter trading on the New York Stock Exchange, the NYSE MKT, the Nasdaq Capital Market, the Nasdaq Global Select Market, the Nasdaq Global Market, the OTB Bulletin Board or the OTCQB marketplace or OTCQX marketplace of the OTC Markets Group;

- our transfer agent's failure to issue to Aspire Capital shares of our common stock which Aspire Capital is entitled to receive under the Purchase Agreement within five business days after an applicable purchase date;
- any breach by us of the representations or warranties or covenants contained in the Purchase Agreement or any related agreements which could have a material adverse effect on us, subject to a cure period of five business days;
- if we become insolvent or are generally unable to pay our debts as they become due; or
- any participation or threatened participation in insolvency or bankruptcy proceedings by or against us.

Our Termination Rights

The Purchase Agreement may be terminated by us at any time, at our discretion, without any penalty or cost to us.

No Short-Selling or Hedging by Aspire Capital

Aspire Capital has agreed that neither it nor any of its agents, representatives and affiliates shall engage in any direct or indirect short-selling or hedging of our common stock during any time prior to the termination of the Purchase Agreement.

Effect of Performance of the Purchase Agreement on Our Stockholders

The Purchase Agreement does not limit the ability of Aspire Capital to sell any or all of the 1,577,699 shares registered in this offering. It is anticipated that shares registered in this offering will be sold over a period of up to approximately 30 months after this registration statement is declared effective under the Securities Act. The sale by Aspire Capital of a significant amount of shares registered in this offering at any given time could cause the market price of our common stock to decline and/or to be highly volatile. Aspire Capital may ultimately purchase all, some or none of the 888,835 shares of common stock not yet issued but registered in this offering, and it may sell all, some or none of the shares issued to it by us (including the Initial Purchase Shares, the Commitment Shares and any shares issued to it in the future). Therefore, sales to Aspire Capital by us pursuant to the Purchase Agreement also may result in substantial dilution to the interests of other holders of our common stock. However, we have the right to control the timing and amount of any sales of our shares to Aspire Capital and the Purchase Agreement may be terminated by us at any time at our discretion without any penalty or cost to us.

Percentage of Outstanding Shares After Giving Effect to the Purchased Shares Issued to Aspire Capital

In connection with entering into the Purchase Agreement, we authorized the sale to Aspire Capital of up to \$10.0 million of our shares of common stock, \$1.0 million of which were issued to Aspire Capital upon the signing of the Purchase Agreement. The remaining \$9.0 million shares may be sold by us to Aspire Capital over a period of approximately 30 months after this registration statement is declared effective under the Securities Act. We estimate that we will sell no more than 888,835 additional shares to Aspire Capital under the Purchase Agreement (exclusive of the 188,864 Commitment Shares and the 500,000 Initial Purchase Shares), all of which are included in this offering. Subject to any required approval by our board of directors, we have the right but not the obligation to issue more than the 1,577,699 shares included in this prospectus to Aspire Capital under the Purchase Agreement. In the event we elect to issue more than 1,577,699 shares under the Purchase Agreement, we will be required to file a new registration statement and have it declared effective by the SEC. The number of shares ultimately offered for sale by Aspire Capital in this offering is dependent upon the number of shares purchased by Aspire Capital under the Purchase Agreement. The following table sets forth the number and percentage of outstanding shares to be held by Aspire Capital after giving effect to the sale of shares of common stock issued to Aspire Capital at varying purchase prices:

Assumed Average Purchase Price	Proceeds from the Sale of Additional Shares to Aspire Capital Under the Purchase Agreement Registered in this Offering	Number of Additional Shares to be Issued in this Offering at the Assumed Average Purchase Price (1)	Percentage of Outstanding Shares After Giving Effect to the Purchased Shares Issued to Aspire Capital (2)
\$ 1.50	\$ 1,333,253	888,835	17.8%
\$ 2.00	\$ 1,777,670	888,835	17.8%
\$ 2.50	\$ 2,222,088	888,835	17.8%
\$ 3.00	\$ 2,666,505	888,835	17.8%
\$ 5.00	\$ 4,444,175	888,835	17.8%
\$ 10.00	\$ 8,888,350	888,835	17.8%
\$ 10.13	\$ 9,000,000	888,450	17.8%
\$ 11.00	\$ 9,000,000	818,181	17.2%
\$ 15.00	\$ 9,000,000	600,000	15.3%

(1) Excludes 188,864 Commitment Shares and 500,000 Initial Purchase Shares issued under the Purchase Agreement between the Company and Aspire Capital.

(2) The denominator is based on 8,584,661 shares outstanding as of April 11, 2016, which includes the 500,000 Initial Purchase Shares and 188,864 Commitment Shares previously issued to Aspire Capital, and 112,400 shares purchased by Aspire Capital in the open market, plus the potential number of shares we may issue to Aspire Capital in the future under the Purchase Agreement.

USE OF PROCEEDS

This prospectus relates to shares of our common stock that may be offered and sold from time to time by Aspire Capital. We will not receive any proceeds upon the sale of shares by Aspire Capital. However, we have received proceeds of \$1.0 million, and may receive additional proceeds up to \$9.0 million, for an aggregate of \$10.0 million gross proceeds, under the Purchase Agreement with Aspire Capital. The proceeds received from the sale of the shares under the Purchase Agreement will be used for working capital and general corporate purposes, including research and development activities. This anticipated use of net proceeds from the sale of our common stock to Aspire Capital under the Purchase Agreement represents our intentions based upon our current plans and business conditions.

DESCRIPTION OF CAPITAL STOCK

General

Our authorized capital stock consists of 30,000,000 shares, all with a par value of \$0.001 per share, 25,000,000 of which are designated as common stock and 5,000,000 of which are designated as preferred stock.

The following description of our capital stock and certain provisions of our amended and restated certificate of incorporation and amended and restated bylaws are summaries and are qualified by reference to our amended and restated certificate of incorporation and our amended and restated bylaws.

All share numbers have been adjusted to reflect the 1-for-7.15 reverse stock split of our common stock. Preferred share issuances referred to below are as of their date of issuance. The preferred stock described below converted into shares of our common stock on a 7.15-for-1 basis prior to the closing of our initial public offering.

As of April 11, 2016, we had 8,584,661 shares of our common stock outstanding which includes the 500,000 Initial Purchase Shares and 188,864 Commitment Shares issued to Aspire Capital under the Purchase Agreement and zero shares of preferred stock outstanding. As of April 11, 2016, we also had outstanding options to acquire 1,962,877 shares of our common stock, having a weighted-average exercise price of \$7.01 per share, and warrants to purchase an aggregate of 578,323 shares of our common stock.

Common Stock

Pursuant to the terms of our amended and restated certificate of incorporation, the holders of common stock are entitled to one vote per share on all matters to be voted upon by the stockholders, except on matters relating solely to terms of preferred stock. Subject to preferences that may be applicable to any outstanding preferred stock, the holders of common stock will be entitled to receive ratably such dividends, if any, as may be declared from time to time by the board of directors out of funds legally available therefor. See 'Dividend Policy.' In the event of our liquidation, dissolution or winding up, the holders of our common stock will be entitled to share ratably in all assets remaining after payment of liabilities, subject to prior distribution rights of preferred stock, if any, then outstanding. The holders of our common stock will have no preemptive or conversion rights or other subscription rights. There will be no redemption or sinking fund provisions applicable to our common stock.

Warrants

In December 2014, we issued an aggregate of 2,369,228 shares of Series C preferred stock and warrants, or the 2014 Warrants, to purchase a like number of shares of our common stock, for aggregate gross proceeds of \$3,081,893. All of the shares of Series C preferred stock were converted into 331,358 shares of our common stock prior to the closing of the initial public offering. Each 2014 Warrant has a term of seven years and provides for the holder to purchase each share of our common stock covered thereby at a purchase price of \$9.30 per share of common stock.

In connection with the Series C Financing, all of the 2014 Notes were converted into shares of Series C preferred stock. A total of \$535,000 unpaid principal plus accrued interest of \$18,342 on the convertible notes converted into 567,529 shares of Series C preferred stock, which were later converted into 79,374 shares of our common stock prior to the closing of our initial public offering, and 79,374 2014 Warrants. A total of \$70,000 unpaid principal plus accrued interest of \$537 on a note payable was extinguished and converted into 54,259 shares of Series C preferred stock, which were later converted into 7,589 shares of our common stock prior to the closing of our initial public offering and 7,589 2014 Warrants.

Warrants to Representative in Initial Public Offering

In connection with our initial public offering, we issued to the representative of the underwriters warrants to purchase up to a total of 160,000 shares of common stock. The warrants are exercisable at any time, and from time to time, in whole or in part, during the four-year period commencing one year from the effective date of our initial public offering, and ending on the date that is five years from the effective date of the offering in compliance with FINRA Rule 5110(f)(2)(G)(i). The warrants are exercisable at a per share price equal to \$6.25 per share. The warrants provide for registration rights upon request, in certain cases. The demand registration right provided will not be greater than five years from the effective date of the offering in compliance with FINRA Rule 5110(f)(2)(G)(iv). The piggyback registration right provided will not be greater than seven years from the effective date of the offering in compliance with FINRA Rule 5110(f)(2)(G)(v). We will bear all fees and expenses attendant to registering the securities issuable on exercise of the warrants other than underwriting commissions incurred and payable by the holders. The exercise price and number of shares issuable upon exercise of the warrants may be adjusted in certain circumstances including in the event of a stock dividend or our recapitalization, reorganization, merger or consolidation. However, the warrant exercise price or underlying shares will not be adjusted for issuances of shares of common stock at a price below the warrant exercise price.

Preferred Stock

Pursuant to the terms of our amended and restated certificate of incorporation, our board of directors has the authority to issue preferred stock in one or more classes or series and to fix the designations, powers, preferences and rights, and the qualifications, limitations or restrictions thereof, including dividend rights, conversion right, voting rights, terms of redemption, liquidation preferences and the number of shares constituting any class or series, without further vote or action by the stockholders. Although we have no present plans to issue any shares of preferred stock, the issuance of shares of preferred stock, or the issuance of rights to purchase such shares, could decrease the amount of earnings and assets available for distribution to the holders of common stock, could adversely affect the rights and powers, including voting rights, of the common stock, and could have the effect of delaying, deterring or preventing a change of control of us or an unsolicited acquisition proposal.

Registration Rights

On September 15, 2008, we entered into an Investors' Rights Agreement with certain holders of our preferred stock. Such Investors' Rights Agreement was amended and restated on November 17, 2010. The Amended and Restated Investors' Rights Agreement was amended on each of January 13, 2011, February 6, 2012, December 4, 2014 and June 9, 2015. The Amended and Restated Investors' Rights Agreement, as amended, provides such holders with certain demand and piggyback registration rights with respect to shares of our common stock into which the shares of our preferred stock are convertible.

Aspire Capital Registration Rights

Concurrently with entering into the Purchase Agreement, we also entered into the Registration Rights Agreement, in which we agreed to file one or more registration statements as permissible and necessary to register under the Securities Act, the sale of the shares of our common stock that have been and may be issued to Aspire Capital under the Purchase Agreement. This registration statement is being registered pursuant to the Registration Rights Agreement.

Anti-Takeover Effects of Delaware Law and Our Amended and Restated Certificate of Incorporation and Amended and Restated Bylaws

The provisions of Delaware law and our amended and restated certificate of incorporation and amended and restated bylaws, could discourage or make it more difficult to accomplish a proxy contest or other change in our management or the acquisition of control by a holder of a substantial amount of our voting stock. It is possible that these provisions could make it more difficult to accomplish, or could deter, transactions that stockholders may otherwise consider to be in their best interests or in our best interests. These provisions are intended to enhance the likelihood of continuity and stability in the composition of our board of directors and in the policies formulated by the board of directors and to discourage certain types of transactions that may involve an actual or threatened change of our control. These provisions are designed to reduce our vulnerability to an unsolicited acquisition proposal and to discourage certain tactics that may be used in proxy fights. Such provisions also may have the effect of preventing changes in our management.

Delaware Statutory Business Combinations Provision. We are subject to the anti-takeover provisions of Section 203 of the Delaware General Corporation Law, or the DGCL. Section 203 prohibits a publicly-held Delaware corporation from engaging in a 'business combination' with an 'interested stockholder' for a period of three years after the date of the transaction in which the person became an interested stockholder, unless the business combination is, or the transaction in which the person became an interested stockholder was, approved in a prescribed manner or another prescribed exception applies. For purposes of Section 203, a 'business combination' is defined broadly to include a merger, asset sale or other transaction resulting in a financial benefit to the interested stockholder, and, subject to certain exceptions, an 'interested stockholder' is a person who, together with his or her affiliates and associates, owns, or within three years prior, did own, 15% or more of the corporation's voting stock.

Election and Removal of Directors. Except as may otherwise be provided by the DGCL, any director or the entire board of directors may be removed, with or without cause, at an annual meeting or a special meeting called for that purpose, by the affirmative vote of the majority of the votes cast by the shares of our capital stock present in person or represented by proxy at such meeting and entitled to vote thereon, provided a quorum is present. Vacancies on our board of directors resulting from the removal of directors and newly created directorships resulting from any increase in the number of directors may be filled solely by the affirmative vote of a majority of the remaining directors then in office (although less than a quorum) or by the sole remaining director. This system of electing and removing directors may discourage a third party from making a tender offer or otherwise attempting to obtain control of us, because it generally makes it more difficult for stockholders to replace a majority of our directors. Our amended and restated certificate of incorporation and amended and restated bylaws do not provide for cumulative voting in the election of directors.

Advance Notice Provisions for Stockholder Proposals and Stockholder Nominations of Directors. Our amended and restated bylaws provide that, for nominations to the board of directors or for other business to be properly brought by a stockholder before a meeting of stockholders, the stockholder must first have given timely notice of the proposal in writing to our Secretary. For an annual meeting, a stockholder's notice generally must be delivered not less than 90 days or more than 120 days prior to the anniversary of the previous year's annual meeting.

Special Meetings of Stockholders. Special meetings of the stockholders may be called at any time only by the board of directors, the Chairman of the board of directors, the Chief Executive Officer or the President, subject to the rights of the holders of any series of preferred stock then outstanding.

Blank-Check Preferred Stock. Our board of directors will be authorized to issue, without stockholder approval, preferred stock, the rights of which will be determined at the discretion of the board of directors and that, if issued, could operate as a 'poison pill' to dilute the stock ownership of a potential hostile acquirer to prevent an acquisition that our board of directors does not approve.

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is Corporate Stock Transfer, Inc.

SELLING STOCKHOLDER

The selling stockholder may from time to time offer and sell any or all of the shares of our common stock set forth below pursuant to this prospectus. When we refer to the 'selling stockholder' in this prospectus, we mean the entity listed in the table below, and its respective pledgees, donees, permitted transferees, assignees, successors and others who later come to hold any of the selling stockholder's interests in shares of our common stock other than through a public sale.

The following table sets forth, as of the date of this prospectus, the name of the selling stockholder for whom we have registered shares for sale to the public, the number of shares of common stock beneficially owned by the selling stockholder prior to this offering, the total number of shares of common stock that the selling stockholder may offer pursuant to this prospectus and the number of shares of common stock that the selling stockholder will beneficially own after this offering. Except as noted below, the selling stockholder does not have, or within the past three years has not had, any material relationship with us or any of our predecessors or affiliates and the selling stockholder is not or was not affiliated with registered broker-dealers.

Based on the information provided to us by the selling stockholder, assuming that the selling stockholder sells all of the shares of our common stock beneficially owned by it that have been registered by us and does not acquire any additional shares during the offering, the selling stockholder will not own any shares other than those appearing in the column entitled 'Beneficial Ownership After This Offering.' We cannot advise you as to whether the selling stockholder will in fact sell any or all of such shares of common stock. In addition, the selling stockholder may have sold, transferred or otherwise disposed of, or may sell, transfer or otherwise dispose of, at any time and from time to time, the shares of our common stock in transactions exempt from the registration requirements of the Securities Act of 1933 after the date on which it provided the information set forth in the table below.

<u>Name</u>	<u>Shares of Common Stock Beneficially Owned Prior to this Offering</u>	<u>Percentage of Outstanding Shares Beneficially Owned Prior to this Offering</u>	<u>Shares of Common to be Sold in the Offering</u>	<u>Beneficial Ownership After this Offering(1)</u>	
				<u>Number of Shares</u>	<u>%(2)</u>
Aspire Capital Fund, LLC(3)	801,264(4)	9.3%	1,577,699	112,400	1.3%

(1) Assumes the sale of all shares of common stock registered pursuant to this prospectus, although the selling stockholder is under no obligation known to us to sell any shares of common stock at this time.

(2) Based on 8,584,661 shares of common stock outstanding on April 11, 2016.

(3) Aspire Capital Partners LLC, or Aspire Partners, is the Managing Member of Aspire Capital Fund LLC, or Aspire Fund. SGM Holdings Corp, or SGM, is the Managing Member of Aspire Partners. Mr. Steven G. Martin is the president and sole shareholder of SGM, as well as a principal of Aspire Partners. Mr. Erik J. Brown is the president and sole shareholder of Red Cedar Capital Corp., or Red Cedar, which is a principal of Aspire Partners. Mr. Christos Komissopoulos is president and sole shareholder of Chrisko Investors Inc., or Chrisko, which is a principal of Aspire Partners. Each of Aspire Partners, SGM, Red Cedar, Chrisko, Mr. Martin, Mr. Brown, and Mr. Komissopoulos may be deemed to be a beneficial owner of common stock held by Aspire Fund. Each of Aspire Partners, SGM, Red Cedar, Chrisko, Mr. Martin, Mr. Brown, and Mr. Komissopoulos disclaims beneficial ownership of the common stock held by Aspire Fund.

(4) As of the date hereof, Aspire Capital holds 801,264 shares of our common stock, which includes 688,864 shares of our common stock that have been acquired by Aspire Capital under the Purchase Agreement (consisting of the 500,000 Initial Purchase Shares sold to Aspire Capital and the 188,864 shares we issued to Aspire Capital as a commitment fee) and 112,400 shares of our common stock that were purchased by Aspire Capital in the open market (based upon information provided to us by Aspire Capital). We may elect in our sole discretion to sell to Aspire Capital up to an additional 888,835 shares under the Purchase Agreement, but Aspire Capital does not presently beneficially own those shares as determined in accordance with the rules of the SEC.

PLAN OF DISTRIBUTION

The common stock offered by this prospectus is being offered by Aspire Capital, the selling stockholder. The common stock may be sold or distributed from time to time by the selling stockholder directly to one or more purchasers or through brokers, dealers, or underwriters who may act solely as agents at market prices prevailing at the time of sale, at prices related to the prevailing market prices, at negotiated prices, or at fixed prices, which may be changed. The sale of the common stock offered by this prospectus may be effected in one or more of the following methods:

- ordinary brokers' transactions;
- transactions involving cross or block trades;
- through brokers, dealers, or underwriters who may act solely as agents;
- 'at the market' into an existing market for the common stock;
- in other ways not involving market makers or established business markets, including direct sales to purchasers or sales effected through agents;
- in privately negotiated transactions; or
- any combination of the foregoing.

In order to comply with the securities laws of certain states, if applicable, the shares may be sold only through registered or licensed brokers or dealers. In addition, in certain states, the shares may not be sold unless they have been registered or qualified for sale in the state or an exemption from the registration or qualification requirement is available and complied with.

The selling stockholder may also sell shares of common stock under Rule 144 promulgated under the Securities Act, if available, rather than under this prospectus. In addition, the selling stockholder may transfer the shares of common stock by other means not described in this prospectus.

Brokers, dealers, underwriters, or agents participating in the distribution of the shares as agents may receive compensation in the form of commissions, discounts, or concessions from the selling stockholder and/or purchasers of the common stock for whom the broker-dealers may act as agent. Aspire Capital has informed us that each such broker-dealer will receive commissions from Aspire Capital which will not exceed customary brokerage commissions.

Aspire Capital is an 'underwriter' within the meaning of the Securities Act.

Neither we nor Aspire Capital can presently estimate the amount of compensation that any agent will receive. We know of no existing arrangements between Aspire Capital, any other stockholder, broker, dealer, underwriter, or agent relating to the sale or distribution of the shares offered by this prospectus. At the time a particular offer of shares is made, a prospectus supplement, if required, will be distributed that will set forth the names of any agents, underwriters, or dealers and any compensation from the selling stockholder, and any other required information.

We will pay all of the expenses incident to the registration, offering, and sale of the shares to the public other than commissions or discounts of underwriters, broker-dealers, or agents. We have agreed to indemnify Aspire Capital and certain other persons against certain liabilities in connection with the offering of shares of common stock offered hereby, including liabilities arising under the Securities Act or, if such indemnity is unavailable, to contribute amounts required to be paid in respect of such liabilities. Aspire Capital has agreed to indemnify us against liabilities under the Securities Act that may arise from certain written information furnished to us by Aspire Capital specifically for use in this prospectus or, if such indemnity is unavailable, to contribute amounts required to be paid in respect of such liabilities.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to our directors, officers, and controlling persons, we have been advised that in the opinion of the SEC this indemnification is against public policy as expressed in the Securities Act and is therefore, unenforceable.

Aspire Capital and its affiliates have agreed not to engage in any direct or indirect short selling or hedging of our common stock during the term of the Purchase Agreement.

We have advised Aspire Capital that while it is engaged in a distribution of the shares included in this prospectus it is required to comply with Regulation M promulgated under the Securities Exchange Act of 1934, as amended. With certain exceptions, Regulation M precludes the selling stockholder, any affiliated purchasers, and any broker-dealer or other person who participates in the distribution from bidding for or purchasing, or attempting to induce any person to bid for or purchase any security which is the subject of the distribution until the entire distribution is complete. Regulation M also prohibits any bids or purchases made in order to stabilize the price of a security in connection with the distribution of that security. All of the foregoing may affect the marketability of the shares offered hereby this prospectus.

We may suspend the sale of shares by Aspire Capital pursuant to this prospectus for certain periods of time for certain reasons, including if the prospectus is required to be supplemented or amended to include additional material information.

This offering will terminate on the date that all shares offered by this prospectus have been sold by Aspire Capital.

LEGAL MATTERS

Reed Smith LLP, Los Angeles, California will pass upon the validity of the shares of common stock offered hereby.

EXPERTS

Mayer Hoffman McCann P.C., our independent registered public accounting firm, has audited our balance sheets as of December 31, 2015 and 2014, and the related statements of operations, changes in securities subject to redemption and shareholders' deficit and cash flows for each of the two years in the period ended December 31, 2015, as set forth in their report, which report expresses an unqualified opinion and includes an explanatory paragraph relating to our ability to continue as a going concern, and has been incorporated by reference in this prospectus and in this registration statement in reliance on the report of Mayer Hoffman McCann P.C. given on their authority as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We have filed with the SEC a Registration Statement on Form S-1 under the Securities Act in connection with this offering of our common stock by our selling stockholder. This Prospectus, which constitutes a part of the Registration Statement, does not contain all of the information set forth in the registration statement, some items of which are contained in exhibits to the Registration Statement as permitted by the rules and regulations of the SEC. For further information with respect to us and our common stock, we refer you to the Registration Statement, including the exhibits and the financial statements and notes filed as a part of the Registration Statement. Statements contained in this prospectus concerning the contents of any contract or any other document are not necessarily complete. If a contract or document has been filed as an exhibit to the Registration Statement, please see the copy of the contract or document that has been filed. Each statement in this prospectus relating to a contract or document filed as an exhibit is qualified in all respects by the filed exhibit. The exhibits to the Registration Statement should be referenced for the complete contents of these contracts and documents. A copy of the Registration Statement and the exhibits filed therewith may be inspected without charge at the public reference room of the SEC, located at 100 F Street, N.E., Room 1580, Washington, D.C. 20549. You may obtain information on the operation of the public reference rooms by calling the SEC at 1-800-SEC-0330. The SEC also maintains an Internet website that contains reports, proxy statements, and other information about issuers, like us, that file electronically with the SEC. The address of that website is www.sec.gov.

We are subject to the information and reporting requirements of the Exchange Act and, in accordance with this law, we file periodic reports, proxy statements, and other information with the SEC. These periodic reports, proxy statements, and other information are available for inspection and copying at the SEC's public reference facilities and the website of the SEC referred to above. We also maintain a website at www.ritterpharmaceuticals.com. You may access our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act with the SEC free of charge at our website (www.ritterpharmaceutical.com) as soon as reasonably practicable after such material is electronically filed with, or furnished to, the SEC. The information contained in, or that can be accessed through, our website is not incorporated by reference into this Prospectus.

INFORMATION INCORPORATED BY REFERENCE

The SEC allows us to 'incorporate by reference' the information we file with it, which means that we can disclose important information to you by referring you to those documents. The information incorporated by reference is considered to be part of this prospectus. We incorporate by reference the documents listed below:

- Our Annual Report on Form 10-K for the fiscal year ended December 31, 2015, which we filed with the SEC on March 21, 2016;
- Our definitive proxy statement, and definitive additional materials, on Schedule 14A, which we filed with the SEC on April 21, 2016;
- Our Quarterly Report on Form 10-Q for the fiscal quarter ended March 31, 2016, which we filed with the SEC on May 9, 2016;
- Our Current Report on Form 8-K filed with the SEC on January 5, 2016; and
- The description of our common stock contained in our registration statement on Form 8-A filed on June 15, 2015 (Registration no. 001-37428) with the SEC, including any amendment or report filed for the purpose of updating such description.

We also incorporate by reference all documents that we subsequently file with the SEC pursuant to Section 13(a), 13(c), 14 or 15(d) of the Exchange Act (i) after the date of the initial registration statement of which this prospectus forms a part and prior to the effectiveness of such registration statement and (ii) after the date of this prospectus and prior to the termination of this offering, unless we specifically provide otherwise in each case, (excluding any information furnished and not filed with the SEC). Information that we file with the SEC will automatically update and may replace information previously filed with the SEC.

We will provide without charge to each person, including any beneficial owner, to whom this prospectus is delivered, upon his or her written or oral request, a copy of any or all documents referred to above which have been or may be incorporated by reference into this prospectus but not delivered with this prospectus excluding exhibits to those documents unless they are specifically incorporated by reference into those documents. You can request those documents from us, at no cost, by writing or telephoning us at: Ritter Pharmaceuticals, Inc., 1880 Century Park East, #1000, Los Angeles, CA 90067, Attn: Vice President Finance, or by calling (310) 203-1000.

You also may access the incorporated reports and other documents referenced above on our website at www.ritterpharmaceuticals.com. The information contained on, or that can be accessed through, our website is not part of this prospectus.

Information furnished under Items 2.02 or 7.01 (or corresponding information furnished under Item 9.01 or included as an exhibit) in any past or future Current Report on Form 8-K that we file with the SEC, unless otherwise specified in such report, is not incorporated by reference in this prospectus.

1,577,699 Shares
Common Stock



PROSPECTUS

, 2016

PART II

INFORMATION NOT REQUIRED IN PROSPECTUS

Item 13. Other Expenses of Issuance and Distribution

The following table sets forth the estimated costs and expenses to be incurred in connection with the issuance and distribution of the securities registered under this Registration Statement. All the amounts shown are estimates except the SEC registration fee.

	Total
SEC registration fee	\$ 299
Printing and engraving expenses	\$ 250
Legal fees and expenses	\$ 100,000
Accounting fees and expenses	\$ 25,000
NASDAQ listing fee	\$ 5,000
Transfer agent and registrar fees	\$ 5,000
Miscellaneous fees and expenses	\$ —
Total	<u>\$ 135,549</u>

Item 14. Indemnification of Directors and Officers

Our amended and restated certificate of incorporation provides that we shall indemnify, to the fullest extent authorized by the Delaware General Corporation Law, each person who is involved in any litigation or other proceeding because such person is or was a director or officer of Ritter Pharmaceuticals, Inc. or is or was serving as an officer or director of another entity at our request, against all expense, loss or liability reasonably incurred or suffered in connection therewith. Our amended and restated certificate of incorporation provides that the right to indemnification includes the right to be paid expenses incurred in defending any proceeding in advance of its final disposition, provided, however, that such advance payment will only be made upon delivery to us of an undertaking, by or on behalf of the director or officer, to repay all amounts so advanced if it is ultimately determined that such director is not entitled to indemnification. If we do not pay a proper claim for indemnification in full within 30 days after we receive a written claim for such indemnification, our certificate of incorporation and our bylaws authorize the claimant to bring an action against us and prescribe what constitutes a defense to such action.

Section 145 of the Delaware General Corporation Law permits a corporation to indemnify any director or officer of the corporation against expenses (including attorney's fees), judgments, fines and amounts paid in settlement actually and reasonably incurred in connection with any action, suit or proceeding brought by reason of the fact that such person is or was a director or officer of the corporation, if such person acted in good faith and in a manner that he reasonably believed to be in, or not opposed to, the best interests of the corporation, and, with respect to any criminal action or proceeding, if he or she had no reason to believe his or her conduct was unlawful. In a derivative action, (*i.e.*, one brought by or on behalf of the corporation), indemnification may be provided only for expenses actually and reasonably incurred by any director or officer in connection with the defense or settlement of such an action or suit if such person acted in good faith and in a manner that he or she reasonably believed to be in, or not opposed to, the best interests of the corporation, except that no indemnification shall be provided if such person shall have been adjudged to be liable to the corporation, unless and only to the extent that the court in which the action or suit was brought shall determine that the defendant is fairly and reasonably entitled to indemnity for such expenses despite such adjudication of liability.

Pursuant to Section 102(b)(7) of the Delaware General Corporation Law, our certificate of incorporation eliminates the liability of a director to us or our stockholders for monetary damages for such a breach of fiduciary duty as a director, except for liabilities arising:

- from any breach of the director's duty of loyalty to us or our stockholders;
- from acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law;
- under Section 174 of the Delaware General Corporation Law; or
- from any transaction from which the director derived an improper personal benefit.

We carry insurance policies insuring our directors and officers against certain liabilities that they may incur in their capacity as directors and officers.

In addition, we have entered into indemnification agreements with each of our current directors and executive officers. These agreements require us to indemnify these individuals to the fullest extent permitted under Delaware law against liabilities that may arise by reason of their service to us and to advance expenses incurred as a result of any proceeding against them as to which they could be indemnified. We also intend to enter into indemnification agreements with our future directors and executive officers.

Item 15. Recent Sales of Unregistered Securities

In the three years preceding the filing of this registration statement, we have issued the following securities that were not registered under the Securities Act. The following issuances have been adjusted to reflect the 1-for-7.15 reverse stock split of our common stock. Preferred share issuances referred to below are as of their date of issuance. The preferred stock described below converted into shares of our common stock on a 7.15-for-1 basis prior to the closing of our initial public offering.

(a) Issuances of Capital Stock

In November 2013, we entered into a Series B Preferred Stock Purchase Agreement with certain investors raising approximately \$500,000, selling 419,995 shares of Series B preferred stock. Also in November 2013, we converted a total of approximately \$135,000 in convertible notes, including accrued interest of approximately \$9,000, into 103,235 shares of Series B preferred stock.

On December 4, 2014, we issued an aggregate of 1,149,397 shares of our Series C Preferred Stock and warrants to purchase an aggregate of 160,754 shares of our common stock to certain investors, including Javelin and Javelin SPV, in the Initial Series C Closing pursuant to the Series C Preferred Stock Purchase Agreement. The aggregate purchase price paid by the investors was approximately \$1.31 million (consisting of cash and cancellation of certain promissory notes issued in 2014, as described below).

On December 8, 2014, we issued an aggregate of 1,833,927 shares of our Series C Preferred Stock and warrants to purchase an aggregate of 256,493 shares of our common stock to Javelin SPV in our Second Series C Closing pursuant to the Series C Preferred Stock Purchase Agreement. The aggregate purchase price paid by Javelin was approximately \$2.39 million.

On December 19, 2014, we issued an aggregate of 7,692 shares of our Series C Preferred Stock and warrants to purchase an aggregate of 1,075 shares of our common stock to one investor in our Third Series C Closing pursuant to the Series C Preferred Stock Purchase Agreement. The aggregate purchase price paid by the investor was \$10,007.

As consideration for Ricerche Sperimentali Montale SpA, or RSM, entering into Amendment No. 2 to the Clinical Supply and Cooperation Agreement, on November 30, 2015, we issued 100,000 shares of common stock to RSM pursuant to a stock purchase agreement, dated as of November 30, 2015.

On December 18, 2015, we entered into the Common Stock Purchase Agreement with Aspire Capital Fund, LLC, or Aspire Capital, which provides that, upon the terms and subject to the conditions and limitations set forth in the agreement, Aspire Capital is committed to purchase up to an aggregate of \$10.0 million shares of our common stock, or the Purchase Shares, over the 30-month term of the agreement. Pursuant to the terms of this agreement, Aspire Capital purchased 500,000 shares of our common stock at \$2.00 per share and we issued 188,864 shares of our common stock to Aspire Capital in consideration for entering into the agreement. The Purchase Shares may be sold by us to Aspire Capital on any business day we select in two ways: (i) through a regular purchase of up to 100,000 shares at a known price based on the market price of our common stock prior to the time of each sale, and (ii) through a VWAP purchase of a number of shares up to 30% of the volume traded on the purchase date at a price equal to the lesser of the closing sale price or 97% of the volume weighted average price for such purchase date.

Except with respect to the Aspire Capital transaction, no underwriters were used in the foregoing transactions. The securities described above were issued and sold in reliance on the exemptions from registration provided by Section 4(a)(2) of the Securities Act and/or Rule 506 of Regulation D promulgated under the Securities Act. Each of the purchasers in these transactions represented to us in connection with its purchase that it was acquiring the securities for investment and not for distribution and that it could bear the risks of the investment. Each purchaser received written disclosures that the securities had not been registered under the Securities Act and that any resale must be made pursuant to a registration statement or an available exemption from registration. All of the foregoing securities were deemed restricted securities for the purposes of the Securities Act, except for the securities that have been issued to or will be issued to Aspire Capital, which are being registered for sale by Aspire Capital in this prospectus.

(b) Promissory Notes

In November 2013, we converted \$37,500 of accounts payable into a note payable resulting from a compromise settlement with a vendor to complete satisfaction of all rights, claims, causes of action, indebtedness, and assertions that the vendor may have against us. The note payable had a term of one year and required payments of \$3,000 per month. The note payable had no stated interest rate and, due to the short-term nature of the note, we did not impute interest on the note. The outstanding balance of the note was \$31,500 as of December 31, 2013. This note payable was fully paid during 2014.

We issued two subordinated convertible notes with principal amounts of \$25,000 and \$350,000 on May 23, 2014, an \$80,000 principal amount subordinated convertible note on September 8, 2014, and an \$80,000 principal amount subordinated convertible note on October 20, 2014, which notes bore interest at a rate of 8% per annum until paid in full. Each of these notes was converted into shares of Series C preferred stock in the Series C Financing.

In addition, we issued a \$70,000 principal amount unsecured promissory note on October 9, 2014. This note bore interest at a rate of 5% per annum until paid in full. This note was converted into shares of Series C preferred stock in the Series C Financing.

No underwriters were used in the foregoing transactions. The securities described above were issued and sold in reliance on the exemptions from registration provided by Section 4(a)(2) of the Securities Act and/or Rule 506 of Regulation D promulgated under the Securities Act. Each of the purchasers in these transactions represented to us in connection with its purchase that it was acquiring the securities for investment and not for distribution and that it could bear the risks of the investment. Each purchaser received written disclosures that the securities had not been registered under the Securities Act and that any resale must be made pursuant to a registration statement or an available exemption from registration. All of the foregoing securities were deemed restricted securities for the purposes of the Securities Act.

(c) Grants and Exercises of Stock Options

Since December 1, 2011, we have granted stock options to purchase an aggregate of 1,786,759 shares of our common stock, with 62,116 of such stock options having an exercise price of \$1.14 per share (of which 33,855 have forfeited as of December 31, 2014), 1,066,567 of such stock options having an exercise price of \$5.86 per share, 97,902 of such stock options having an exercise price of \$1.27, 280,086 of such stock options having an exercise price of \$9.29, and 280,086 of such stock options having an exercise price of \$13.22 per share to employees and non-employees pursuant to our stock plans.

As described in the section entitled 'Outstanding Equity Awards at Fiscal Year-End,' we also granted an option to Michael Step on December 2, 2014 for a number of shares of common stock as would, together with the 646,537 shares subject to the option granted to Mr. Step on December 2, 2014, represent in the aggregate 7.5% of the shares of common stock deemed to be outstanding on a fully-diluted basis as of the date that we raised in the aggregate a minimum of \$15,000,000 in one or more private and/or public offerings, or a Qualified Financing, after giving effect to (i) the issuance of the shares issued in the Qualified Financing, (ii) the issuance of this option, and (iii) any adjustments. This option became exercisable upon the closing of our initial public offering on June 29, 2015. Pursuant to the terms of the agreement, the option is exercisable for a total of 163,799 shares of our common stock, which, together with the shares subject to an option granted to Mr. Step on December 2, 2014 to purchase 646,537 shares, represents 7.5% of the shares of common stock deemed to be outstanding at June 29, 2015 on a fully-diluted basis, after giving effect to the number of shares subject to this option.

No underwriters were used in the foregoing transactions. The securities were issued in reliance on the exemptions from registration provided by Section 4(a)(2) of the Securities Act and/or Rule 701 promulgated under Section 3(b) of the Securities Act as a transaction pursuant to a compensatory benefit plan or contract relating to compensation. Each purchaser received written disclosures that the securities had not been registered under the Securities Act and that any resale must be made pursuant to a registration statement or an available exemption from registration. All of the foregoing securities were deemed restricted securities for the purposes of the Securities Act.

(d) Prepaid Forward Sale of Preferred Stock

On November 30, 2010, we concurrently entered into a Research and Development Agreement & License, or the R&D Agreement, and a Put and Call Option Agreement, or the KPM Option Agreement, with two commonly controlled entities, Kolu Pohaku Technologies, LLC, or KPT, and Kolu Pohaku Management, LLC, or KPM. The agreement was subsequently amended on, July 6, 2011, September 30, 2011, February 6, 2012 and November 4, 2013 to increase the funding received by us.

Pursuant to the terms of the KPM Option Agreement, we had the right to put to KPM and KPM had the right to call from us 1,469,994 shares of our Series B preferred stock at any time after December 31, 2014. The number of shares was determined by dividing the \$1,750,000 of payments made by KPT to us under the R&D Agreement by the Series B preferred stock original issue price of \$1.19 per share. On March 26, 2015, we exercised our right to put the KPM Option and issued 1,469,994 shares of Series B preferred stock to KPM.

Item 16. Exhibits and Financial Statement Schedules

(a) Exhibits

See the Exhibit Index on the page immediately preceding the exhibits for a list of exhibits filed as part of this registration statement on Form S-1, which Exhibit Index is incorporated herein by reference.

(b) Financial Statement Schedules

Schedules have been omitted because the information required to be set forth therein is not required or is shown either in the financial statements or notes thereto.

Item 17. Undertakings

(a) The undersigned registrant hereby undertakes:

- (1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:
 - (i) To include any prospectus required by Section 10(a)(3) of the Securities Act of 1933;
 - (ii) To reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Commission pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than 20 percent change in the maximum aggregate offering price set forth in the 'Calculation of Registration Fee' table in the effective registration statement;
 - (iii) To include any material information with respect to the plan of distribution not previously disclosed in the registration statement or any material change to such information in the registration statement;
 - (2) That, for the purpose of determining any liability under the Securities Act of 1933, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.
 - (3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.
 - (4) That, for the purpose of determining liability under the Securities Act of 1933 to any purchaser: each prospectus filed pursuant to Rule 424(b) as part of a registration statement relating to an offering, other than registration statements relying on Rule 430B or other than prospectuses filed in reliance on Rule 430A, shall be deemed to be part of and included in the registration statement as of the date it is first used after effectiveness; *provided, however*, that no statement made in a registration statement or prospectus that is part of the registration statement or made in a document incorporated or deemed incorporated by reference into the registration statement or prospectus that is part of the registration statement will, as to a purchaser with a time of contract of sale prior to such first use, supersede or modify any statement that was made in the registration statement or prospectus that was part of the registration statement or made in any such document immediately prior to such date of first use.
- (b) The undersigned registrant hereby undertakes that, for purposes of determining any liability under the Securities Act of 1933, each filing of the registrant's annual report pursuant to section 13(a) or section 15(d) of the Securities Exchange Act of 1934 (and, where applicable, each filing of an employee benefit plan's annual report pursuant to section 15(d) of the Securities Exchange Act of 1934) that is incorporated by reference in the registration statement shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.
- (c) Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the registrant pursuant to the provisions described under Item 14 above, or otherwise, the registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the registrant of expenses incurred or paid by a director, officer or controlling person of the registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, as amended, the Registrant has duly caused this Post-Effective Amendment No. 2 to the Registration Statement on Form S-1 to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Los Angeles, California, on the 1st day of June, 2016.

ITTER PHARMACEUTICALS, INC.

By: /s/ Michael D. Step
Name: Michael D. Step
Title: Chief Executive Officer

Pursuant to the requirements of the Securities Act of 1933, as amended, this Post-Effective Amendment No. 2 to the Registration Statement has been signed by the following persons in the capacities and on the dates indicated below.

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Michael D. Step</u> Michael D. Step	Chief Executive Officer and Director (Principal Executive Officer)	June 1, 2016
<u>/s/ Ellen Mochizuki</u> Ellen Mochizuki	Vice President Finance (Principal Financial and Accounting Officer)	June 1, 2016
<u>/s/ Ira E. Ritter</u> Ira E. Ritter	Executive Chairman, Chief Strategic Officer and Director	June 1, 2016
<u>/s/ Andrew J. Ritter</u> Andrew J. Ritter	President and Director	June 1, 2016
<u>*</u> Noah Doyle	Director	June 1, 2016
<u>*</u> Matthew W. Foehr	Director	June 1, 2016
<u>*</u> Paul V. Maier	Director	June 1, 2016
<u>*</u> Gerald T. Proehl	Director	June 1, 2016

By: /s/ Andrew J. Ritter
Andrew J. Ritter
Attorney-in-fact

EXHIBIT INDEX

Exhibit No.	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
3.1	Amended and Restated Certificate of Incorporation of Ritter Pharmaceuticals, Inc.	8-K	001-37428	3.1	7/1/2015
3.2	Amended and Restated Bylaws of Ritter Pharmaceuticals, Inc.	8-K	001-37428	3.2	7/1/2015
4.1	Form of Common Stock Certificate of Ritter Pharmaceuticals, Inc.	S-1/A	333-202924	4.1	5/22/2015
4.2	Amended and Restated Investors' Rights Agreement, dated as of November 17, 2010, by and among Ritter Pharmaceuticals, Inc. and the persons and entities named therein	S-1	333-202924	4.2	3/23/2015
4.3	Amendment No. 1 to the Amended and Restated Investors' Rights Agreement, dated as of January 13, 2011, by and among Ritter Pharmaceuticals, Inc. and the persons and entities named therein	S-1	333-202924	4.3	3/23/2015
4.4	Amendment No. 2 to the Amended and Restated Investors' Rights Agreement, dated as of February 6, 2012, by and among Ritter Pharmaceuticals, Inc. and the persons and entities named therein	S-1	333-202924	4.4	3/23/2015
4.5	Amendment No. 3 to the Amended and Restated Investors' Rights Agreement, dated as of December 4, 2014, by and among Ritter Pharmaceuticals, Inc. and the persons and entities named therein	S-1	333-202924	4.5	3/23/2015
4.6	Amendment No. 4 to the Amended and Restated Investors' Rights Agreement, by and among Ritter Pharmaceuticals, Inc. and the persons and entities named therein	S-1	333-208818	4.6	12/31/2015
4.7	Form of Common Stock Purchase Warrant	S-1	333-208818	4.7	12/31/2015
4.8	Form of Representative's Warrant Agreement	S-1/A	333-202924	4.7	5/8/2015
4.9	Registration Rights Agreement, dated December 18, 2015, by and between Ritter Pharmaceuticals, Inc. and Aspire Capital Fund, LLC	8-K	001-37428	4.1	12/21/2015
5.1	Opinion of Reed Smith LLP	S-1	333-208818	5.1	12/31/2015
10.1	Office Lease, dated June 25, 2013, by and between Douglas Emmett 1997, LLC and Ritter Pharmaceuticals, Inc.	S-1	333-202924	10.1	5/8/2015
10.2+	Offer Letter, dated December 2, 2014, by and between Michael D. Step and Ritter Pharmaceuticals, Inc.	S-1	333-202924	10.2	5/8/2015
10.3+	Executive Compensation Plan	S-1	333-202924	10.3	5/8/2015
10.4+	Executive Severance & Change in Control Agreement, dated October 1, 2014, by and between Ritter Pharmaceuticals, Inc. and Michael D. Step	S-1	333-202924	10.4	5/8/2015
10.5+	2008 Stock Plan	S-8	333-207709	99.1	10/30/15
10.6+	2009 Stock Plan	S-1	333-202924	10.6	3/23/2015
10.7+	2015 Equity Incentive Plan	S-8	333-207709	99.3	10/30/15
10.8+	Form of Notice of Grant of Stock Option under the 2015 Equity Incentive Plan	S-8	333-207709	99.4	10/30/15
10.9+	Stock Option Agreement, dated December 2, 2014, by and between Ritter Pharmaceuticals, Inc. and Michael D. Step	S-1	333-202924	10.8	5/8/2015
10.10+	Stock Option Agreement, dated December 2, 2014, by and between Ritter Pharmaceuticals, Inc. and Michael D. Step	S-1	333-202924	10.9	5/8/2015

10.11+	Stock Option Agreement, dated December 2, 2014, by and between Ritter Pharmaceuticals, Inc. and Michael D. Step	S-1	333-202924	10.10	5/8/2015
10.12+	Stock Option Agreement, dated September 25, 2013, by and between Ritter Pharmaceuticals, Inc. and Andrew J. Ritter	S-1	333-202924	10.11	5/8/2015
10.13+	Stock Option Agreement, dated December 2, 2014, by and between Ritter Pharmaceuticals, Inc. and Andrew J. Ritter	S-1	333-202924	10.12	5/8/2015
10.14+	Stock Option Agreement, dated December 2, 2014, by and between Ritter Pharmaceuticals, Inc. and Andrew J. Ritter	S-1	333-202924	10.13	5/8/2015
10.15+	Stock Option Agreement, dated September 25, 2013, by and between Ritter Pharmaceuticals, Inc. and Ira E. Ritter	S-1	333-202924	10.14	5/8/2015
10.16+	Stock Option Agreement, dated December 2, 2014, by and between Ritter Pharmaceuticals, Inc. and Ira E. Ritter	S-1	333-202924	10.15	5/8/2015
10.17+	Stock Option Agreement, dated December 2, 2014, by and between Ritter Pharmaceuticals, Inc. and Ira E. Ritter	S-1	333-202924	10.16	5/8/2015
10.18	Research and Development Agreement & License, dated November 30, 2010, by and among Kolu Pohaku Technologies, LLC, Kolu Pohaku Management, LLC and Ritter Pharmaceuticals, Inc.	S-1	333-202924	10.17	5/8/2015
10.19	Amendment No. 1 to Research and Development Agreement & License, dated July 6, 2011, by and among Kolu Pohaku Technologies, LLC, Kolu Pohaku Management, LLC and Ritter Pharmaceuticals, Inc.	S-1	333-202924	10.18	5/8/2015
10.20	Amendment No. 2 to Research and Development Agreement & License, dated September 30, 2011, by and among Kolu Pohaku Technologies, LLC, Kolu Pohaku Management, LLC and Ritter Pharmaceuticals, Inc.	S-1	333-202924	10.19	5/8/2015
10.21	Amendment No. 3 to Research and Development Agreement & License, dated February 6, 2012, by and among Kolu Pohaku Technologies, LLC, Kolu Pohaku Management, LLC and Ritter Pharmaceuticals, Inc.	S-1	333-202924	10.20	5/8/2015
10.22	Amendment No. 4 to Research and Development Agreement & License, dated November 4, 2013, by and among Kolu Pohaku Technologies, LLC, Kolu Pohaku Management, LLC and Ritter Pharmaceuticals, Inc.	S-1	333-202924	10.21	5/8/2015
10.23	Put and Call Option Agreement, dated November 30, 2010, by and between Kolu Pohaku Technologies, LLC and Ritter Pharmaceuticals, Inc.	S-1	333-202924	10.22	5/8/2015
10.24	Subordinated Convertible Promissory Note to SJ Investment Company, LLC, dated May 23, 2014, in the principal amount of \$25,000.00	S-1	333-202924	10.23	5/8/2015
10.24	Subordinated Convertible Promissory Note to Javelin Venture Partners, L.P., dated May 23, 2014, in the principal amount of \$350,000.00	S-1	333-202924	10.24	5/8/2015
10.26	Subordinated Convertible Promissory Note to Javelin Venture Partners, L.P., dated September 8, 2014, in the principal amount of \$80,000.00	S-1	333-202924	10.25	5/8/2015
10.27	Unsecured Promissory Note to Javelin Venture Partners, L.P., dated October 9, 2014, in the principal amount of \$70,000.00	S-1	333-202924	10.26	5/8/2015
10.28	Subordinated Convertible Promissory Note, dated October 20, 2014, in the principal amount of \$80,000.00	S-1	333-202924	10.27	5/8/2015
10.29	Series C Preferred Stock and Warrant Purchase Agreement, dated December 4, 2014, by and among Ritter Pharmaceuticals, Inc. and the Investors named therein	S-1	333-202924	10.28	5/8/2015
10.30+	Form of Indemnification Agreement between Ritter Pharmaceuticals, Inc. and each of its directors and executive officers	S-1/A	333-202924	10.29	4/24/2015
10.31	Clinical Supply and Operation Agreement, dated December 16, 2009, by and among Ritter Pharmaceuticals, Inc. and Ricerche Sperimentali Montale SpA and Inalco SpA	S-1/A	333-202924	10.30	4/24/2015

10.32	Amendment 1 to the Clinical Supply and Cooperation Agreement, dated September 25, 2010, by and among Ritter Pharmaceuticals, Inc. and Ricerche Sperimentali Montale SpA and Inalco SpA	S-1/A	333-202924	10.31	4/24/2015
10.33+	Offer Letter, by and between Ritter Pharmaceuticals, Inc. and Andrew J. Ritter	10-Q	001-37428	10.1	8/12/2015
10.34+	Offer Letter, by and between Ritter Pharmaceuticals, Inc. and Ira E. Ritter	10-Q	001-37428	10.2	8/12/2015
10.35+	Executive Severance & Change in Control Agreement, by and between Ritter Pharmaceuticals, Inc. and Andrew J. Ritter	10-Q	001-37428	10.3	8/12/2015
10.36+	Executive Severance & Change in Control Agreement, by and between Ritter Pharmaceuticals, Inc. and Ira E. Ritter	10-Q	001-37428	10.4	8/12/2015
10.37	Lease Agreement, dated July 9, 2015, between the Company and Century Park	10-Q	001-37428	10.1	11/10/2015
10.38	Amendment No. 2 to Clinical Supply and Cooperation Agreement, effective July 24, 2015, between Ritter Pharmaceuticals, Inc., Ricerche Sperimentali Montale SpA, and Inalco SpA	10-Q	001-37428	10.2	11/10/2015
10.39+	Offer Letter, dated August 14, 2015, by and between Ritter Pharmaceuticals, Inc. and Ellen Mochizuki	10-Q	001-37428	10.3	11/10/2015
10.40+	Letter of Agreement, dated October 20, 2015 between Ritter Pharmaceuticals, Inc. and Chord Advisors, LLC	10-Q	001-37428	10.4	11/10/2015
10.41	Common Stock Purchase Agreement, dated December 18, 2015, by and between Ritter Pharmaceuticals, Inc. and Aspire Capital Fund, LLC	8-K	001-37428	10.1	12/21/2015
10.42	Master Services Agreement, effective December 29, 2015, by and between Covance Inc. and Ritter Pharmaceuticals, Inc.	S-1	333-208818	10.42	12/30/2015
23.1*	Consent of Mayer Hoffman McCann P.C., independent registered public accounting firm				
23.2	Consent of Reed Smith LLP (included in Exhibit 5.1)	S-1	333-208818	5.1	12/30/2015
24.1	Power of Attorney (included on applicable signature pages)	S-1	333-208818	-	12/30/2015

* Filed herewith.

+ Indicates management contract or compensatory plan or arrangement.



Mayer Hoffman McCann P.C.

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CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

As independent registered public accountants, we hereby consent to the incorporation by reference in this Post-Effective Amendment No. 2 to the Registration Statement on Form S-1 and related Prospectus of our report dated March 21, 2016 relating to the financial statements of Ritter Pharmaceuticals, Inc. (which report includes an explanatory paragraph relating to the uncertainty of the Company's ability to continue as a going concern) and to the reference to us under the caption "Experts" which is contained in this Prospectus.

/s/ Mayer Hoffman McCann P.C.

Orange County, California
June 1, 2016
