Filed Pursuant to Rule 424(b)(5)
Registration No. 333-221266

Prospectus Supplement
(to Prospectus dated November 14, 2017)

8,400,000 Shares

Common Stock

Pursuant to this prospectus supplement and the accompanying prospectus, we are offering up to 8,400,000 shares of our common stock, par value $0.001 per share.

Our common stock is quoted on The Nasdaq Global Market under the symbol "RARX." On February 14, 2018, the last reported sale price of our common stock on The Nasdaq Global Market was $6.50 per share.

Investing in our securities involves a high degree of risk. Before buying any shares you should read the discussion of material risks of investing in our securities in "Risk Factors" beginning on page S-15.

	Per Share	Total
Public offering price	$ 6.00	$ 50,400,000
Underwriting discounts and commissions(1)	$ 0.36	$ 3,024,000
Proceeds to us (before expenses)	$ 5.64	$ 47,376,000

(1) See "Underwriting."

Certain of our existing principal stockholders and directors have indicated an interest in purchasing up to an aggregate of approximately $22 million in shares of our common stock in this offering at the public offering price. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no shares in this offering to such stockholders and individuals, and such stockholders and individuals may determine to purchase more, less or no shares in this offering.

We have granted a 30-day option to the underwriters to purchase up to 1,260,000 additional shares of our common stock (15% of the shares sold).

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined whether this prospectus supplement or the accompanying prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

Delivery of the shares is expected to be made on or about February 16, 2018.

Credit Suisse

Jefferies

BMO Capital Markets

SunTrust Robinson Humphrey

The date of this prospectus supplement is February 14, 2018

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be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

ABOUT THIS PROSPECTUS SUPPLEMENT

On November 1, 2017, we filed with the Securities and Exchange Commission, or SEC, a registration statement on Form S-3 (File No. 333-221266) utilizing a shelf registration process relating to the securities described in this prospectus supplement, which registration statement was declared effective on November 14, 2017. Under this shelf registration process, we may, from time to time, sell up to $250.0 million in the aggregate of common stock, preferred stock, debt securities, warrants and/or units in any combination.

This prospectus supplement describes the specific terms of an offering of shares of our common stock and also adds to and updates information contained in the accompanying prospectus and the documents incorporated by reference into the accompanying prospectus. The second part, the accompanying prospectus, provides more general information. If the information in this prospectus supplement is inconsistent with the accompanying prospectus or any document incorporated by reference therein filed prior to the date of this prospectus supplement, you should rely on the information in this prospectus supplement.

We and the underwriters have not authorized anyone to provide you with any information or to make any representations other than those included or incorporated by reference in this prospectus supplement and the accompanying prospectus and any relevant free writing prospectus. If you receive any information not authorized by us, we and the underwriters take no responsibility for, and can provide no assurance as to the reliability of, such information. We are not making an offer to sell the shares of common stock in any jurisdiction where the offer or sale is not permitted. You should not assume that the information contained or incorporated by reference in this prospectus supplement or the accompanying prospectus or any relevant free writing prospectus is accurate as of any date other than its respective date.

It is important for you to read and consider all of the information contained in this prospectus supplement and the accompanying prospectus in making your investment decision. We include cross-references in this prospectus supplement and the accompanying prospectus to captions in these materials where you can find additional related discussions. The table of contents in this prospectus supplement provides the pages on which these captions are located. You should read both this prospectus supplement and the accompanying prospectus, together with the additional information described in the sections entitled "Where You Can Find More Information" and "Incorporation by Reference" of this prospectus supplement, before investing in our common stock.

We are offering to sell, and seeking offers to buy, shares of common stock only in jurisdictions where offers and sales are permitted. The distribution of this prospectus supplement and the accompanying prospectus and the offering of the common stock in certain jurisdictions may be restricted by law. Persons outside the United States who come into possession of this prospectus supplement and the accompanying prospectus must inform themselves about, and observe any restrictions relating to, the offering of the common stock and the distribution of this prospectus supplement and the accompanying prospectus outside the United States. This prospectus supplement and the accompanying prospectus do not constitute, and may not be used in connection with, an offer to sell, or a solicitation of an offer to buy, any securities offered by this prospectus supplement and the accompanying prospectus by any person in any jurisdiction in which it is unlawful for such person to make such an offer or solicitation.

Our principal executive offices are located at 87 Cambridge Park Drive, Cambridge, MA 02140, and our telephone number is (617) 401-4060. Our website address is www.rapharma.com. The information contained on our website is not a part of, and should not be construed as being incorporated by reference into, this prospectus supplement or the accompanying prospectus.

Unless the context otherwise requires, "Ra Pharmaceuticals," the "company," "we," "us," "our" and similar names refer to Ra Pharmaceuticals, Inc.

CAUTIONARY STATEMENT REGARDING FORWARD-LOOKING STATEMENTS

This prospectus supplement and the accompanying prospectus, including the documents that we incorporate by reference, contain forward-looking statements within the meaning of Section 27A of the Securities Act and Section 21E of the Exchange Act. Any statements about our expectations, beliefs, plans, objectives, assumptions or future events or performance are not historical facts and may be forward-looking. These statements are often, but are not always, made through the use of words or phrases such as "may," "will," "could," "should," "expects," "intends," "plans," "anticipates," "believes," "estimates," "predicts," "projects," "potential," "continue," and similar expressions, or the negative of these terms. Accordingly, these statements involve estimates, assumptions and uncertainties which could cause actual results to differ materially from those expressed in them. Any forward-looking statements are qualified in their entirety by reference to the factors discussed throughout this prospectus supplement and the accompanying prospectus, and in particular those factors referenced in the section "Risk Factors."

This prospectus supplement and the accompanying prospectus contain forward-looking statements that are based on our management's belief and assumptions and on information currently available to our management. These statements relate to future events or our future financial performance, and involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to be materially different from any future results, levels of activity, performance or achievements expressed or implied by these forward-looking statements. Forward-looking statements include, but are not limited to, statements about:

- the initiation, timing, progress and results of our research and development programs and future preclinical and clinical studies;
- the risk that topline data from our Phase 2 clinical program in paroxysmal nocturnal hemoglobinuria, or PNH, may not be indicative of final study results or results from future trials;
- our ability to advance any product candidates into, and successfully complete, clinical studies and obtain regulatory approval for them;
- our ability to identify additional product candidates using our Extreme Diversity™ platform;
- the timing or likelihood of regulatory filings and approvals;
- the commercialization, marketing and manufacturing of our product candidates, if approved;
- the pricing and reimbursement of our product candidates, if approved;
- the rate and degree of market acceptance and clinical utility of any products for which we receive marketing approval;
- the implementation of our strategic plans for our business, product candidates and technology;
- the scope of protection we are able to establish and maintain for intellectual property rights covering our product candidates and technology;
- our expectations related to the use of proceeds from our public offering, and estimates of our expenses, future revenues, capital requirements and our needs for additional financing;
- our ability to maintain and establish collaborations;
- our financial performance;
- developments relating to our competitors and our industry, including the impact of government regulation; and

- other risks and uncertainties, including those listed under the caption "Risk Factors" in this prospectus supplement and the accompanying prospectus or any other documents incorporated by reference in this prospectus supplement and the accompanying prospectus.

Given these uncertainties, readers should not place undue reliance on our forward-looking statements. These forward-looking statements speak only as of the date on which the statements were made and are not guarantees of future performance. Except as may be required by applicable law, we do not undertake to update any forward-looking statements after the date of this prospectus or the respective dates of documents incorporated by reference herein or therein that include forward-looking statements.

PROSPECTUS SUPPLEMENT SUMMARY

The following summary is qualified in its entirety by, and should be read together with, the more detailed information and financial statements and related notes thereto appearing elsewhere or incorporated by reference in this prospectus supplement and the accompanying prospectus. Before you decide to invest in our securities, you should read the entire prospectus supplement and the accompanying prospectus carefully, including the risk factors and the financial statements and related notes included or incorporated by reference in this prospectus supplement and the accompanying prospectus.

Our Company

Overview

We are a clinical-stage biopharmaceutical company using our proprietary peptide chemistry platform to develop novel therapeutics for the treatment of serious diseases that are caused by excessive or uncontrolled activation of the complement system, a critical component of the immune system. We are developing our lead product candidate, RA101495, a convenient self-administered subcutaneous, or SC, injection, which is an injection into the tissue under the skin, for the treatment of PNH. PNH is a rare, chronic, life-threatening, blood disorder where red blood cells are mistakenly attacked and destroyed by the complement system, and has an estimated worldwide population and treated population of 16,000 and 4,000 to 5,000, respectively. We initiated our Phase 2 clinical program for RA101495 in PNH patients in the second quarter of 2017, released initial data in June 2017 and additional interim results in December 2017, and completed dosing in February 2018. We are also developing RA101495, administered SC, to treat other debilitating complement-mediated diseases such as generalized myasthenia gravis, or gMG, with an estimated worldwide patient population and treated population of 94,000 and 47,000, respectively, atypical hemolytic uremic syndrome, or aHUS, with an estimated worldwide patient population and treated population of 5,500 and 2,000 to 3,000, respectively, and lupus nephritis, or LN. We initiated a Phase 2 clinical trial with RA101495 for gMG in the fourth quarter of 2017 and a Phase 1b clinical trial supporting development in aHUS and LN in the first quarter of 2018. Additionally, we are pursuing discovery and preclinical programs targeting selective inhibition of other uncontrolled complement pathway factors to treat a variety of ophthalmic, renal and inflammatory diseases. In addition to our focus on developing novel therapeutics to treat complement-mediated diseases, we have validated our Extreme Diversity platform by successfully identifying and delivering orally-available cyclic peptides for a non-complement cardiovascular target with a large market opportunity in a collaboration with Merck & Co., Inc.

Recent Developments:

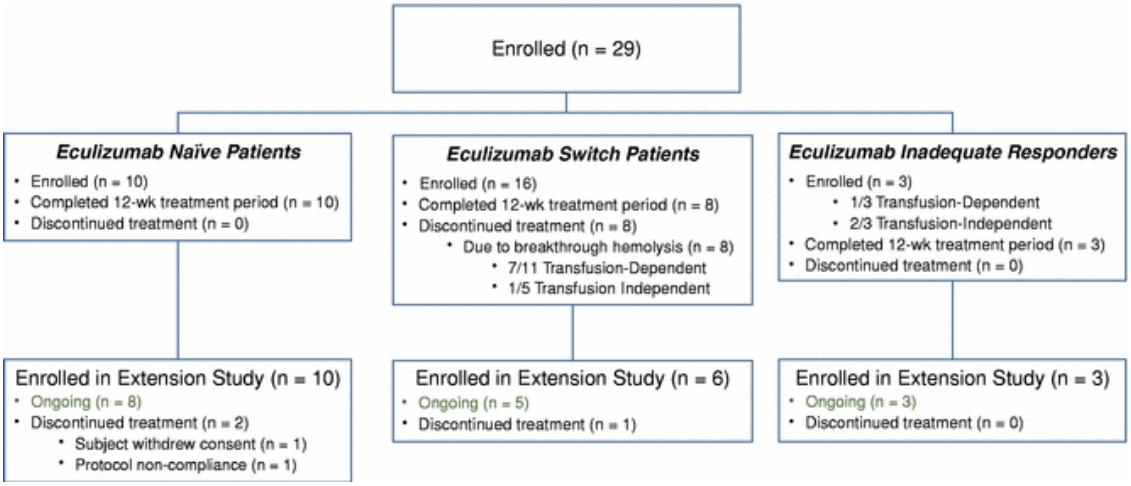
Phase 2 PNH Program Update

On February 12, 2018, we announced the completion of dosing and topline data for our global Phase 2 clinical program in PNH. The global, dose-finding Phase 2 clinical program was designed to evaluate the safety, tolerability, preliminary efficacy, pharmacokinetics, or PK, and pharmacodynamics, or PD, of RA101495 SC in patients with PNH.

We enrolled a total of 29 patients across three cohorts in the Phase 2 clinical program in PNH. The first cohort enrolled 10 patients who had not previously been treated with eculizumab. We refer to these patients as eculizumab naïve patients. The second cohort enrolled 16 patients, who, prior to the trial, were treated with an eculizumab regimen and, in connection with the trial, were switched over to treatment with RA101495 SC. We refer to these patients as eculizumab switch patients. The third cohort enrolled three patients. These patients are U.S. based and were inadequate responders to eculizumab and who were also switching over to RA101495 SC. We refer to these patients as eculizumab inadequate responders.

The primary efficacy endpoint was the change in lactate dehydrogenase or LDH levels, from baseline to the mean level from week 6 to week 12 of the trial. Patients in all three cohorts were eligible to enter a long-term extension study following the completion of the initial 12-week dosing period.

The diagram below summarizes, with respect to all three cohorts in our global Phase 2 clinical program in PNH, the patient enrollment, disposition, and continuation in the long-term extension study following the completion of the initial 12-week dosing period:



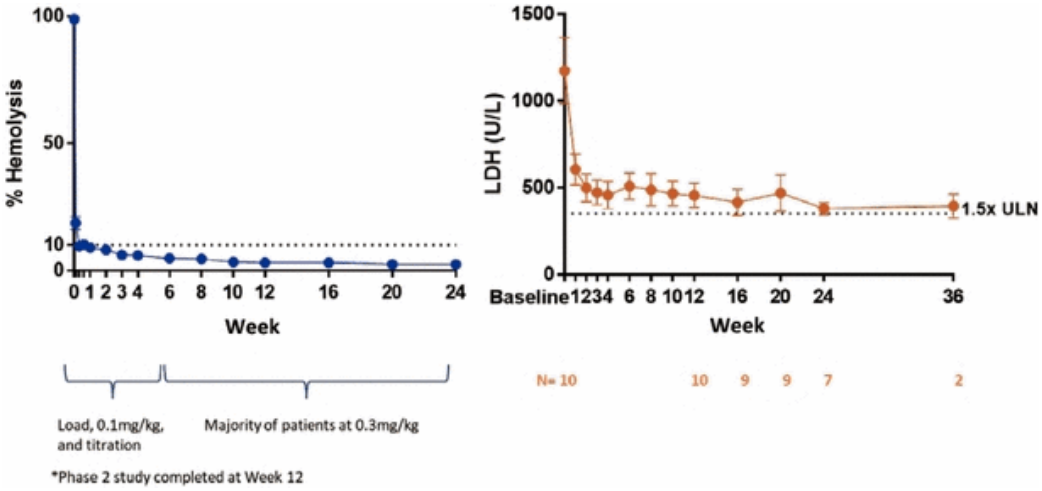
A total of 21 patients across all three cohorts completed the initial 12-week dosing period of whom 16 (or 76%) continue to receive treatment with RA101495 SC in our long-term extension study: 8 eculizumab naïve patients, 5 eculizumab switch patients, and all 3 eculizumab inadequate responders.

The data cut-off date for the December 4, 2017 interim results was November 30, 2017 and the data cut-off date for the topline data published on February 12, 2018 was February 7, 2018.

Eculizumab Naïve Cohort

On December 4, 2017, we announced that all 10 patients enrolled in the eculizumab naïve cohort had completed dosing and that RA101495 SC met the primary endpoint in these eculizumab naïve patients (n=10). As previously noted, we observed a rapid, robust, and sustained reduction in LDH levels compared to baseline (p=0.002) and near complete suppression of complement activity, as depicted in the right panel in the figure below. The study population enrolled in this cohort is typical of patients referred for initiation of C5 inhibitor therapy in real-world clinical practice. The mean baseline LDH level was greater than 1000 U/L, with a range up to 2435 U/L, and the median granulocyte clone size was 87.7%, indicative of severe disease. As shown in the left panel of the figure

below, RA101496 SC administration resulted in a rapid, sustained, and near-complete inhibition of hemolysis activity in patients' sera.



Data presented based on data cut-off of February 7, 2018

Of note, six out of the ten eculizumab naïve patients were transfusion dependent prior to initiation of RA101495 SC. As depicted in the figure below, 50% (3/6) of eculizumab naïve patients who required a blood transfusion during the six months prior to enrollment, who we refer to as transfusion-dependent patients remained transfusion-free while on study.

Subject ID	Transfused during 6 months prior to Week 0 visit	Transfused anytime after Week 0 visit while on study
007-001	No	No
007-002	Yes	Yes
009-001	No	No
010-001	Yes	Yes
012-002	Yes	Yes
013-001	No	No
013-002	Yes	No
013-003	No	No
014-001	Yes	No
017-002	Yes	No

Data presented based on data cutoff of February 7, 2018

Based on topline data, meaningful improvements in standard measures of quality of life, as shown by the Functional Assessment of Chronic Illness Therapy, or FACIT, fatigue score, were observed, as well as a high level of patient satisfaction with subcutaneous self-administration based on patient surveys. By the end of the 12-week treatment period with RA101495 SC, the mean FACIT score increased by 5.9 points, consistent in both direction and magnitude with the eculizumab experience from TRIUMPH study, and which we believe is illustrative of how similar improvements in hemolytic markers such as LDH may translate to clinical benefits in quality of life.

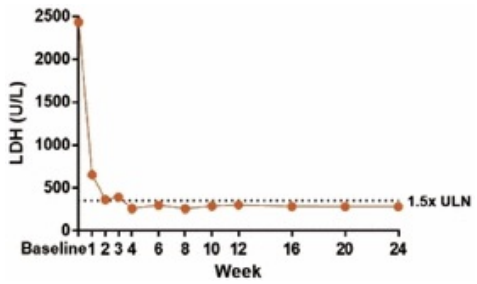
Additionally, at the end of the 12-week treatment period with RA101495 SC, we conducted a brief survey to evaluate patients' degree of treatment satisfaction with once daily subcutaneous

self-administration on a simple 5-point scale. The mean treatment satisfaction score for the cohort was 4.3 points, falling between the responses of "satisfied" and "very satisfied".

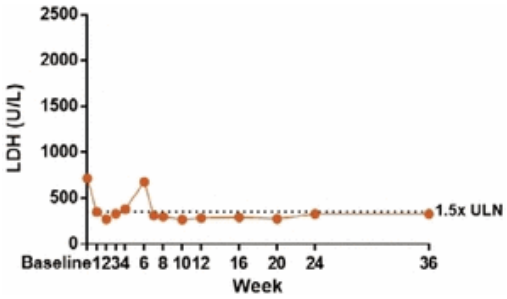
On December 4, 2017, we summarized two case studies from the treatment naïve cohort, which we believe further illustrate the pharmacologic activity of RA101495 SC. In case study one (as depicted in the left figure below), with data available through the cutoff date of February 7, 2018, RA101495 SC controlled LDH in the patient with the very highest baseline LDH levels in the study (2435U/L), a level consistent with that seen in patients enrolled in the TRIUMPH trial of eculizumab. Treatment with RA101495 SC in this patient resulted in an 88% reduction in LDH from baseline to week 12, and continued through the extension study to week 24. We believe these results support that RA101495 SC has the potential to control LDH even in PNH patients with the highest levels of hemolytic activity, and indicate that the LDH level achieved on treatment is not governed by the baseline LDH, but by the adequacy of complement inhibition achieved.

In case study two (as depicted in the right figure below), the long-term follow-up is provided for one of the two patients presented in our initial data release from June 2017 (and December 2017). This patient had a transient breakthrough hemolysis event at week six that was attributed to an inter-current viral infection. Treatment with RA101495 SC was continued at the same dose, and LDH levels normalized rapidly at that time. With continued long-term treatment, LDH has remained well-controlled, and there have been no further recurrences of breakthrough hemolysis during the following 7.5 months of treatment.

Case Study 1: 32 yr. old M Caucasian
Patient with the highest baseline LDH (2435U/L)



Case Study 2: 65 yr. old F Caucasian
Patient 2 from initial data release (June 2017)



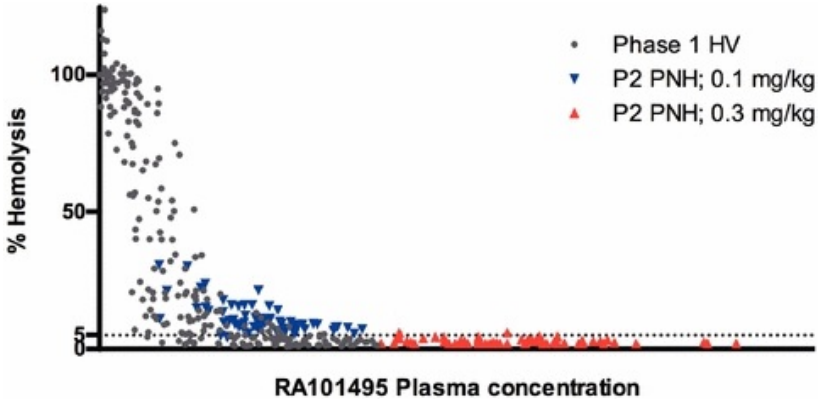
Data presented based on data cutoff of February 7, 2018

As of February 7, 2018, eight of 10 eculizumab naïve patients continue on the long-term extension study, with the two initial eculizumab naïve patients dosing out to 36 weeks with sustained LDH control with no significant safety or tolerability issues observed.

The Phase 2 study provided evidence supporting the dose required for complete complement inhibition. Whereas the 0.1 mg/kg dose of RA101495 SC administered in the Phase 2 study in PNH resulted in sub-maximal inhibition of hemolysis (<95% at trough), the 0.3 mg/kg dose of RA101495 SC resulted in near-complete inhibition of hemolysis (□ 95% at trough at all timepoints). We believe these

data supports the selection of 0.3 mg/kg RA101495 SC daily as the recommended dose for our planned Phase 3 studies in PNH.

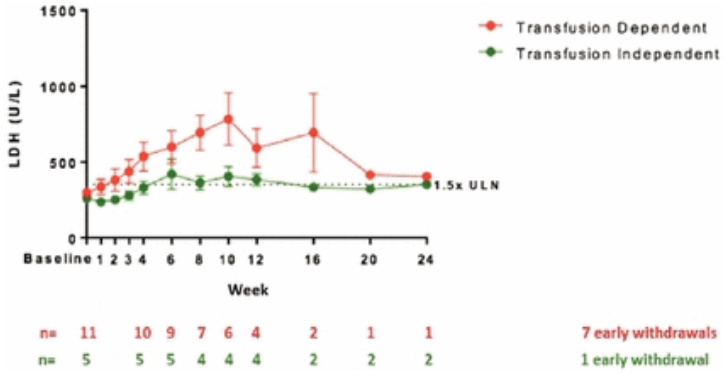
PK/PD RA101495, Phase 1 (HV) and Phase 2 (PNH, naïve)



Eculizumab Switch Cohort

In the eculizumab switch cohort, which enrolled 16 patients, comprised of 5 patients who were transfusion-independent at baseline (before switching to RA101495 SC) and 11 who were transfusion-dependent at baseline. Topline results from the completed switch cohort provide initial evidence of near complete, sustained, and uninterrupted inhibition of complement activity during and after eculizumab washout. As depicted in the figure below, the LDH response observed to date in switch patients was bimodal based on prior transfusion requirements on eculizumab. In transfusion-independent patients from this cohort (n=5), a population segment representing the majority of patients currently treated with eculizumab (approximately 80% of patients on long-term eculizumab therapy), switching to RA101495 SC has resulted in overall stable mean LDH levels with only one patient (1/5) withdrawing early due to breakthrough hemolysis and reverting to eculizumab without complications. Among patients who were transfusion-dependent at baseline (n=11), breakthrough hemolysis occurred after switching in seven patients (7/11), who all reverted to eculizumab treatment without complications. Of note, our Phase 2 clinical trial of RA101495 SC enrolled a disproportionately larger percentage of transfusion-dependent PNH patients compared to estimates of the percentage of transfusion-dependent PNH patients on long-term eculizumab therapy in the real world.

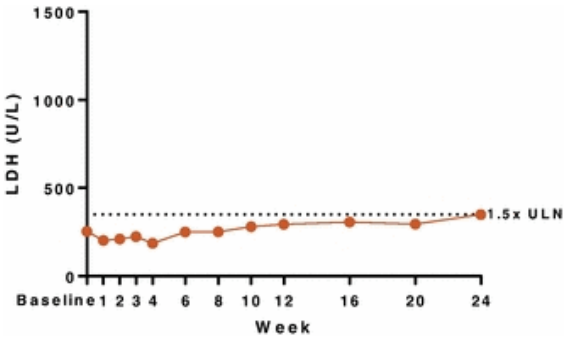
LDH in Switch Cohort



Data presented based on data cutoff of February 7, 2018

On December 4, 2017 (as depicted in the figure below), we summarized a case study of a 28-year old male who had been on eculizumab for seven years, and was transfusion-independent at the time of enrollment. His last dose of eculizumab was two weeks prior to the baseline visit. After switching to RA101495, LDH has remained well-controlled through 24 weeks of administration, and the patient continues to receive study drug in the long-term extension.

Case Study: Successful Switching from Eculizumab to RA101495 SC



Data presented based on data cutoff of February 7, 2018

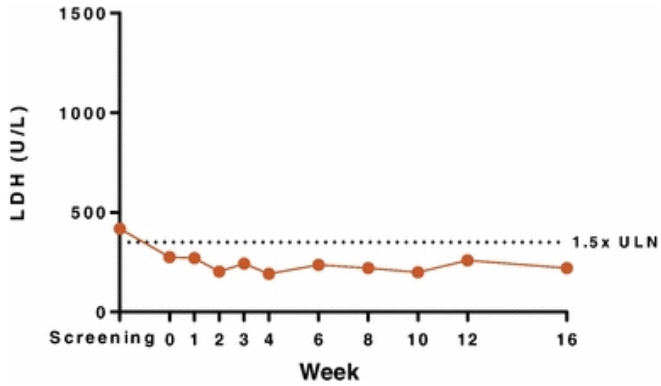
As of February 7, 2018, five of the eight patients in the eculizumab switch cohort who completed dosing, have are continuing on the long-term extension study, with sustained LDH control and no major safety or tolerability issues observed.

Eculizumab Inadequate Responder Cohort

In the U.S.-based cohort of inadequate responders to eculizumab who have a history of elevated LDH, three patients were enrolled, consisting of two patients that were transfusion-independent at baseline and one patient that was transfusion-dependent at baseline. As of February 7, 2018, all three patients have completed 12 weeks of dosing and all three inadequate responders to eculizumab continue on the long-term extension study with sustained LDH control with no major safety or tolerability issues observed.

Topline results from the first patient in this cohort show LDH stabilization and relief of side effects associated with eculizumab intolerance, as depicted in the figure below. The patient is a 53 year old male with modestly elevated LDH and documented intolerance to eculizumab characterized by fatigue and whole-body pain after each infusion. As a result of eculizumab-intolerance he was only able to receive 450 mg of eculizumab every two weeks, lower than the standard dose of 900 mg. As depicted in the figure below, following switching from eculizumab to RA101495 SC, LDH improved and remained consistently below 1.5xULN, while at the same time the symptoms related to eculizumab-intolerance have resolved and the patient has been able to down-titrate pain medications.

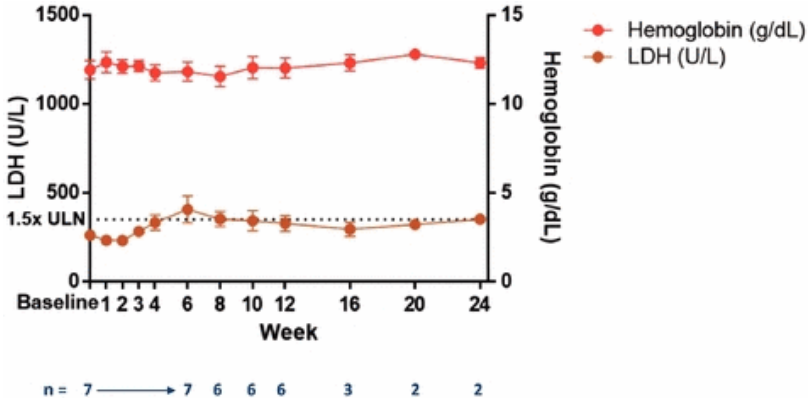
Case Study: First Inadequate Responder (USA)



Data presented based on data cutoff of February 7, 2018

As depicted in the figure below, across transfusion-independent patients switching from eculizumab to RA101495 SC (n=7), pooled from both the switch cohort and the U.S.-based inadequate responder cohort, mean LDH and hemoglobin levels have remained stable from baseline through the cut-off date of February 7, 2018 for those patients remaining on study. One patient out of these seven withdrew from the study early and reverted to eculizumab due to breakthrough hemolysis.

Stabilization of LDH and Hemoglobin in Transfusion-Independent Patients
Eculizumab Switch & Inadequate Responder Cohorts—Pooled Data



Data presented based on data cutoff of February 7, 2018

Across all cohorts, no major safety or tolerability concerns have been identified as of February 7, 2018 after more than 500 patient weeks of cumulative exposure. The majority of adverse events were deemed unrelated to the study drug and the most frequent study drug-related adverse event to date was headache. No meningococcal infections or thromboembolic events have been observed. Out of more than 3,500 doses administered to date, only nine mild (grade 1) injection site reactions have occurred in five patients. As of February 7, 2018, full compliance with once daily subcutaneous self-administration of RA101495 SC has been observed.

Based on the topline results of the Phase 2 studies, we are planning to conduct a Phase 3 program to support the approval of RA101495 SC in PNH. Both treatment naïve and switch patients who were

transfusion-independent on eculizumab were generally well-controlled on RA101495 SC, and both of these populations are planned for inclusion in our Phase 3 program.

Our goal is to seek rapid approval of RA101495 SC for PNH and, if approved, leverage competitive pricing for RA101495 SC to expand patient access around the world and establish RA101495 SC as first-line therapy in PNH. We plan to hold end-of-Phase 2 meetings with regulators in the first half of 2018 and start our Phase 3 program for PNH in the second half of 2018. If developed and approved, we believe, due to its convenient product profile and our anticipated pricing flexibility, RA101495 SC has the potential to serve as the natural first-line therapy for newly diagnosed naïve patients with PNH, which we estimate to constitute approximately 10% of the patient population, as well as an attractive and convenient alternative for transfusion-free patients switching from eculizumab, which we estimate to constitute approximately 72% of the patient population. In sum, we believe we can address over 80% of the current PNH market. Moreover, despite eculizumab sales in 2017 totaling approximately $1.5 billion, we believe the majority of patients with PNH have yet to initiate treatment. In developing its commercial presentation, we intend to leverage key properties of RA101495 SC, including its stability at room temperature, small volume, low viscosity and resistance to shear forces and compatibility with needles.

Phase 2 Program in gMG

Myasthenia gravis, or MG, is a chronic, autoimmune, neuromuscular disease characterized by weakness and fatigue of voluntary muscles. Patients with MG present with muscle weakness that becomes increasingly severe with repeated use and recovers with rest. Weakness can be localized to specific muscles, such as those responsible for eye movements, but often progresses to affect a broader range, including head, limb, and respiratory muscles. This progression is often described as the generalized, or severe, form of the disease. gMG is estimated to affect over 80,000 individuals worldwide.

gMG symptoms may become life-threatening when muscle weakness involves the diaphragm and intercostal muscles in the chest wall that are responsible for breathing. The most severe complication of gMG, known as myasthenic crisis, requires hospitalization, intubation, and mechanical ventilation.

MG is characterized by the production of autoantibodies that interfere with the normal transmission of electrical signals from nerves to muscles. The most common target of autoantibodies in MG is the acetylcholine receptor, or AChR, which is located at the site at which a motor neuron transmits signals to a skeletal muscle fiber, known as the neuromuscular junction. Binding of anti-AChR autoantibodies to the AChR results in activation of the classical complement cascade and assembly of the membrane attack complex, or MAC. Influx of calcium through the MAC causes local damage to the postsynaptic membrane, local inflammation, diminished response to acetylcholine, and reduced responsiveness of the muscle.

Inhibition of terminal complement activity at the level of C5 or C6 has been demonstrated to prevent development of disease pathology in experimental animal models of MG. RA101495 SC potently inhibits C5. Furthermore, eculizumab, a humanized monoclonal inhibitor of C5, was recently approved to treat gMG.

Following promising clinical data collected to date from which we observed the favorable PK and PD profile for RA101495 SC, we believe the convenience of once-daily, SC, self-administration of RA101495 may enable treatment of a broad population of gMG patients.

In December 2017, we initiated dosing in our Phase 2, multicenter, randomized, double-blind, placebo-controlled trial, which is designed to evaluate the safety, tolerability, and preliminary efficacy of RA101495 SC in patients with gMG. The trial is expected to enroll approximately 36 patients. At the outset of the 12-week treatment period, patients will be randomized in a 1:1:1 ratio and will receive

daily, SC doses of 0.1 mg/kg of RA101495, 0.3 mg/kg of RA101495, or matching placebo. The primary efficacy endpoint is change in Quantitative Myasthenia Gravis, or QMG, score from baseline to week 12. All patients will have the opportunity to receive RA101495 SC in a long-term extension study. We expect topline data from this trial in the first half of 2019.

Phase 1b Program in Renally Impaired Patients

Building on the clinical data collected to date from which we observed the favorable PK and PD profile of RA101495 SC, in January 2018, we initiated dosing in our Phase 1b clinical trial in patients with renal impairment, supporting development of RA101495 in complement-mediated renal diseases. C5 is a clinically-validated target for multiple complement-mediated renal disorders, such as aHUS.

Our Phase 1b, multi-center, open-label trial is designed to evaluate the PK profile of RA101495 SC in these patients. The trial is planned to enroll approximately 16 subjects, including eight patients with severe renal impairment matched with eight healthy control subjects with normal renal function. Each patient will receive a single, SC dose of 0.3 mg/kg of RA101495. The trial will compare the PK profile in patients with renal impairment with subjects with normal renal function.

We expect topline data from this trial in mid-2018.

Other Developments

Our cash and cash equivalents is expected to be approximately $70.4 million at December 31, 2017, as compared to $84.1 million at September 30, 2017. This financial data as of December 31, 2017 is preliminary and is based on information available to management as of the date of this prospectus supplement and is subject to completion by management of our financial statements as of and for the fiscal year ended December 31, 2017. Our independent registered public accountants have not audited, reviewed or performed any procedures with respect to such preliminary financial data and accordingly do not express an opinion or any other form of assurance with respect thereto. These results could change as a result of further review. Complete yearly results will be announced in our annual financial results earnings press release and included in our Annual Report on Form 10-K for the year ended December 31, 2017.

Company Information

We were incorporated under the laws of the State of Delaware in June 2008 under the name Ra Pharmaceuticals, Inc. Our executive offices are located at 87 Cambridge Park Drive, Cambridge, Massachusetts 02140, and our telephone number is (617) 401-4060. Our website address is www.rapharma.com. We do not incorporate the information on or accessible through our website into this prospectus, and you should not consider any information on, or that can be accessed through, our website as part of this prospectus.

We own various U.S. federal trademark applications and unregistered trademarks, including our company name, Ra Pharmaceuticals, Ra Pharma and our logo. All other trademarks or trade names referred to in this prospectus are the property of their respective owners. Solely for convenience, the trademarks and trade names in this prospectus supplement are referred to without the symbols ® and ™, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

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 amended, or the JOBS Act. 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:

- 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 about our executive compensation arrangements;
- no non-binding advisory votes on executive compensation or golden parachute arrangements;
- exemption from the auditor attestation requirement in the assessment of our internal control over financial reporting; and
- an exemption from new or revised financial accounting standards until they would apply to private companies and from compliance with any new requirements adopted by the Public Company Accounting Oversight Board requiring mandatory audit firm rotation.

We may take advantage of these exemptions for up to five years or such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company on the date that is the earliest of (i) the last day of the fiscal year in which we have total annual gross revenues of $1.07 billion or more; (ii) December 31, 2021; (iii) the date on which we have issued more than $1 billion in nonconvertible debt during the previous three years; or (iv) the date on which we are deemed to be a large accelerated filer under the rules of the Securities and Exchange Commission, or SEC. We may choose to take advantage of some but not all of these exemptions. We have irrevocably elected to "opt out" of the exemption for the delayed adoption of certain accounting standards and, therefore, will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

The Offering

Common stock offered by us	8,400,000 shares of common stock.
Option to purchase additional shares	We have granted the underwriters an option for a period of 30 days to purchase up to 1,260,000 additional shares of common stock.
Common stock to be outstanding immediately after this offering	31,026,684 shares of common stock (or 32,286,684 shares of common stock if the underwriters exercise their option to purchase additional shares in full), based on the offering price of $6.00 per share.
Use of proceeds	We intend to use the net proceeds from this offering to fund the Phase 2 trial for RA101495 for gMG and for working capital and general corporate and administrative expenses. See "Use of Proceeds" on page S-30.
Risk factors	This investment involves a high degree of risk. You should read the description of risks set forth under "Risk Factors" beginning on page S-15 of this prospectus supplement or otherwise incorporated by reference in this prospectus supplement for a discussion of factors to consider before deciding to purchase our securities.
Nasdaq Global Market symbol	"RARX."
Indications of Interest	Certain of our existing principal stockholders and directors have indicated an interest in purchasing up to an aggregate of approximately $22 million in shares of our common stock in this offering at the public offering price. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no shares in this offering to such stockholders and individuals, and such stockholders and individuals may determine to purchase more, less or no shares in this offering.

The number of shares of our common stock to be outstanding immediately after this offering is based on 22,626,684 shares outstanding as of December 31, 2017, and gives effect to the sale of 8,400,000 shares of common stock at $6.00 per share, and does not include:

- 3,470,068 shares of our common stock issuable upon the exercise of outstanding options under our 2016 Stock Award and Incentive Plan with a weighted-average exercise price of $9.99 per share, as of December 31, 2017;
- 847,866 shares of our common stock available for future issuance under our 2016 Stock Award and Incentive Plan as of December 31, 2017; and
- 400,461 shares of common stock available for future issuance under our 2016 Employee Stock Purchase Plan as of December 31, 2017.

RISK FACTORS

Investing in our common stock involves risk. Before deciding whether to invest in our common stock, you should consider carefully the risks and uncertainties described below. You should also consider the risks, uncertainties and assumptions discussed under the heading "Risk Factors" included in our most recent annual report on Form 10-K, and included in our Quarterly Reports for the fiscal quarters ended March 31, 2017, June 30, 2017 and September 30, 2017, which are on file with the SEC and are incorporated herein by reference, and which may be amended, supplemented or superseded from time to time by other reports we file with the SEC in the future. There may be other unknown or unpredictable economic, business, competitive, regulatory or other factors that could have material adverse effects on our future results. If any of these risks actually occurs, our business, business prospects, financial condition or results of operations could be seriously harmed. This could cause the trading price of our common stock to decline, resulting in a loss of all or part of your investment. Please also read carefully the section above entitled "Cautionary Statement Regarding Forward-Looking Statements."

Risks Related to the Discovery, Development and Commercialization of Our Product Candidates

Results of preclinical studies and early clinical trials may not be predictive of results of future clinical trials.

The outcome of preclinical studies and early clinical trials may not be predictive of the success of later clinical trials, and interim results of clinical trials do not necessarily predict success in the results of completed clinical trials. Many companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in late-stage clinical trials after achieving positive results in earlier development, and we could face similar setbacks. The design of a clinical trial can determine whether its results will support approval of a product and flaws in the design of a clinical trial may not become apparent until the clinical trial is well advanced. We have limited experience in designing clinical trials and may be unable to design and execute a clinical trial to support marketing approval. In addition, preclinical and clinical data are often susceptible to varying interpretations and analyses. Many companies that believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval for the product candidates. Even if we, or any future collaborators, believe that the results of clinical trials for our product candidates warrant marketing approval, the FDA or comparable foreign regulatory authorities may disagree and may not grant marketing approval of our product candidates.

In some instances, there can be significant variability in safety or efficacy results between different clinical trials of the same product candidate due to numerous factors, including changes in trial procedures set forth in protocols, differences in the size and type of the patient populations, changes in and adherence to the dosing regimen and other clinical trial protocols and the rate of dropout among clinical trial participants. If we fail to receive positive results in clinical trials of our product candidates, the development timeline and regulatory approval and commercialization prospects for our most advanced product candidates, and, correspondingly, our business and financial prospects would be negatively impacted.

From time to time, we may also publish interim, "topline" or preliminary data from our clinical studies. For example, on February 12, 2018 we announced topline data from our Phase 2 program in PNH. Interim data from clinical trials that we may complete are subject to the risk that one or more of the clinical outcomes may materially change as patient enrollment continues and more patient data become available. Preliminary or topline data remain subject to audit and verification procedures that may result in the final data being materially different from the preliminary or interim data we previously published. As a result, these data should be viewed with caution until the final data are available. Adverse changes between preliminary or interim data and final data could significantly harm our business prospects.

We are at a very early stage in our development efforts, our approach is unproven and we may not be able to successfully develop and commercialize any product candidates.

RA101495 is a novel therapeutic compound and its potential therapeutic benefit is unproven. There is only one approved therapy inhibiting C5. Our product candidates may not demonstrate in patients any or all of the pharmacological benefits we believe they may possess or compare favorably to the approved C5 inhibitor therapy. We have not yet succeeded and may never succeed in demonstrating efficacy and safety for these or any other product candidates in clinical trials or in obtaining marketing approval thereafter. For example, although we have evaluated RA101495 in preclinical studies and have evaluated RA101495 in an early-stage clinical trial and in our ongoing Phase 2 clinical trial, we have not yet advanced RA101495 into Phase 3 clinical development, nor have we obtained regulatory approval to sell any product based on our therapeutic approaches.

Our development plans include exploring the potential of complement inhibition, including C5 inhibition, to treat complement-mediated diseases for which complement inhibition has not been fully validated. This is an unproven approach to the treatment of diseases such as generalized myasthenia gravis, or gMG, atypical hemolytic uremic syndrome, or aHUS, and lupus nephritis, or LN. The scientific evidence to support the feasibility of developing products to treat such disease by C5 inhibition is both preliminary and limited. Accordingly, our focus on treating these diseases may not result in the discovery and development of commercially viable products.

If we are unsuccessful in our development efforts, we may not be able to advance the development of our product candidates, commercialize products, raise capital, expand our business or continue our operations.

Our business depends heavily upon the success of RA101495, which is still under development. If we are unable to obtain regulatory approval for or successfully commercialize RA101495, our business will be materially harmed.

We currently have no products approved for sale and are investing a significant portion of our efforts and financial resources in the development of our lead product candidate, RA101495. Successful continued development and ultimate regulatory approval of RA101495 for paroxysmal nocturnal hemoglobinuria, or PNH, and, in the future, a range of debilitating autoimmune diseases including gMG, aHUS and LN is critical to the future success of our business. We will need to raise sufficient funds for, and successfully enroll and complete, our clinical development program for RA101495 in PNH. The future regulatory and commercial success of this product candidate is subject to a number of risks, including the following:

- we may not have sufficient financial and other resources to initiate or complete the necessary clinical trials for RA101495;
- notwithstanding topline results from our Phase 2 clinical trial and ongoing long-term extension trial in PNH, we may not be able to obtain adequate evidence of clinical efficacy and safety for RA101495 in PNH; gMG or renally impaired patients;
- we do not know the degree to which RA101495 will be accepted as a therapy, if approved;
- in our clinical programs, we may experience variability in patients, adjustments to clinical trial procedures and the need for additional clinical trial sites, which could delay our clinical trial progress;
- the results of our clinical trials may not meet the level of statistical or clinical significance required by the FDA, the European Medicines Agency, or EMA, or comparable foreign regulatory bodies for marketing approval;

- notwithstanding complete enrollment in our ongoing Phase 2 clinical trial in PNH, we may have difficulty enrolling patients in trials if, for instance, a current or future effective standard of care limits the desire of patients, physicians, or regulatory agencies to participate in or support clinical trials;
- notwithstanding the lack of meaningful safety or tolerability concerns in our Phase 2 clinical trial and ongoing long-term extension trial in PNH, patients in our clinical trials may die or suffer other adverse effects for reasons that may or may not be related to RA101495, which could delay or prevent further clinical development;
- the standards implemented by regulatory agencies may change at any time;
- the FDA, EMA or foreign regulatory agencies may require endpoints for a clinical trial for the treatment of PNH, gMG, aHUS and LN that differ from the endpoints of our planned, current or future trials, which may require us to conduct additional clinical trials;
- the mechanism of action of RA101495 is complex and we cannot guarantee the degree to which it will translate into a medical benefit in any indications;
- if approved for PNH, gMG, aHUS and LN, RA101495 will likely compete with the off-label use of currently marketed products and other therapies in development;
- our intellectual property rights may not be patentable, valid or enforceable; and
- we may not be able to obtain, maintain, defend or enforce our patents and other intellectual property rights.

Of the large number of drugs in development in the pharmaceutical industry, only a small percentage result in the submission of a new drug application, or NDA, to the FDA and even fewer are approved for commercialization. Furthermore, even if we do receive regulatory approval to market RA101495, any such approval may be subject to limitations on the indicated uses or patient populations for which we may market the product. Accordingly, even if we are able to obtain the requisite financing to continue to fund our development programs, we cannot assure you that RA101495 will be successfully developed or commercialized. If we or any of our future development partners are unable to develop, or obtain regulatory approval for, or, if approved, successfully commercialize RA101495, we may not be able to generate sufficient revenue to continue our business.

We face substantial competition, which may result in others discovering, developing or commercializing products before or more successfully than we do, and reducing or eliminating our commercial opportunity.

The development and commercialization of new products is highly competitive. We expect that we, and any future collaborators, will face significant competition from major pharmaceutical companies, specialty pharmaceutical companies and biotechnology companies worldwide with respect to any of our product candidates that we, or any future collaborators, may seek to develop or commercialize in the future, including from drugs that act through the complement system and drugs that use different approaches. The principal competitor for our program in PNH is eculizumab, a C5 inhibitor, which is marketed as Soliris by Alexion Pharmaceuticals and is the only drug approved for the treatment of PNH. Alexion Pharmaceuticals is also developing a next-generation C5 inhibitor named ALXN 1210 that is designed to use a less frequent intravenous dosing schedule. We are also aware that there are a number of other companies that are actively developing product candidates for the treatment of PNH, including AMY101, directed at complement component 3, or C3, inhibition that is currently in early clinical development by Amyndas Pharmaceuticals, a product candidate directed at C3 inhibition such as APL-2 that is currently in clinical development by Apellis Pharmaceuticals, product candidates directed at C5 inhibition such as ALN-CC5, an RNAi therapeutic targeting the production of C5 being developed by Alnylam that is in early clinical trials, Coversin, a small protein inhibitor of C5 being

developed by Akari Pharmaceuticals that is in early clinical trials, LFG316, a monoclonal antibody inhibitor of C5 being developed by Novartis Pharma, a biosimilar product candidate ABP595 being developed by Amgen that is currently in clinical trials, RO7112689, a monoclonal antibody inhibitor of C5 being developed by F. Hoffmann-La Roche, REGN3918, a C5 antibody developed by Regeneron and other product candidates directed at other mechanisms of complement inhibition such as ACH-4471, an orally available small molecule inhibitor of complement Factor D, that is currently in development by Achillion Pharmaceuticals.

MG is currently treated with cholinesterase inhibitors and non-specific immunosuppressive agents, including azathioprine, cyclophosphamide, cyclosporine, intravenous immunoglobulin, or IVIG, mycophenolate, prednisone, and tacrolimus. Alexion Pharmaceuticals recently announced approval of eculizumab for the treatment of refractory MG in Europe and gMG in the United States. Both rituximab, marketed by F. Hoffmann-La Roche, and belimumab, marketed by GlaxoSmithKline, which target B cell activity, are in clinical development for gMG. Anti-CD40, being developed as CFZ533 by Novartis Pharma, bortezomib, and the FcRN agonist ARGX-113 developed by Argen-X, are being tested in clinical trials in gMG. A therapeutic vaccine targeting B and T-cell receptors (CV-MG-01) is in early clinical testing for gMG.

Our competitors may succeed in developing, acquiring or licensing technologies and products that are more effective, have fewer side effects or more tolerable side effects or are less costly than any product candidates that we are currently developing or that we may develop, which could render our product candidates obsolete and noncompetitive.

Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer, more effective, have fewer or less severe side effects, are more convenient or are less expensive than any products that we, or any future collaborators, may develop. Our competitors also may obtain FDA or other marketing approval for their products before we, or any future collaborators, are able to obtain approval for ours, which could result in our competitors establishing a strong market position before we, or any future collaborators, are able to enter the market.

Many of our existing and potential future competitors have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining marketing approvals and marketing approved products than we do, and may be able to reduce the price at which they sell their products. Mergers and acquisitions in the pharmaceutical and biotechnology industries may result in even more resources being concentrated among a smaller number of our competitors. Smaller or early stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, the development of our product candidates.

If clinical trials of our product candidates fail to satisfactorily demonstrate safety and efficacy to the FDA and other regulators, we, or any future collaborators, may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of these product candidates.

We, and any future collaborators, are not permitted to commercialize, market, promote or sell any product candidate in the United States without obtaining marketing approval from the FDA. Foreign regulatory authorities, such as the EMA, impose similar requirements. We have not previously submitted a NDA to the FDA or similar drug approval filings to comparable foreign regulatory authorities for any of our product candidates. We, and any future collaborators, must complete

extensive preclinical development and clinical trials to demonstrate the safety and efficacy of our product candidates in humans before we will be able to obtain these approvals.

Clinical testing is expensive, is difficult to design and implement, can take many years to complete and is inherently uncertain as to outcome. We cannot guarantee that any clinical trials will be conducted as planned or completed on schedule, if at all. The clinical development of our product candidates is susceptible to the risk of failure inherent at any stage of product development, including failure to demonstrate efficacy in a clinical trial or across a broad population of patients, the occurrence of adverse events that are severe or medically or commercially unacceptable, failure to comply with protocols or applicable regulatory requirements and determination by the FDA or any comparable foreign regulatory authority that a product candidate may not continue development or is not approvable. It is possible that even if one or more of our product candidates has a beneficial effect, that effect will not be detected during clinical evaluation as a result of one or more of a variety of factors, including the size, duration, design, measurements, conduct or analysis of our clinical trials. Conversely, as a result of the same factors, our clinical trials may indicate an apparent positive effect of a product candidate that is greater than the actual positive effect, if any. Similarly, in our clinical trials we may fail to detect toxicity of or intolerability caused by our product candidates, or mistakenly believe that our product candidates are toxic or not well tolerated when that is not in fact the case.

Any inability to successfully complete preclinical and clinical development could result in additional costs to us, or any future collaborators, and impair our ability to generate revenues from product sales, regulatory and commercialization milestones and royalties. Moreover, if we, or any future collaborators, are required to conduct additional clinical trials or other testing of our product candidates beyond the trials and testing that we or they contemplate, if we or they are unable to successfully complete clinical trials of our product candidates or other testing or the results of these trials or tests are unfavorable, uncertain or are only modestly favorable, or there are unacceptable safety concerns associated with our product candidates, we, or any future collaborators may:

- incur additional unplanned costs;
- be delayed in obtaining marketing approval for our product candidates;
- not obtain marketing approval at all;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- obtain approval with labeling that includes significant use or distribution restrictions or significant safety warnings, including boxed warnings;
- be subject to additional post-marketing testing or other requirements; or
- be required to remove the product from the market after obtaining marketing approval.

Our failure to successfully complete clinical trials of our product candidates and to demonstrate the efficacy and safety necessary to obtain regulatory approval to market any of our product candidates would significantly harm our business.

Our product candidates may cause undesirable side effects or have other properties that could delay or prevent their regulatory approval, limit the commercial profile of an approved label, or result in significant negative consequences following marketing approval, if any.

Undesirable side effects caused by our product candidates could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or comparable foreign regulatory authorities. Results of our clinical trials could reveal a high and unacceptable severity and prevalence of side effects or unexpected

characteristics. To date, subjects exposed to our product candidate RA101495 in our Phase 1 clinical trial have experienced drug-related side effects including injection site erythema, which was reported in patients receiving the highest dose, fatigue, headache, dizziness, rash and upper respiratory tract infection. In our Phase 2 clinical trial of RA101495, the most frequent adverse effect that we observed was headache.

If unacceptable side effects arise in the development of our product candidates, we, the FDA or comparable foreign regulatory authorities, the Institutional Review Boards, or IRBs, or independent ethics committees at the institutions in which our studies are conducted, or the Data Safety Monitoring Board, or DSMB, could suspend or terminate our clinical trials or the FDA or comparable foreign regulatory authorities could order us to cease clinical trials or deny approval of our product candidates for any or all targeted indications. Treatment-related side effects could also affect patient recruitment or the ability of enrolled patients to complete the trial or result in potential product liability claims. In addition, these side effects may not be appropriately recognized or managed by the treating medical staff. We expect to have to train medical personnel using our product candidates to understand the side effect profiles for our clinical trials and upon any commercialization of any of our product candidates. Inadequate training in recognizing or managing the potential side effects of our product candidates could result in patient injury or death. Any of these occurrences may harm our business, financial condition and prospects significantly.

Moreover, clinical trials of our product candidates are conducted in carefully defined sets of patients who have agreed to enter into clinical trials. Consequently, it is possible that our clinical trials, or those of any future collaborator, may indicate an apparent positive effect of a product candidate that is greater than the actual positive effect, if any, or alternatively fail to identify undesirable side effects. If, following approval of a product candidate, we, or others, discover that the product is less effective than previously believed or causes undesirable side effects that were not previously identified, any of the following adverse events could occur:

- regulatory authorities may withdraw their approval of the product or seize the product;
- we, or any future collaborators, may need to recall the product, or be required to change the way the product is administered or conduct additional clinical trials;
- additional restrictions may be imposed on the marketing of, or the manufacturing processes for, the particular product;
- we may be subject to fines, injunctions or the imposition of civil or criminal penalties;
- regulatory authorities may require the addition of labeling statements, such as a "black box" warning or a contraindication;
- we, or any future collaborators, may be required to create a Medication Guide outlining the risks of the previously unidentified side effects for distribution to patients;
- we, or any future collaborators, could be sued and held liable for harm caused to patients;
- the product may become less competitive; and
- our reputation may suffer.

Any of these events could harm our business and operations, and could negatively impact our stock price.

If we encounter difficulties enrolling patients in our clinical trials, our clinical development activities could be delayed or otherwise adversely affected.

We may not be able to initiate or continue clinical trials required by the FDA, EMA or other foreign regulatory agencies for RA101495 if we are unable to locate and enroll a sufficient number of eligible patients to participate in these clinical trials. We will be required to identify and enroll a sufficient number of patients with PNH, gMG, aHUS and LN for each of our planned clinical trials of RA101495 in these indications. While we completed enrollment of patients in our Phase 2 clinical trial of RA101495, there can be no assurance we will be successful in enrolling patients in our planned and future clinical trials in a timely manner or at all. Each of these is a rare disease or indication with relatively small patient populations, which could result in slow enrollment of clinical trial participants. For example, we estimate that there are approximately 16,000 PNH patients worldwide, approximately 94,000 gMG patients worldwide, 5,500 aHUS patients worldwide, and approximately 63,000 LN patients in the United States.

Patient enrollment is affected by other factors, including:

- severity of the disease under investigation;
- design of the clinical trial protocol;
- size and nature of the patient population;
- eligibility criteria for the trial in question;
- perceived risks and benefits of the product candidate under trial;
- proximity and availability of clinical trial sites for prospective patients;
- availability of competing therapies and clinical trials;
- clinicians' and patients' perceptions as to the potential advantages of the drug being studied in relation to other available therapies, including standard-of-care and any new drugs that may be approved for the indications we are investigating;
- efforts to facilitate timely enrollment in clinical trials;
- patient referral practices of physicians; and
- our ability to monitor patients adequately during and after treatment.

Further, there are only a limited number of specialist physicians who treat patients with these diseases, and major clinical centers are concentrated in a few geographic regions. We also may encounter difficulties in identifying and enrolling such patients with a stage of disease appropriate for our ongoing or future clinical trials. For example, based on topline results from our Phase 2 trial of RA101495, for the switch patient population in our future Phase 3 program design, we currently expect to target only patients that are transfusion-independent on long-term eculizumab therapy. Moreover, some or all of the above factors, as well as other unanticipated causes, may result in delays to our ability to initiate or report data from these trials. In addition, the process of finding and diagnosing patients may prove costly. Our inability to enroll a sufficient number of patients for any of our clinical trials would result in significant delays or may require us to abandon one or more clinical trials.

We currently have no marketing, sales or distribution infrastructure with respect to our product candidates. If we are unable to develop our sales, marketing and distribution capability on our own or through collaborations with marketing partners, we will not be successful in commercializing our product candidates.

We currently have no marketing, sales or distribution capabilities and have limited sales or marketing experience within our organization. If our product candidate RA101495 is approved, we

intend either to establish a sales and marketing organization with technical expertise and supporting distribution capabilities to commercialize RA101495, or to outsource this function to a third party. Either of these options would be expensive and time consuming. Some or all of these costs may be incurred in advance of any approval of RA101495. In addition, we may not be able to hire a sales force in the United States or other target market that is sufficient in size or has adequate expertise in the medical markets that we intend to target. These risks may be particularly pronounced due to our focus on our lead indications of PNH, gMG, aHUS and LN, each of which is a rare disease with relatively small patient populations. Any failure or delay in the development of our or third parties' internal sales, marketing and distribution capabilities would adversely impact the commercialization of RA101495 and other future product candidates.

With respect to our existing and future product candidates, we may choose to collaborate with third parties that have direct sales forces and established distribution systems, either to augment or to serve as an alternative to our own sales force and distribution systems. Our product revenue may be lower than if we directly marketed or sold any approved products. In addition, any revenue we receive will depend in whole or in part upon the efforts of these third parties, which may not be successful and are generally not within our control. If we are unable to enter into these arrangements on acceptable terms or at all, we may not be able to successfully commercialize any approved products. If we are not successful in commercializing any approved products, our future product revenue will suffer and we may incur significant additional losses.

The route of administration, formulation or dose for RA101495, which we are currently developing for SC self-administration, may be inadequate.

We are currently developing RA101495 for SC self-administration. Unsatisfactory drug availability due to problems relating to this route of administration or the ability of the drug to bind to its target is another potential cause of lack of efficacy of RA101495 if and when it is commercialized. C5, the target of RA101495 is predominantly found in blood. For PNH, RA101495 will be administered subcutaneously. In our Phase 1 study of RA101495 in single-ascending dose cohorts and a multiple-dose cohort, single and repeat SC doses of RA101495 were safe and well tolerated in healthy volunteers. In addition, while we observed promising signs that patients complied with once-daily subcutaneous self-administration at home of RA101495 in our Phase 2 clinical trial, there is no guarantee that patients will continue to comply in this trial or in future trials. If daily SC administration proves to be unfeasible, then we may need to research additional doses, formulations or routes of administration, which could delay commercialization of RA101495 and result in significant additional costs to us. Additionally, while we may offer training in SC injections, reliance on patient self-administration may lead to higher rates of user error due to poor administration procedure by patients and reduced patient compliance as compared with administration by healthcare professionals.

Chronic dosing of patients with RA101495 could lead to an immune response that causes adverse reactions or impairs the activity and/or efficacy of the drug, or causes other side effects.

There is a risk that chronic dosing of patients with RA101495 may lead to an immune response that causes adverse reactions or impairs the activity and/or efficacy of the drug. Patients may develop an allergic reaction to the drug and/or develop antibodies directed at the drug. Impaired drug activity could be caused by neutralization of the drug's inhibitory activity or by an increased rate of clearance of the drug from circulation. For example, one potential side effect of RA101495 that has occurred in patients receiving eculizumab, a humanized antibody against C5, is an increased incidence of meningococcal infections as a result of inhibition of the terminal complement system in a manner similar to RA101495. As a result, patients receiving RA101495 may also require immunization with a meningococcal vaccine and prophylactic antibiotics. While we did not observe any incidents of meningococcal infection or thromboembolic events in our topline results from our Phase 2 clinical trial

of RA101495 and ongoing long-term extension trial, there can be no assurance that these results will be maintained as we continue the long-term extension trial.

Any immune response that causes adverse reactions or impairs the activity of the drug could cause a delay in or termination of our development of RA101495, which would have a material adverse effect on our financial condition and results of operation.

The incidence and prevalence for target patient populations of RA101495 have not been established with precision. If the market opportunities for RA101495 are smaller than we estimate or if any approval that we obtain is based on a narrower definition of the patient population, our revenue and ability to achieve profitability will be adversely affected, possibly materially.

The precise incidence and prevalence for PNH, gMG, aHUS and LN are unknown. Our projections of both the number of people who have these diseases, as well as the subset of people with these diseases who have the potential to benefit from treatment with our drug candidates, are based on estimates. For example, we estimate that there are approximately 16,000 PNH patients worldwide, approximately 94,000 gMG patients worldwide, 5,500 aHUS patients worldwide, and approximately 63,000 LN patients in the United States.

The total addressable market opportunity for RA101945 will ultimately depend upon, among other things, the diagnosis criteria included in the final label for RA101945, if our product candidates are approved for sale for these indications, acceptance by the medical community and patient access, drug pricing and reimbursement. The number of patients who can be treated with our product candidates may turn out to be lower than expected, patients may not be otherwise amenable to treatment with our drugs, or new patients may become increasingly difficult to identify or gain access to, all of which would adversely affect our results of operations and our business.

Risks Related to Our Business

Comprehensive tax reform legislation could adversely affect our business and financial condition.

The U.S. government has recently enacted comprehensive tax legislation that includes significant changes to the taxation of business entities, referenced herein as the Tax Reform Act. These changes include, among others, a permanent reduction to the corporate income tax rate, limiting interest deductions, adopting elements of a territorial tax system and introducing certain anti-base erosion provisions. We continue to examine the impact this tax reform legislation may have on our business. The effect of the Tax Reform Act on our business, whether adverse or favorable, is uncertain, and may not become evident for some period of time. We urge our stockholders to consult with their legal and tax advisors with respect to any such legislation and the potential tax consequences of investing in our common stock.

Our ability to use net operating losses and research and development credits to offset future taxable income may be subject to certain limitations.

As of December 31, 2016, we had federal and state net operating loss carryforwards of $45.1 million and $41.0 million, respectively, which begin to expire in various amounts in 2030. As of December 31, 2016, we also had federal research and development tax credit carryforwards of $2.5 million and state research and development tax credit carryforwards of $1.5 million, which begin to expire in 2031. These net operating loss and tax credit carryforwards could expire unused and be unavailable to offset future income tax liabilities. In addition, in general, under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, or the Code, a corporation that undergoes an "ownership change" is subject to limitations on its ability to utilize its pre-change net operating losses or tax credits, or NOLs or credits, to offset future taxable income or taxes. For these purposes, an ownership change generally occurs where the aggregate stock ownership of one or more stockholders or

groups of stockholders who owns at least 5% of a corporation's stock increases its ownership by more than 50 percentage points over its lowest ownership percentage within a specified testing period. Our existing NOLs or credits may be subject to limitations arising from previous ownership changes, and if we undergo an ownership change in connection with or after this offering, our ability to utilize NOLs or credits could be further limited by Sections 382 and 383 of the Code. In addition, future changes in our stock ownership, many of which are outside of our control, could result in an ownership change under Sections 382 and 383 of the Code. Our NOLs or credits may also be impaired under state law. Accordingly, we may not be able to utilize a material portion of our NOLs or credits. The reduction of the corporate tax rate under the Tax Reform Act may cause a reduction in the economic benefit of our net operating loss carryforwards and other deferred tax assets available to the us. Under the Tax Reform Act, net operating losses generated after December 31, 2017 will not be subject to expiration.

Risks Related to Our Common Stock and this Offering

An active trading market for our common stock may not be sustained.

In October 2016, we closed our initial public offering. Prior to that offering, there had been no public market for our common stock. Although shares of our common stock are listed and trading on The Nasdaq Global Market, an active trading market for our shares may not continue to be sustained. If an active market for our common stock does not continue, it may be difficult for our stockholders to sell their shares without depressing the market price for the shares or sell their shares at or above the prices at which they acquired their shares or sell their shares at the time they would like to sell. Any inactive trading market for our common stock may also impair our ability to raise capital to continue to fund our operations by selling shares and may impair our ability to acquire other companies or technologies by using our shares as consideration.

We are an "emerging growth company," and the reduced disclosure requirements applicable to emerging growth companies may make our common stock less attractive to investors.

We are an "emerging growth company," as defined in the JOBS Act, and may remain an emerging growth company for up to five years following our initial public offering. For so long as we remain an emerging growth company, we are permitted and plan to rely on exemptions from certain disclosure requirements that are applicable to other public companies that are not emerging growth companies. These exemptions include not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, or SOX Section 404, not being required to comply with any requirement that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation or a supplement to the auditor's report providing additional information about the audit and the financial statements, reduced disclosure obligations regarding executive compensation and exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved. We cannot predict whether investors will find our common stock less attractive if we rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our stock price may be more volatile.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. This allows an emerging growth company to delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards and, therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

We will incur increased costs as a result of operating as a public company, and our management will be required to devote substantial time to new compliance initiatives and corporate governance practices.

As a public company, and particularly after we are no longer an "emerging growth company," we will incur significant legal, accounting and other expenses that we did not incur as a private company, which we anticipate could amount to between $1.0 million and $2.0 million annually. The Sarbanes-Oxley Act of 2002, the Dodd-Frank Wall Street Reform and Consumer Protection Act, the listing requirements of the NASDAQ Global Market and other applicable securities rules and regulations impose various requirements on public companies, including establishment and maintenance of effective disclosure and financial controls and corporate governance practices. We expect that we will need to hire additional accounting, finance and other personnel in connection with our becoming, and our efforts to comply with the requirements of being, a public company and our management and other personnel will need to devote a substantial amount of time towards maintaining compliance with these requirements. These requirements will increase our legal and financial compliance costs and will make some activities more time-consuming and costly.

We are evaluating these rules and regulations, and cannot predict or estimate the amount of additional costs we may incur or the timing of such costs. These rules and regulations are often subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies which could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices.

Pursuant to SOX Section 404 we will be required to furnish a report by our management on our internal control over financial reporting beginning with our second filing of an Annual Report on Form 10-K with the SEC after we become a public company. However, while we remain an emerging growth company, we will not be required to include an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. To achieve compliance with SOX Section 404 within the prescribed period, we will be engaged in a process to document and evaluate our internal control over financial reporting, which is both costly and challenging. In this regard, we will need to continue to dedicate internal resources, potentially engage outside consultants and adopt a detailed work plan to assess and document the adequacy of internal control over financial reporting, continue steps to improve control processes as appropriate, validate through testing that controls are functioning as documented and implement a continuous reporting and improvement process for internal control over financial reporting. Despite our efforts, there is a risk that we will not be able to conclude, within the prescribed timeframe or at all, that our internal control over financial reporting is effective. If we identify one or more material weaknesses, it could result in an adverse reaction in the financial markets due to a loss of confidence in the reliability of our financial statements.

A significant portion of our total outstanding shares is restricted from immediate resale but may be sold into the market in the near future, which could cause the market price of our common stock to decline significantly, even if our business is doing well.

Sales of a substantial number of shares of our common stock in the public market could occur at any time. These sales, or the perception in the market that the holders of a large number of shares of common stock intend to sell shares, could reduce the market price of our common stock. As of December 31, 2017, we have 22,626,684 shares of outstanding common stock, of which approximately 9.3 million shares are subject to restrictions on transfer under 90-day lock-up arrangements with the underwriters of this offering. These restrictions are due to expire on February 28, 2018, resulting in a substantial number of these shares becoming eligible for public sale at that time if they are registered under the Securities Act or if they qualify for an exemption from registration under the Securities Act including under Rules 144 or 701.

Moreover, based on filings with the SEC as of December 31, 2017, holders of an aggregate of approximately 13.4 million shares of our common stock have rights, subject to conditions, to require us to file registration statements covering their shares or to include their shares in registration statements that we may file for ourselves or other stockholders. We have also registered shares of our common stock issued and available for issuance under our equity compensation plans, which can be freely sold in the public market, subject to vesting requirements, volume limitations applicable to affiliates and lock-up agreements. If these additional shares are sold, or if it is perceived that they will be sold, in the public market, the trading price of our common stock could decline.

We do not anticipate paying any cash dividends on our capital stock in the foreseeable future. Accordingly, stockholders must rely on capital appreciation, if any, for any return on their investment.

We have never declared nor paid cash dividends on our capital stock. We currently plan to retain all of our future earnings, if any, to finance the operation, development and growth of our business. In addition, the terms of any future debt or credit agreements may preclude us from paying dividends. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future.

Concentration of ownership of our common stock among our existing executive officers, directors and principal stockholders may prevent new investors from influencing significant corporate decisions.

As of December 31, 2017, our executive officers and directors, combined with our stockholders who owned more than 5% of our outstanding common stock and their affiliates in the aggregate, beneficially own shares representing approximately 69.4% of our common stock. In addition, certain of our existing principal stockholders and directors have indicated an interest in purchasing up to an aggregate of approximately $22 million in shares of our common stock in this offering at the public offering price. As a result, if these stockholders were to choose to act together, they would be able to control all matters submitted to our stockholders for approval, as well as our management and affairs. For example, these persons, if they choose to act together, would control the election of directors and approval of any merger, consolidation or sale of all or substantially all of our assets. This concentration of ownership control may:

- delay, defer or prevent a change in control;
- entrench our management or the board of directors; or
- impede a merger, consolidation, takeover or other business combination involving us that other stockholders may desire.

Some of these persons or entities may have interests different than yours. For example, because many of these stockholders purchased their shares at prices substantially below the current market price and have held their shares for a longer period, they may be more interested in selling our company to an acquirer than other investors or they may want us to pursue strategies that deviate from the interests of other stockholders.

Provisions in our corporate charter documents and under Delaware law may prevent or frustrate attempts by our stockholders to change our management or hinder efforts to acquire a controlling interest in us.

Provisions in our corporate charter and our bylaws may discourage, delay or prevent a merger, acquisition or other change in control of us that stockholders may consider favorable, including transactions in which you might otherwise receive a premium for your shares. These provisions could also limit the price that investors might be willing to pay in the future for shares of our common stock, thereby depressing the market price of our common stock. In addition, because our board of directors is responsible for appointing the members of our management team, these provisions may frustrate or

prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors. Among other things, these provisions:

- establish a classified board of directors such that all members of the board are not elected at one time;
- allow the authorized number of our directors to be changed only by resolution of our board of directors;
- limit the manner in which stockholders can remove directors from the board;
- establish advance notice requirements for nominations for election to the board of directors or for proposing matters that can be acted on at stockholder meetings;
- require that stockholder actions must be effected at a duly called stockholder meeting and prohibit actions by our stockholders by written consent;
- limit who may call a special meeting of stockholders;
- authorize our board of directors to issue preferred stock without stockholder approval, which could be used to institute a "poison pill" that would work to dilute the stock ownership of a potential hostile acquirer, effectively preventing acquisitions that have not been approved by our board of directors; and
- require the approval of the holders of at least 75% of the votes that all our stockholders would be entitled to cast to amend or repeal certain provisions of our charter or bylaws.

Moreover, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the General Corporation Law of the State of Delaware, which prohibits a person who owns in excess of 15% of our outstanding voting stock from merging or combining with us for a period of three years after the date of the transaction in which the person acquired in excess of 15% of our outstanding voting stock, unless the merger or combination is approved in a prescribed manner. This could discourage, delay or prevent someone from acquiring us or merging with us, whether or not it is desired by, or beneficial to, our stockholders. This could also have the effect of discouraging others from making tender offers for our common stock, including transactions that may be in your best interests. These provisions may also prevent changes in our management or limit the price that investors are willing to pay for our stock.

If securities or industry analysts do not publish research or publish inaccurate or unfavorable research about our business, our share price and trading volume could decline.

The trading market for our common stock may be influenced, in part, by the research and reports that industry or securities analysts publish about us or our business. If no or few securities or industry analysts maintain coverage of us, or one or more of the analysts who cover us issues an adverse opinion about our company, our stock price would likely decline. If one or more of these analysts ceases research coverage of us or fails to regularly publish reports on us, we could lose visibility in the financial markets, which in turn could cause our stock price or trading volume to decline.

We have broad discretion in the use of the net proceeds from this offering and our existing cash and may not use them effectively.

Our management will have broad discretion in the application of the net proceeds from this offering, including for any of the purposes described in the section entitled "Use of Proceeds," as well as our existing cash and cash equivalents, and you will be relying on the judgment of our management regarding such application. You will not have the opportunity, as part of your investment decision, to

assess whether the proceeds are being used appropriately. Our management might not apply the net proceeds or our existing cash in ways that ultimately increase the value of your investment. If we do not invest or apply the net proceeds from this offering or our existing cash and cash equivalents in ways that enhance stockholder value, we may fail to achieve expected financial results, which could cause our stock price to decline. Pending their use, we may invest the net proceeds from this offering in short-term, investment-grade, interest-bearing securities. These investments may not yield a favorable return to our stockholders.

You will experience immediate dilution in the book value per share of the securities you purchase in this offering.

Because the price per share of our common stock being offered is substantially higher than the net tangible book value per share of our common stock, you will suffer substantial dilution in the net tangible book value of the common stock you purchase in this offering. Based on the public offering price of $6.00 per share, and a net tangible book value per share of our common stock of $3.63 as of September 30, 2017, if you purchase shares of common stock in this offering, you will suffer immediate and substantial dilution of $1.83 per share in the net tangible book value of the common stock you purchase. Any exercise of outstanding stock options, warrants or other equity awards will result in further dilution. See "Dilution" for a more detailed discussion of the dilution you will incur if you purchase our securities in this offering.

The trading price of the shares of our common stock could be highly volatile, and purchasers of our common stock could incur substantial losses.

Our stock began trading on The Nasdaq Global Market on October 26, 2016. Between that date and February 14, 2018, it has traded between $5.80 and $27.84 per share. Our stock price could be subject to wide fluctuations in response to a variety of factors, which include:

- the initiation, timing, progress and results of our research and development programs and future preclinical and clinical studies;
- the risk that topline data from our Phase 2 clinical trial in paroxysmal nocturnal hemoglobinuria, or PNH, may not be indicative of final study results or results from future trials;
- our ability to advance any product candidates into, and successfully complete, clinical studies and obtain regulatory approval for them;
- our ability to identify additional product candidates using our Extreme Diversity^{TM} platform;
- the timing or likelihood of regulatory filings and approvals;
- the commercialization, marketing and manufacturing of our product candidates, if approved;
- the pricing and reimbursement of our product candidates, if approved;
- the rate and degree of market acceptance and clinical utility of any products for which we receive marketing approval;
- the implementation of our strategic plans for our business, product candidates and technology;
- the scope of protection we are able to establish and maintain for intellectual property rights covering our product candidates and technology;
- our expectations related to the use of proceeds from our public offering, and estimates of our expenses, future revenues, capital requirements and our needs for additional financing;
- our ability to maintain and establish collaborations;

- our financial performance;
- developments relating to our competitors and our industry, including the impact of government regulation; and
- other risks and uncertainties, including those listed under the caption "Risk Factors" in this prospectus supplement and the accompanying prospectus or any other documents incorporated by reference in this prospectus supplement and the accompanying prospectus.

As a result, you may not be able to sell your shares of common stock at or above the price at which you purchase them. In addition, the stock market in general, and The Nasdaq Global Market and the stock of biotechnology and emerging pharmaceutical companies in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of these companies. Broad market and industry factors may negatively affect the market price of our common stock, regardless of our actual operating performance.

USE OF PROCEEDS

We estimate that the net proceeds from the sale of the shares of common stock we are offering will be approximately $47.1 million, based on the public offering price of $6.00 per share, and after deducting the estimated underwriting discounts and commissions and estimated offering costs payable by us. If the underwriters exercise in full their option to purchase additional shares, we estimate that our net proceeds from this offering will be approximately $54.2 million.

The principal purpose of this offering is to obtain additional capital to support our operations. We expect to use the net proceeds of this offering, in addition to our existing cash resources, for the following purposes:

- to fund the Phase 2 trial for RA101495 for gMG; and
- working capital and general corporate and administrative expenses.

The amounts and timing of our use of the net proceeds from this offering will depend on a number of factors, such as the timing and progress of our research and development efforts, the timing and progress of any collaborative or strategic partnering efforts, and the competitive environment for our planned products. As of the date of this prospectus supplement, we cannot specify with certainty all of the particular uses for the net proceeds to us from this offering. Accordingly, our management will have broad discretion in the timing and application of these proceeds. Pending application of the net proceeds as described above, we intend to temporarily invest the proceeds in short-term, interest-bearing instruments.

MARKET FOR COMMON STOCK

Our common stock is traded under the symbol "RARX" and is quoted on The Nasdaq Global Market. The following table sets forth the high and low sales prices for shares of our common stock, as reported by The Nasdaq Global Market for the periods indicated.

Year Ending December 31, 2018	High	Low
First Quarter(1)	$ 9.47	$ 5.80

Year Ended December 31, 2017	High	Low
First Quarter	$ 24.12	$ 13.83
Second Quarter	$ 27.84	$ 15.13
Third Quarter	$ 19.03	$ 12.16
Fourth Quarter	$ 17.90	$ 7.15

Year Ended December 31, 2016	High	Low
Fourth Quarter(2)	$ 16.56	$ 12.05

(1) For the period from January 1, 2018 through February 14, 2018.

(2) For the period from October 26, 2016 through December 31, 2016.

On February 14, 2018, the closing price for the common stock as reported on The Nasdaq Global Market was $6.50.

As of December 31, 2017, there were 18 stockholders of record, which excludes stockholders whose shares were held in nominee or street name by brokers.

DIVIDEND POLICY

We have never declared or paid cash dividends on our common stock, and we do not expect to pay any cash dividends on our common stock in the foreseeable future. Payment of future dividends, if any, on our common stock will be at the discretion of our Board of Directors after taking into account various factors, including our financial condition, operating results, anticipated cash needs, and plans for expansion.

DILUTION

If you purchase shares of our common stock in this offering, your interest will be diluted to the extent of the difference between the public offering price per share of our common stock and the net tangible book value per share of our common stock after this offering. Our net tangible book value as of September 30, 2017 was $82.2 million, or $3.63 per share of common stock. "Net tangible book value" is total assets minus the sum of liabilities and intangible assets. "Net tangible book value per share" is net tangible book value divided by the total number of shares of common stock outstanding.

After giving effect to the sale by us of 8,400,000 shares of common stock, and after deducting the estimated underwriting discounts and commissions and estimated offering expenses that we will pay, our net tangible book value as of September 30, 2017, would have been approximately $129.2 million, or $4.17 per share of common stock. This amount represents an immediate increase in net tangible book value of $0.54 per share to existing stockholders and an immediate dilution of $1.83 per share to purchasers in this offering.

The following table illustrates the dilution:

Public offering price per share of common stock		$ 6.00
Net tangible book value per share as of September 30, 2017	$ 3.63	
Increase in net tangible book value per share attributable to this offering	$ 0.54	
Pro forma net tangible book value per share after this offering		$ 4.17
Dilution per share to new investors		$ 1.83

This table does not include:

- 3,358,325 shares of our common stock issuable upon the exercise of outstanding options under our 2016 Stock Award and Incentive Plan with a weighted-average exercise price of $9.81 per share, as of September 30, 2017;
- 963,538 shares of our common stock available for future issuance under our 2016 Stock Award and Incentive Plan as of September 30, 2017; and
- 400,461 shares of common stock available for future issuance under our 2016 Employee Stock Purchase Plan as of September 30, 2017.

Certain of our existing principal stockholders and directors have indicated an interest in purchasing up to an aggregate of approximately $22 million in shares of our common stock in this offering at the public offering price. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no shares in this offering to such stockholders and individuals, and such stockholders and individuals may determine to purchase more, less or no shares in this offering.

UNDERWRITING

Under the terms and subject to the conditions contained in an underwriting agreement dated February 14, 2018 we have agreed to sell to the underwriters named below, for whom Credit Suisse Securities (USA) LLC, Jefferies LLC and BMO Capital Markets Corp. are acting as representatives the following respective numbers of shares of common stock:

Underwriter	Number of Shares
Credit Suisse Securities (USA) LLC	2,772,000
Jefferies LLC	2,688,000
BMO Capital Markets Corp.	2,100,000
SunTrust Robinson Humphrey, Inc	840,000
Total	8,400,000

The underwriting agreement provides that the underwriters are obligated to purchase all the shares of common stock in the offering if any are purchased, other than those shares covered by the over-allotment option described below. The underwriting agreement also provides that if an underwriter defaults the purchase commitments of non-defaulting underwriters may be increased or the offering may be terminated.

We have agreed to indemnify the underwriters and certain of their controlling persons against certain liabilities, including liabilities under the Securities Act, and to contribute to payments that the underwriters may be required to make in respect of those liabilities.

We have granted to the underwriters a 30-day option to purchase on a pro rata basis up to 1,260,000 additional shares at the public offering price less the underwriting discounts and commissions.

Certain of our existing principal stockholders and directors have indicated an interest in purchasing up to an aggregate of approximately $22 million in shares of our common stock in this offering at the public offering price. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no shares in this offering to such stockholders and individuals, and such stockholders and individuals may determine to purchase more, less or no shares in this offering.

The underwriters propose to offer the shares of common stock initially at the public offering price on the cover of this prospectus supplement and to selling group members at that price less a selling concession of $0.216 per share. After the public offering the representatives may change the public offering price and selling concession.

The following table summarizes the compensation and estimated expenses we will pay:

	Per Share		Total	
	Without Over-allotment	With Over-allotment	Without Over-allotment	With Over-allotment
Underwriting Discounts and Commissions paid by us	$ 0.36	$ 0.36	$ 3,024,000	$ 3,477,600

We estimate that our out of pocket expenses for this offering will be approximately $0.3 million. We have also agreed to reimburse the underwriters for certain expenses incurred in connection with this offering in an amount of up to $45,000.

We have agreed that we will not offer, sell, contract to sell, pledge or otherwise dispose of, directly or indirectly, or file with the Securities and Exchange Commission a registration statement under the Securities Act of 1933 (the "Securities Act") relating to, any shares of our common stock or securities

convertible into or exchangeable or exercisable for any shares of our common stock, or publicly disclose the intention to make any offer, sale, pledge, disposition or filing, without the prior written consent of the representatives for a period of 90 days after the date of this prospectus supplement. The restrictions described in this paragraph do not apply in certain circumstances, including grants of employee stock options pursuant to our existing plans or issuances pursuant to the exercise of such employee options.

Our officers and directors and other stockholders have agreed that they will not offer, sell, contract to sell, pledge or otherwise dispose of, directly or indirectly, any shares of our common stock or securities convertible into or exchangeable or exercisable for any shares of our common stock, enter into a transaction that would have the same effect, or enter into any swap, hedge or other arrangement that transfers, in whole or in part, any of the economic consequences of ownership of our common stock, whether any of these transactions are to be settled by delivery of our common stock or other securities, in cash or otherwise, or publicly disclose the intention to make any offer, sale, pledge or disposition, or to enter into any transaction, swap, hedge or other arrangement, without, in each case, the prior written consent of the representatives for a period of 90 days after the date of this prospectus supplement. The restrictions described in this paragraph do not apply in certain circumstances, including: (i) transfers as a bona fide gift or gifts or for bona fide estate planning purposes; (ii) transfers to a trust or limited family partnership for the direct or indirect benefit of the securityholder or the immediate family of the securityholder; (iii) transfers by will, other testamentary document or intestate succession; (iv) transfers pursuant to a court order in respect of, or by operation of law, as a result of a divorce; (v) transfers to us in connection with the exercise, including any "net" exercise, of any options or warrants or the conversion of any convertible security in accordance with its terms, provided that any securities issued upon such exercise or conversion will be subject to the lock-up restrictions and no filing or public announcement under the Securities Exchange Act of 1934, as amended, or the Exchange Act, is required or is voluntarily made in connection with such transfer, exercise, or conversion, other than a filing on a Form 5 made after the expiration of the lock-up period or, in the case of a "net" exercise, a filing on a Form 4 that reports such "net" exercise under the transaction code "F"); (vi) transfers to wholly-owned and controlled limited liability company or partnership; (vii) with respect to a securityholder that is a trust, transfers to any beneficiary or the estate of any such beneficiary; (viii) transfers or distributions to members, limited partners, stockholders or affiliates of, or any investment fund or other entity that controls or manages, the securityholder; (ix) transfers or distributions in connection with a merger or sale of all or substantially all of our voting securities or assets; (x) the entering into of a written trading plan pursuant to Rule 10b5-1 of the Exchange Act during the lock-up period, provided that no sales of the securities are made pursuant to such plan, and no public disclosures are made regarding such plan, prior to the expiration of the lock-up period; and (xi) securities purchased in the open market or in this offering so long as no filing or public announcement by any party under Section 16 of the Exchange Act is required or will be voluntarily made, other than a filing on a Form 5 made after the expiration of the lock-up period.

We have agreed to indemnify the underwriters against liabilities under the Securities Act, or contribute to payments that the underwriters may be required to make in that respect.

Our common stock is listed on The NASDAQ Global Market under the symbol "RARX."

In connection with the offering the underwriters may engage in stabilizing transactions, over-allotment transactions, syndicate covering transactions and penalty bids.

- Stabilizing transactions permit bids to purchase the underlying security so long as the stabilizing bids do not exceed a specified maximum.
- Over-allotment involves sales by the underwriters of shares in excess of the number of shares the underwriters are obligated to purchase, which creates a syndicate short position. The short position may be either a covered short position or a naked short position. In a covered short

position, the number of shares over-allotted by the underwriters is not greater than the number of shares that they may purchase in the over-allotment option. In a naked short position, the number of shares involved is greater than the number of shares in the over-allotment option. The underwriters may close out any covered short position by either exercising their over-allotment option and/or purchasing shares in the open market.

- Syndicate covering transactions involve purchases of the common stock in the open market after the distribution has been completed in order to cover syndicate short positions. In determining the source of shares to close out the short position, the underwriters will consider, among other things, the price of shares available for purchase in the open market as compared to the price at which they may purchase shares through the over-allotment option. If the underwriters sell more shares than could be covered by the over-allotment option, a naked short position, the position can only be closed out by buying shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that there could be downward pressure on the price of the shares in the open market after pricing that could adversely affect investors who purchase in the offering.

- Penalty bids permit the representatives to reclaim a selling concession from a syndicate member when the common stock originally sold by the syndicate member is purchased in a stabilizing or syndicate covering transaction to cover syndicate short positions.

These stabilizing transactions, syndicate covering transactions and penalty bids may have the effect of raising or maintaining the market price of our common stock or preventing or retarding a decline in the market price of the common stock. As a result the price of our common stock may be higher than the price that might otherwise exist in the open market. These transactions may be effected on The Nasdaq Global Market and, if commenced, may be discontinued at any time.

A prospectus in electronic format may be made available on the web sites maintained by one or more of the underwriters, or selling group members, if any, participating in this offering and one or more of the underwriters participating in this offering may distribute prospectuses electronically. The representatives may agree to allocate a number of shares to underwriters and selling group members for sale to their online brokerage account holders. Internet distributions will be allocated by the underwriters and selling group members that will make internet distributions on the same basis as other allocations.

Other Relationships

The underwriters and their respective affiliates are full-service financial institutions engaged in various activities, which may include securities trading, commercial and investment banking, financial advisory, investment management, investment research, principal investment, hedging, financing and brokerage activities. Certain of the underwriters and their respective affiliates have, from time to time, performed, and may in the future perform, various financial advisory and investment banking services for us, for which they received or will receive customary fees and expenses.

In addition, in the ordinary course of their business activities, the underwriters and their affiliates may make or hold a broad array of investments and actively trade debt and equity securities (or related derivative securities) and financial instruments (including bank loans) for their own account and for the accounts of their customers. These investments and securities activities may involve securities and/or instruments of ours or our affiliates. The underwriters and their affiliates may also make investment recommendations and/or publish or express independent research views in respect of such securities or financial instruments and may hold, or recommend to clients that they acquire, long and/or short positions in such securities and instruments.

Selling Restrictions

Notice to Prospective Investors in Australia

This prospectus is not a disclosure document for the purposes of Australia's Corporations Act 2001 (Cth) of Australia, or Corporations Act, has not been lodged with the Australian Securities & Investments Commission and is only directed to the categories of exempt persons set out below. Accordingly, if you receive this prospectus in Australia:

1. You confirm and warrant that you are either:

- a "sophisticated investor" under section 708(8)(a) or (b) of the Corporations Act;
- a "sophisticated investor" under section 708(8)(c) or (d) of the Corporations Act and that you have provided an accountant's certificate to the Company which complies with the requirements of section 708(8)(c)(i) or (ii) of the Corporations Act and related regulations before the offer has been made;
- a person associated with the Company under Section 708(12) of the Corporations Act; or
- a "professional investor" within the meaning of section 708(11)(a) or (b) of the Corporations Act.

To the extent that you are unable to confirm or warrant that you are an exempt sophisticated investor, associated person or professional investor under the Corporations Act any offer made to you under this prospectus is void and incapable of acceptance.

2. You warrant and agree that you will not offer any of the securities issued to you pursuant to this prospectus for resale in Australia within 12 months of those securities being issued unless any such resale offer is exempt from the requirement to issue a disclosure document under section 708 of the Corporations Act.

Notice to Canadian Residents

Resale Restrictions

The distribution of shares of common stock in Canada is being made only in the provinces of Ontario, Quebec, Alberta and British Columbia on a private placement basis exempt from the requirement that we prepare and file a prospectus with the securities regulatory authorities in each province where trades of these securities are made. Any resale of the common stock in Canada must be made under applicable securities laws which may vary depending on the relevant jurisdiction, and which may require resales to be made under available statutory exemptions or under a discretionary exemption granted by the applicable Canadian securities regulatory authority. Purchasers are advised to seek legal advice prior to any resale of the securities.

Representations of Canadian Purchasers

By purchasing shares of our common stock in Canada and accepting delivery of a purchase confirmation, a purchaser is representing to us and the dealer from whom the purchase confirmation is received that:

- the purchaser is entitled under applicable provincial securities laws to purchase the shares of common stock without the benefit of a prospectus qualified under those securities laws as it is an "accredited investor" as defined under National Instrument 45-106—Prospectus Exemptions,
- the purchaser is a "permitted client" as defined in National Instrument 31-103—Registration Requirements, Exemptions and Ongoing Registrant Obligations,

- where required by law, the purchaser is purchasing as principal and not as agent, and
- the purchaser has reviewed the text above under Resale Restrictions.

Other Relationships

Canadian purchasers are hereby notified that the underwriters are relying on the exemption set out in section 3A.3 or 3A.4, if applicable, of National Instrument 33-105—*Underwriting Conflicts* from having to provide certain conflict of interest disclosure in this document.

Statutory Rights of Action

Securities legislation in certain provinces or territories of Canada may provide a purchaser with remedies for rescission or damages if the offering memorandum (including any amendment thereto) such as this document contains a misrepresentation, provided that the remedies for rescission or damages are exercised by the purchaser within the time limit prescribed by the securities legislation of the purchaser's province or territory. The purchaser of these securities in Canada should refer to any applicable provisions of the securities legislation of the purchaser's province or territory for particulars of these rights or consult with a legal advisor.

Enforcement of Legal Rights

All of our directors and officers as well as the experts named herein may be located outside of Canada and, as a result, it may not be possible for Canadian purchasers to effect service of process within Canada upon us or those persons. All or a substantial portion of our assets and the assets of those persons may be located outside of Canada and, as a result, it may not be possible to satisfy a judgment against us or those persons in Canada or to enforce a judgment obtained in Canadian courts against us or those persons outside of Canada.

Taxation and Eligibility for Investment

Canadian purchasers of our common stock should consult their own legal and tax advisors with respect to the tax consequences of an investment in the shares of common stock in their particular circumstances and about the eligibility of the shares of common stock for investment by the purchaser under relevant Canadian legislation.

Notice to Prospective Investors in the European Economic Area

In relation to each Member State of the European Economic Area that has implemented the Prospectus Directive, or each, a Relevant Member State, each underwriter represents and agrees that with effect from and including the date on which the Prospectus Directive is implemented in that Relevant Member State, or the Relevant Implementation Date, it has not made and will not make an offer of our common stock to the public in that Relevant Member State prior to the publication of a prospectus in relation to our common stock that has been approved by the competent authority in that Relevant Member State or, where appropriate, approved in another Relevant Member State and notified to the competent authority in that Relevant Member State, all in accordance with the Prospectus Directive, except that it may, with effect from and including the Relevant Implementation Date, make an offer of our common stock to the public in that Relevant Member State at any time:

- to any legal entity that is a qualified investor as defined in the Prospectus Directive;
- to fewer than 100 or, if the Relevant Member State has implemented the relevant provision of the PD Amending Directive, 150, natural or legal persons (other than qualified investors as defined in the Prospectus Directive) subject to obtaining the prior consent of the manager for any such offer; or

- in any other circumstances falling within Article 3(2) of the Prospectus Directive;

provided that no such offer of our common stock shall require the publication by the issuer or any underwriter of a prospectus pursuant to Article 3 of the Prospectus Directive.

For the purposes of this provision, the expression an "offer to the public" in relation to any shares of our common stock in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and our common stock to be offered so as to enable an investor to decide to purchase or subscribe our common stock, as the same may be varied in that Relevant Member State by any measure implementing the Prospectus Directive in that Member State and the expression Prospectus Directive means Directive 2003/71/EC (and amendments thereto, including Directive 2010/73/EU, to the extent implemented in each Relevant Member State) and includes any relevant implementing measure in each Relevant Member State.

Any distributor subject to MiFID II that is offering, selling or recommending the shares is responsible for undertaking its own target market assessment in respect of the shares and determining its own distribution channels for the purposes of the MiFID product governance rules under Commission Delegated Directive (EU) 2017/593 ("Delegated Directive"). Neither the Issuer nor the underwriters make any representations or warranties as to a distributor's compliance with the Delegated Directive.

Notice to Prospective Investors in Hong Kong

No securities have been offered or sold, and no securities may be offered or sold, in Hong Kong, by means of any document, other than to persons whose ordinary business is to buy or sell shares or debentures, whether as principal or agent; or to "professional investors" as defined in the Securities and Futures Ordinance (Cap. 571) of Hong Kong ("SFO") and any rules made under that Ordinance; or in other circumstances which do not result in the document being a "prospectus" as defined in the Companies Ordinance (Cap. 32) of Hong Kong ("CO") or which do not constitute an offer or invitation to the public for the purpose of the CO or the SFO. No document, invitation or advertisement relating to the securities has been issued or may be issued or may be in the possession of any person for the purpose of issue (in each case whether in Hong Kong or elsewhere), which is directed at, or the contents of which are likely to be accessed or read by, the public of Hong Kong (except if permitted under the securities laws of Hong Kong) other than with respect to securities which are or are intended to be disposed of only to persons outside Hong Kong or only to "professional investors" as defined in the SFO and any rules made under that Ordinance.

This prospectus has not been registered with the Registrar of Companies in Hong Kong. Accordingly, this prospectus may not be issued, circulated or distributed in Hong Kong, and the securities may not be offered for subscription to members of the public in Hong Kong. Each person acquiring the securities will be required, and is deemed by the acquisition of the securities, to confirm that he is aware of the restriction on offers of the securities described in this prospectus and the relevant offering documents and that he is not acquiring, and has not been offered any securities in circumstances that contravene any such restrictions.

Notice to Prospective Investors in Japan

The offering has not been and will not be registered under the Financial Instruments and Exchange Law of Japan (Law No. 25 of 1948 of Japan, as amended), or FIEL, and the prospectus will not offer or sell any securities, directly or indirectly, in Japan or to, or for the benefit of, any resident of Japan (which term as used herein means any person resident in Japan, including any corporation or other entity organized under the laws of Japan), or to others for re-offering or resale, directly or indirectly, in Japan or to, or for the benefit of, any resident of Japan, except pursuant to an exemption

from the registration requirements of, and otherwise in compliance with, the FIEL and any other applicable laws, regulations and ministerial guidelines of Japan.

Notice to Prospective Investors in Singapore

This prospectus has not been and will not be lodged or registered as a prospectus with the Monetary Authority of Singapore. Accordingly, this prospectus and any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of the shares of common stock may not be circulated or distributed, nor may the common stock be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor under Section 274 of the Securities and Futures Act, Chapter 289 of Singapore (the "SFA"), (ii) to a relevant person pursuant to Section 275(1), or any person pursuant to Section 275(1A), and in accordance with the conditions specified in Section 275, of the SFA, or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA.

Where the shares of common stock are subscribed or purchased under Section 275 of the SFA by a relevant person which is:

(a) a corporation (which is not an accredited investor (as defined in Section 4A of the SFA)) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or

(b) a trust (where the trustee is not an accredited investor) whose sole purpose is to hold investments and each beneficiary of the trust is an individual who is an accredited investor,

securities (as defined in Section 239(1) of the SFA) of that corporation or the beneficiaries' rights and interest (howsoever described) in that trust shall not be transferred within six months after that corporation or that trust has acquired the shares of common stock pursuant to an offer made under Section 275 of the SFA except:

(i) to an institutional investor or to a relevant person defined in Section 275(2) of the SFA, or to any person arising from an offer referred to in Section 275(1A) or Section 276(4)(i)(B) of the SFA;

(ii) where no consideration is or will be given for the transfer;

(iii) where the transfer is by operation of law;

(iv) as specified in Section 276(7) of the SFA; or

(v) as specified in Regulation 32 of the Securities and Futures (Offers of Investments) (Shares and Debentures) Regulations 2005 of Singapore.

Notice to Prospective Investors in Switzerland

This document is not intended to constitute an offer or solicitation to purchase or invest in the securities described herein. The securities may not be publicly offered, sold or advertised, directly or indirectly, in, into or from Switzerland and will not be listed on the SIX Swiss Exchange or on any other exchange or regulated trading facility in Switzerland. Neither this document nor any other offering or marketing material relating to the securities constitutes a prospectus as such term is understood pursuant to article 652a or article 1156 of the Swiss Code of Obligations or a listing prospectus within the meaning of the listing rules of the SIX Swiss Exchange or any other regulated trading facility in Switzerland, and neither this document nor any other offering or marketing material relating to the securities may be publicly distributed or otherwise made publicly available in Switzerland.

Neither this document nor any other offering or marketing material relating to the offering, nor the Company nor the securities have been or will be filed with or approved by any Swiss regulatory authority. The securities are not subject to the supervision by any Swiss regulatory authority, e.g., the Swiss Financial Markets Supervisory Authority FINMA (FINMA), and investors in the securities will not benefit from protection or supervision by such authority.

Notice to Prospective Investors in the United Kingdom

Each underwriter:

- has only communicated or caused to be communicated and will only communicate or cause to be communicated any invitation or inducement to engage in investment activity (within the meaning of section 21 of the Financial Services and Markets Act 2000, or the FSMA) in connection with the sale or issue of common stock in circumstances in which section 21 of the FSMA does not apply to such underwriter; and

- has complied with, and will comply with all applicable provisions of the FSMA with respect to anything done by it in relation to the shares of common stock in, from, or otherwise involving the United Kingdom.

This prospectus is directed solely at persons who (i) are outside the United Kingdom or (ii) have professional experience in matters relating to investments or (iii) are persons falling within Article 49(2)(a) to (d) of the FSMA (Financial Promotion) Order 2005 (all such persons together being referred to as "relevant persons"). This prospectus must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this prospectus relates is available only to relevant persons and will be engaged in with relevant persons only.

MATERIAL U.S. FEDERAL INCOME TAX CONSIDERATIONS FOR NON-U.S. HOLDERS

The following is a summary of the material U.S. federal income tax consequences of the ownership and disposition of our common stock to non-U.S. holders (as defined below), but does not purport to be a complete analysis of all the potential tax considerations relating thereto. This summary is based upon the provisions of the Internal Revenue Code of 1986, as amended, or the Code, Treasury regulations promulgated thereunder, administrative rulings and judicial decisions, all as of the date hereof. These authorities may be changed or subject to differing interpretations, possibly with retroactive effect, so as to result in U.S. federal income tax consequences different from those set forth below. We have not sought any ruling from the Internal Revenue Service, or the IRS, with respect to the statements made and the conclusions reached in the following summary, and there can be no assurance that the IRS will agree with such statements and conclusions.

This summary also does not address the tax considerations arising under the laws of any U.S. state or local or any non-U.S. jurisdiction, the Medicare tax on net investment income or any alternative minimum tax consequences. In addition, this discussion does not address tax considerations applicable to an investor's particular circumstances or to investors that may be subject to special tax rules, including, without limitation:

- banks, insurance companies or other financial institutions;
- tax-exempt organizations;
- dealers in securities or currencies;
- traders in securities that elect to use a mark-to-market method of accounting for their securities holdings;
- persons that own, or are deemed to own, more than five percent of our capital stock;
- certain former citizens or long-term residents of the United States subject to tax as expatriates;
- persons who hold our common stock as a position in a hedging transaction, "straddle," "conversion transaction" or other risk reduction transaction;
- persons subject to special tax accounting rules as a result of any item of gross income with respect to the stock being taken into account in an applicable financial statement;
- persons who do not hold our common stock as a capital asset within the meaning of Section 1221 of the Code (generally, for investment purposes);
- persons deemed to sell our common stock under the constructive sale provisions of the Code;
- pension plans;
- controlled foreign corporations;
- passive foreign investment companies; or
- persons that acquire our common stock as compensation for services.

In addition, if a partnership, including any entity or arrangement classified as a partnership for U.S. federal income tax purposes, holds our common stock, the tax treatment of a partner generally will depend on the status of the partner and upon the activities of the partnership. Accordingly, partnerships that hold our common stock, and partners in such partnerships, should consult their tax advisors.

You are urged to consult your tax advisor with respect to the application of the U.S. federal income tax laws to your particular situation, as well as any tax consequences of the purchase, ownership and disposition of our common stock arising under the U.S. federal estate or gift tax rules

or under the laws of any U.S. state or local, non-U.S. or other taxing jurisdiction or under any applicable tax treaty.

Non-U.S. Holder Defined

For purposes of this discussion, you are a non-U.S. holder if you are a beneficial owner of our common stock that is for U.S. federal income tax purposes (i) a foreign corporation or any other foreign organization taxable as a corporation for U.S. federal income tax purposes, (ii) a nonresident alien individual, or (iii) a foreign estate or trust that in either case is not subject to U.S. federal income tax on a net-income basis on income or gain from a share of our common stock.

Distributions

If we make distributions on our common stock, those payments will constitute dividends for U.S. tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. To the extent those distributions exceed both our current and our accumulated earnings and profits, they will constitute a return of capital and will first reduce your basis in our common stock, but not below zero, and then will be treated as gain from the sale of stock (which will be taxed as described below under "—Gain on Sale or Other Disposition of Common Stock").

Subject to the discussions below regarding backup withholding and FATCA, any dividend paid to you generally will be subject to U.S. withholding tax either at a rate of 30% of the gross amount of the dividend or such lower rate as may be specified by an applicable income tax treaty. In order to receive a reduced treaty rate, you must provide the applicable withholding agent with an IRS Form W-8BEN (generally including a U.S. taxpayer identification number), IRS Form W-8-BEN-E or another appropriate version of IRS Form W-8 (or a successor form), in each case, certifying qualification for the reduced rate.

Dividends received by you that are effectively connected with the conduct of a U.S. trade or business (and, if an income tax treaty applies, are attributable to a permanent establishment maintained by you in the United States) generally are exempt from such withholding tax. In order to obtain this exemption, you must provide the applicable withholding agent with an IRS Form W-8ECI or successor form or other applicable IRS Form W-8 properly certifying such exemption. Such effectively connected dividends, although not subject to withholding tax, are taxed at the same graduated rates applicable to U.S. persons, net of certain deductions and credits. In addition, if you are a corporate non-U.S. holder, dividends you receive that are effectively connected with your conduct of a U.S. trade or business (and, if an income tax treaty applies, are attributable to a permanent establishment maintained by the you in the United States) may also be subject to a branch profits tax at a rate of 30% or such lower rate as may be specified by an applicable income tax treaty.

If you are eligible for a reduced rate of withholding tax pursuant to a tax treaty, you may be able to obtain a refund of any excess amounts currently withheld if you file an appropriate claim for refund with the IRS.

Gain on Sale or Other Disposition of Common Stock

Subject to the discussions below regarding backup withholding and FATCA, you generally will not be required to pay U.S. federal income tax on any gain realized upon the sale or other disposition of our common stock unless:

- the gain is effectively connected with the conduct of a U.S. trade or business (and, if an income tax treaty applies, the gain is attributable to a permanent establishment maintained by you in the United States), in which case you will be required to pay tax on the net gain derived from the

sale under regular graduated U.S. federal income tax rates, and if you are a corporation, you may be subject to the branch profits tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty;

- you are an individual who is present in the United States for a period or periods aggregating 183 days or more during the taxable year in which the sale or disposition occurs and certain other conditions are met, in which case you will be required to pay a flat 30% tax on the gain derived from the sale (or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence), which tax may be offset by U.S. source capital losses (even though you are not considered a resident of the United States); or

- our common stock constitutes a U.S. real property interest by reason of our status as a "U.S. real property holding corporation" for U.S. federal income tax purposes, or a USRPHC, at any time within the shorter of the five-year period preceding the disposition or your holding period for our common stock. Generally, a corporation is a U.S. real property holding corporation only if the fair market value of its U.S. real property interests equals or exceeds 50% of the sum of the fair market value of its worldwide real property interests plus its other assets used or held for use in a trade or business. Although there can be no assurance, we believe that we are not currently and will not become a USRPHC. However, because the determination of whether we are a USRPHC depends on the fair market value of our U.S. real property relative to the fair market value of our other business assets, there can be no assurance that we will not become a USRPHC in the future. Even if we become a USRPHC, however, as long as our common stock is regularly traded on an established securities market, such common stock will be treated as U.S. real property interests only if you actually or constructively hold more than five percent of such regularly traded common stock at any time during the applicable period that is specified in the Code.

Backup Withholding and Information Reporting

Generally, we must report annually to the IRS the amount of dividends paid to you, your name and address, and the amount of tax withheld, if any. A similar report will be sent to you. Pursuant to applicable income tax treaties or other agreements, the IRS may make these reports available to tax authorities in your country of residence.

Payments of dividends or of proceeds on the disposition of stock made to you may be subject to additional information reporting and backup withholding at a current rate of 24% unless you establish an exemption, for example by properly certifying your non-U.S. status on an IRS Form W-8BEN, IRS Form W-8BEN-E or another appropriate version of IRS Form W-8 (or a successor form). Notwithstanding the foregoing, backup withholding and information reporting may apply if the applicable withholding agent has actual knowledge, or reason to know, that you are a U.S. person.

Information reporting and backup withholding will generally apply to the proceeds of a disposition of our common stock by a non-U.S. holder effected by or through the U.S. office of any broker, U.S. or foreign, unless the holder certifies its status as a non-U.S. holder and satisfies certain other requirements, or otherwise establishes an exemption. Generally, information reporting and backup withholding will not apply to a payment of disposition proceeds to a non-U.S. holder where the transaction is effected outside the United States through a non-U.S. office of a broker. However, for information reporting purposes, dispositions effected through a non-U.S. office of a broker with substantial U.S. ownership or operations generally will be treated in a manner similar to dispositions effected through a U.S. office of a broker.

Backup withholding is not an additional tax; rather, the U.S. income tax liability of persons subject to backup withholding will be reduced by the amount of tax withheld. If withholding results in an

overpayment of taxes, a refund or credit may generally be obtained from the IRS, provided that the required information is furnished to the IRS in a timely manner.

Foreign Account Tax Compliance Act ("FATCA")

Provisions commonly referred to as "FATCA" may impose withholding tax on certain types of payments made to "foreign financial institutions" and certain other non-U.S. entities. The legislation imposes a 30% withholding tax on dividends on, and gross proceeds from the sale or other disposition of, our common stock paid to a foreign financial institution or to certain non-financial foreign entities, unless (i) the foreign financial institution undertakes certain diligence and reporting obligations, (ii) the non-financial foreign entity either certifies it does not have any substantial U.S. owners or furnishes identifying information regarding each substantial U.S. owner and such entity meets certain other specified requirements, or (iii) an exception applies. If the payee is a foreign financial institution and an exception does not apply, it must enter into an agreement with the U.S. Treasury requiring, among other things, that it undertake to identify accounts held by certain U.S. persons or U.S.-owned foreign entities, annually report certain information about such accounts, and withhold 30% on payments to account holders whose actions prevent it from complying with these reporting and other requirements. If the country in which a payee is resident has entered into an "intergovernmental agreement" with the United States regarding FATCA, that agreement may permit the payee to report to that country rather than to the U.S. Treasury. Under final regulations and published guidance, any obligation to withhold from payments made to a foreign financial institution or a non-financial foreign entity under FATCA currently applies with respect to payments of dividends on our common stock, but with respect to the gross proceeds of a sale or other disposition of our common stock will not begin until January 1, 2019. Prospective investors should consult their tax advisors regarding FATCA.

Each prospective investor should consult its tax advisor regarding the particular U.S. federal, state and local and non-U.S. tax consequences of purchasing, holding and disposing of our common stock, including the consequences of any proposed change in applicable laws.

LEGAL MATTERS

The validity of the common stock being offered hereby will be passed upon by Goodwin Procter LLP, Boston, Massachusetts. Latham & Watkins LLP, Boston, Massachusetts, is acting as counsel for the underwriters in connection with certain legal matters related to this offering.

EXPERTS

The consolidated financial statements of Ra Pharmaceuticals, Inc. as of December 31, 2016 and 2015, and for each of the years in the three-year period ended December 31, 2016, have been included herein and in the registration statement in reliance upon the report of Deloitte & Touche LLP, an independent registered public accounting firm, given on the authority of said firm as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We are subject to the information requirements of the Exchange Act and, in accordance therewith, file annual, quarterly and special reports, proxy statements and other information with the SEC. You may read and copy any document we file at the SEC's Public Reference Room at 100 F Street, N.E., Washington, D.C. 20549. You may call the SEC at 1-800-SEC-0330 for further information on the operation of the Public Reference Room. These documents also may be accessed through the SEC's electronic data gathering, analysis and retrieval system, or EDGAR, via electronic means, including the SEC's home page on the Internet (*www.sec.gov*).

We have the authority to designate and issue more than one class or series of stock having various preferences, conversion and other rights, voting powers, restrictions, limitations as to dividends, qualifications, and terms and conditions of redemption. See "Description of Capital Stock" in the accompanying prospectus. We will furnish a full statement of the relative rights and preferences of each class or series of our stock which has been so designated and any restrictions on the ownership or transfer of our stock to any shareholder upon request and without charge. Written requests for such copies should be directed to Ra Pharmaceuticals, Inc., 87 Cambridge Park Drive, Cambridge, Massachusetts 02140, or by telephone request to (617) 401-4060. Our website is located at www.rapharma.com. Information contained on our website is not incorporated by reference into this prospectus and, therefore, is not part of this prospectus supplement or the accompanying prospectus.

INCORPORATION BY REFERENCE

The SEC allows us to "incorporate by reference" information that we file with them. Incorporation by reference allows us to disclose important information to you by referring you to those other documents. The information incorporated by reference is an important part of this prospectus supplement and the accompanying prospectus, and information that we file later with the SEC will automatically update and supersede this information. We filed a registration statement on Form S-3 under the Securities Act of 1933, as amended, with the SEC with respect to the securities being offered pursuant to this prospectus supplement and the accompanying prospectus. This prospectus supplement and the accompanying prospectus omit certain information contained in the registration statement, as permitted by the SEC. You should refer to the registration statement, including the exhibits, for further information about us and the securities being offered pursuant to this prospectus supplement and the accompanying prospectus. Statements in this prospectus supplement and the accompanying prospectus regarding the provisions of certain documents filed with, or incorporated by reference in, the registration statement are not necessarily complete and each statement is qualified in all respects by that reference. Copies of all or any part of the registration statement, including the documents incorporated by reference or the exhibits, may be obtained upon payment of the prescribed rates at the offices of the SEC listed above in "Where You Can Find More Information." The documents we are incorporating by reference are:

- description of our common stock contained in our Registration Statement on Form 8-A, filed on October 21, 2016;
- our Annual Report on Form 10-K for the fiscal year ended December 31, 2016, filed on March 6, 2017;
- our Quarterly Reports on Form 10-Q for the fiscal quarter ended March 31, 2017, filed on May 11, 2017, for the fiscal quarter ended June 30, 2017, filed on August 9, 2017, and for the fiscal quarter ended September 30, 2017, filed on November 9, 2017;
- our annual Proxy Statement on Schedule 14A relating to our annual meeting of stockholders, filed with the SEC on April 28, 2017 (with respect to those portions incorporated by reference into our Annual Report on Form 10-K for the year ended December 31, 2016); and
- our Current Reports on Form 8-K filed with the SEC on December 8, 2017 and February 14, 2018.

In addition, all documents (other than current reports furnished under Item 2.02 or Item 7.01 of Form 8-K and exhibits filed in such forms that are related to such items unless such Form 8-K expressly provides to the contrary) subsequently filed by us pursuant to Section 13(a), 13(c), 14 or 15(d) of the Securities Exchange Act of 1934, as amended, before the date our offering is terminated or completed are deemed to be incorporated by reference into, and to be a part of, this prospectus supplement and the accompanying prospectus.

Any statement contained in this prospectus supplement and the accompanying prospectus or in a document incorporated or deemed to be incorporated by reference into this prospectus supplement and the accompanying prospectus will be deemed to be modified or superseded for purposes of this prospectus supplement and the accompanying prospectus to the extent that a statement contained in this prospectus supplement and the accompanying prospectus or any other subsequently filed document that is deemed to be incorporated by reference into this prospectus supplement and the accompanying prospectus modifies or supersedes the statement. Any statement so modified or superseded will not be deemed, except as so modified or superseded, to constitute a part of this prospectus supplement and the accompanying prospectus.

We will furnish without charge to you, on written or oral request, a copy of any or all of the documents incorporated by reference, including exhibits to these documents. You should direct any requests for documents to Ra Pharmaceuticals, Inc., 87 Cambridge Park Drive, Cambridge, MA 02140, or by telephone request to (617) 401-4060.

You should rely only on information contained in, or incorporated by reference into, this prospectus supplement and the accompanying prospectus. We have not authorized anyone to provide you with information different from that contained in this prospectus supplement and the accompanying prospectus or incorporated by reference in this prospectus supplement and the accompanying prospectus. We are not making offers to sell the securities in any jurisdiction in which such an offer or solicitation is not authorized or in which the person making such offer or solicitation is not qualified to do so or to anyone to whom it is unlawful to make such offer or solicitation.

$250,000,000

Common Stock
Preferred Stock
Debt Securities
Warrants
Units

We may from time to time issue, in one or more series or classes, up to $250,000,000 in aggregate principal amount of our common stock, preferred stock, debt securities, warrants and/or units. We may offer these securities separately or together in units. We will specify in the accompanying prospectus supplement the terms of the securities being offered. We may sell these securities to or through underwriters and also to other purchasers or through agents. We will set forth the names of any underwriters or agents, and any fees, conversions or discount arrangements, in the accompanying prospectus supplement. We may not sell any securities under this prospectus without delivery of the applicable prospectus supplement.

You should read this document and any prospectus supplement or amendment carefully before you invest in our securities.

Our common stock is listed on The NASDAQ Global Market under the symbol "RARX." On October 31, 2017, the closing price for our common stock, as reported on The NASDAQ Global Market, was $13.14 per share. Our principal executive offices are located at 87 Cambridge Park Drive, Cambridge, MA 02140.

Investing in our securities involves a high degree of risk. You should review carefully the risks and uncertainties referenced under the heading "*Risk Factors*" contained in this prospectus beginning on page 3 and any applicable prospectus supplement, and under similar headings in the other documents that are incorporated by reference into this prospectus.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The date of this Prospectus is November 14, 2017.

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ABOUT THIS PROSPECTUS

This prospectus is part of a registration statement that we filed with the Securities and Exchange Commission, or the SEC, using a "shelf" registration process. Under this shelf registration process, we may from time to time sell any combination of the securities described in this prospectus in one or more offerings for an aggregate offering price of up to $250,000,000.

This prospectus provides you with a general description of the securities we may offer. Each time we sell securities, we will provide one or more prospectus supplements that will contain specific information about the terms of the offering. The prospectus supplement may also add, update or change information contained in this prospectus. You should read both this prospectus and the accompanying prospectus supplement together with the additional information described under the heading "Where You Can Find More Information" beginning on page 30 of this prospectus.

You should rely only on the information contained in or incorporated by reference in this prospectus, any accompanying prospectus supplement or in any related free writing prospectus filed by us with the SEC. We have not authorized anyone to provide you with different information. This prospectus and the accompanying prospectus supplement do not constitute an offer to sell or the solicitation of an offer to buy any securities other than the securities described in the accompanying prospectus supplement or an offer to sell or the solicitation of an offer to buy such securities in any circumstances in which such offer or solicitation is unlawful. You should assume that the information appearing in this prospectus, any prospectus supplement, the documents incorporated by reference and any related free writing prospectus is accurate only as of their respective dates. Our business, financial condition, results of operations and prospects may have changed materially since those dates.

Unless the context otherwise *indicates, references in this prospectus to the "company," "we," "us" and "our" refer to Ra Pharmaceuticals, Inc.*

RISK FACTORS

Investing in our securities involves a high degree of risk. You should carefully consider the risks referenced below and described in the documents incorporated by reference in this prospectus and any prospectus supplement, as well as other information we include or incorporate by reference into this prospectus and any applicable prospectus supplement, before making an investment decision. Our business, financial condition or results of operations could be materially adversely affected by the materialization of any of these risks. The trading price of our securities could decline due to the materialization of any of these risks, and you may lose all or part of your investment. This prospectus and the documents incorporated herein by reference also contain forward-looking statements that involve risks and uncertainties. Actual results could differ materially from those anticipated in these forward-looking statements as a result of certain factors, including the risks referenced below and described in the documents incorporated herein by reference, including (i) our annual report on Form 10-K for the fiscal year ended December 31, 2016, which is on file with the SEC and is incorporated herein by reference, (ii) our quarterly reports on Form 10-Q for the quarter ended June 30, 2017 and March 31, 2017, each of which is incorporated by reference into this prospectus, and (iii) other documents we file with the SEC that are deemed incorporated by reference into this prospectus.

CAUTIONARY STATEMENT REGARDING FORWARD-LOOKING STATEMENTS

This prospectus, including the documents that we incorporate by reference, contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, or the Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or the Exchange Act. Any statements about our expectations, beliefs, plans, objectives, assumptions or future events or performance are not historical facts and may be forward-looking. These statements are often, but are not always, made through the use of words or phrases such as "may," "will," "could," "should," "expects," "intends," "plans," "anticipates," "believes," "estimates," "predicts," "projects," "potential," "continue," and similar expressions, or the negative of these terms, or similar expressions. Accordingly, these statements involve estimates, assumptions, risks and uncertainties which could cause actual results to differ materially from those expressed in them. Any forward-looking statements are qualified in their entirety by reference to the factors discussed throughout this prospectus, and in particular those factors referenced in the section "Risk Factors."

This prospectus contains forward-looking statements that are based on our management's belief and assumptions and on information currently available to our management. These statements relate to future events or our future financial performance, and involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to be materially different from any future results, levels of activity, performance or achievements expressed or implied by these forward-looking statements. Forward-looking statements include, but are not limited to, statements about:

- the initiation, timing, progress and results of our research and development programs and future preclinical and clinical studies;
- the risk that initial data from our ongoing Phase 2 clinical trial in paroxysmal nocturnal hemoglobinuria, or PNH, may not be indicative of final study results or data from other patients that we obtain from this clinical trial;
- our ability to advance any product candidates into, and successfully complete, clinical studies and obtain regulatory approval for them;
- our ability to identify additional product candidates using our Extreme Diversity™ platform;
- the timing or likelihood of regulatory filings and approvals;
- the commercialization, marketing and manufacturing of our product candidates, if approved;
- the pricing and reimbursement of our product candidates, if approved;
- the rate and degree of market acceptance and clinical utility of any products for which we receive marketing approval;
- the implementation of our strategic plans for our business, product candidates and technology;
- the scope of protection we are able to establish and maintain for intellectual property rights covering our product candidates and technology;
- our expectations related to the use of proceeds from our public offering, and estimates of our expenses, future revenues, capital requirements and our needs for additional financing;
- our ability to maintain and establish collaborations;
- our financial performance;
- developments relating to our competitors and our industry, including the impact of government regulation;

- other risks and uncertainties, including those listed under the caption "Risk Factors" in this prospectus and any prospectus supplement that we may file.

These forward-looking statements are neither promises nor guarantees of future performance due to a variety of risks and uncertainties and other factors more fully discussed in the "Risk Factors" section in this prospectus, the section of any accompanying prospectus supplement entitled "Risk Factors" and the risk factors and cautionary statements described in other documents that we file from time to time with the SEC, specifically under "Item 1A. Risk Factors" and elsewhere in our most recent Annual Report on Form 10-K for the period ended December 31, 2016, our Quarterly Reports on Form 10-Q for the quarters ended June 30, 2017 and March 31, 2017, and our Current Reports on Form 8-K.

Given these uncertainties, readers should not place undue reliance on our forward-looking statements. These forward-looking statements speak only as of the date on which the statements were made and are not guarantees of future performance. Except as may be required by applicable law, we do not undertake to update any forward-looking statements after the date of this prospectus or the respective dates of documents incorporated by reference herein or therein that include forward-looking statements.

PROSPECTUS SUMMARY

Overview

We are a clinical-stage biopharmaceutical company using our proprietary peptide chemistry platform to develop novel therapeutics for the treatment of serious diseases that are caused by excessive or uncontrolled activation of the complement system, a critical component of the immune system. We are developing our lead product candidate, RA101495, a convenient self-administered subcutaneous, or SC, injection, which is an injection into the tissue under the skin, for the treatment of PNH. PNH is a rare, chronic, life-threatening, blood disorder where red blood cells are mistakenly attacked and destroyed by the complement system. We initiated our Phase 2 clinical program for RA101495 in PNH patients in the second quarter of 2017 and released initial data in June 2017. We expect to report additional data from our Phase 2 program around year-end 2017. We are also developing RA101495, administered SC, to treat other debilitating complement-mediated diseases such as generalized myasthenia gravis, or gMG, atypical hemolytic uremic syndrome, or aHUS, and lupus nephritis, or LN. We expect to initiate a Phase 2 clinical trial with RA101495 for gMG and a Phase 1b clinical trial supporting development in aHUS and LN in the fourth quarter of 2017. Additionally, we are pursuing discovery and preclinical programs targeting selective inhibition of other uncontrolled complement pathway factors to treat a variety of ophthalmic, renal and inflammatory diseases. In addition to our focus on developing novel therapeutics to treat complement-mediated diseases, we have validated our Extreme Diversity platform by successfully identifying and delivering orally-available cyclic peptides for a non-complement cardiovascular target with a large market opportunity in a collaboration with Merck & Co., Inc.

Company Information

We were incorporated under the laws of the State of Delaware in June 2008 under the name Ra Pharmaceuticals, Inc. Our executive offices are located at 87 Cambridge Park Drive, Cambridge, Massachusetts 02140, and our telephone number is (617) 401-4060. Our website address is www.rapharma.com. We do not incorporate the information on or accessible through our website into this prospectus, and you should not consider any information on, or that can be accessed through, our website as part of this prospectus.

We own various U.S. federal trademark applications and unregistered trademarks, including our company name, Ra Pharmaceuticals, Ra Pharma and our logo. All other trademarks or trade names referred to in this prospectus are the property of their respective owners. Solely for convenience, the trademarks and trade names in this prospectus are referred to without the symbols ® and ™, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

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 amended, or the JOBS Act. 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:

- 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 about our executive compensation arrangements;
- no non-binding advisory votes on executive compensation or golden parachute arrangements;

- exemption from the auditor attestation requirement in the assessment of our internal control over financial reporting; and
- an exemption from new or revised financial accounting standards until they would apply to private companies and from compliance with any new requirements adopted by the Public Company Accounting Oversight Board requiring mandatory audit firm rotation.

We may take advantage of these exemptions for up to five years or such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company on the date that is the earliest of (i) the last day of the fiscal year in which we have total annual gross revenues of $1.07 billion or more; (ii) December 31, 2022; (iii) the date on which we have issued more than $1.07 billion in nonconvertible debt during the previous three years; or (iv) the date on which we are deemed to be a large accelerated filer under the rules of the Securities and Exchange Commission, or SEC. We may choose to take advantage of some but not all of these exemptions. We have irrevocably elected to "opt out" of the exemption for the delayed adoption of certain accounting standards and, therefore, will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

RATIO OF EARNINGS TO FIXED CHARGES

Our earnings were insufficient to cover fixed charges for each of the periods in the table below, and we are unable to disclose a ratio of earnings to fixed charges for such periods. The table below sets forth our deficiency of earnings to cover fixed charges on a historical basis for the periods indicated. You should read this table in conjunction with the financial statements and notes incorporated by reference in this prospectus. The table is qualified by the more detailed information appearing in the computation table found in Exhibit 12.1 to the registration statement of which this prospectus is a part.

	Three Months Ended	Year Ended December 31,		
	June 30, 2017	2016	2015	2014
		(in thousands)		
Deficiency of Earnings to Fixed Charges	$ 12,663	$ 28,882	$ 13,962	$ 5,503

Earnings consist of loss from operations before the benefit from income taxes and fixed charges. Fixed charges consist of the sum of interest expenses and the component of rental expenses that we believe to be representative of the interest factor for these amounts.

USE OF PROCEEDS

We intend to use the net proceeds from the sale of any securities offered under this prospectus for general corporate purposes unless otherwise indicated in the applicable prospectus supplement. General corporate purposes may include costs to commercialize our products, research and development and clinical development costs to support the advancement of our product candidates and the expansion of our product candidate pipeline; funding for the hiring of additional personnel, capital expenditures and the costs of operating as a public company. We may temporarily invest the net proceeds in a variety of capital preservation instruments, including investment grade instruments, certificates of deposit or direct or guaranteed obligations of the U.S. government, or may hold such proceeds as cash, until they are used for their stated purpose. We have not determined the amount of net proceeds to be used specifically for such purposes. As a result, management will retain broad discretion over the allocation of net proceeds.

SECURITIES WE MAY OFFER

This prospectus contains summary descriptions of the securities we may offer from time to time. These summary descriptions are not meant to be complete descriptions of each security. The particular terms of any security will be described in the applicable prospectus supplement.

DESCRIPTION OF CAPITAL STOCK

The following description of our common stock and preferred stock, together with the additional information we include in any applicable prospectus supplements, summarizes the material terms and provisions of the common stock and preferred stock that we may offer under this prospectus. The following description of our capital stock does not purport to be complete and is subject to, and qualified in its entirety by, our amended and restated certificate of incorporation and amended and restated bylaws, which are exhibits to the registration statement of which this prospectus forms a part, and by applicable law. The terms of our common stock and preferred stock may also be affected by Delaware law.

General

Our authorized capital stock consists of 150,000,000 shares of common stock, par value $0.001 per share, and 5,000,000 shares of undesignated preferred stock, par value $0.001 per share.

As of September 30, 2017, there were 22,622,755 shares of common stock outstanding and no shares of preferred stock outstanding. As of October 27, 2017, we had approximately 18 record holders of our capital stock.

Common Stock

We are authorized to issue one class of common stock. The holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of the stockholders. The holders of our common stock do not have any cumulative voting rights. Holders of our common stock are entitled to receive ratably any dividends declared by our board of directors out of funds legally available for that purpose, subject to any preferential dividend rights of any outstanding preferred stock. Our common stock has no preemptive rights, conversion rights or other subscription rights or redemption or sinking fund provisions.

In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in all assets remaining after payment of all debts and other liabilities and any liquidation preference of any outstanding preferred stock.

The rights, preferences and privileges of holders of common stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of preferred stock that we may designate and issue in the future. Except as described under "Anti-Takeover Effects of Delaware Law and our Certificate of Incorporation and Bylaws" below, a majority vote of the holders of common stock is generally required to take action under our certificate of incorporation and by-laws.

Preferred Stock

Our board of directors is authorized, without action by the stockholders, to designate and issue up to an aggregate of 5,000,000 shares of preferred stock in one or more series. Our board of directors can designate the rights, preferences and privileges of the shares of each series and any of its qualifications, limitations or restrictions. Our board of directors may authorize the issuance of preferred stock with voting or conversion rights that could adversely affect the voting power or other rights of the holders of common stock. The issuance of preferred stock, while providing flexibility in connection with possible future financings and acquisitions and other corporate purposes could, under certain circumstances, have the effect of restricting dividends on our common stock, diluting the voting power of our common stock, impairing the liquidation rights of our common stock, or delaying, deferring or preventing a change in control of our company, which might harm the market price of our common stock. See "Anti-Takeover Effects of Delaware Law and our Certificate of Incorporation and Bylaws" below.

Our board of directors will make any determination to issue such shares based on its judgment as to our company's best interests and the best interests of our stockholders. We have no shares of preferred stock outstanding and we have no current plans to issue any shares of preferred stock.

Registration Rights

Based on filings with the Securities and Exchange Commission as of October 31, 2017, the holders of 13.3 million shares of our common stock, or their permitted transferees, which we refer to as our registrable securities, are entitled to rights with respect to the registration of these securities under the Securities Act. These rights are provided under the terms of the investor rights agreement that is an exhibit to the registration statement of which this prospectus is a part. The investor rights agreement includes demand registration rights, short-form registration rights and piggyback registration rights. All fees, costs and expenses incurred in connection with registrations under the investor rights agreement will be borne by us, and all selling expenses, including underwriting discounts and selling commissions, will be borne by the holders of the shares being registered.

Demand registration rights

The holders of our registrable securities are entitled to demand registration rights. Under the terms of the investor rights agreement, we will be required, upon the request of holders of a majority in interest of these holders of these securities that would result in an aggregate offering price of at least $10.0 million, to file a registration statement and use commercially reasonable efforts to effect the registration of all or a portion of these shares for public resale. We are required to effect up to three registrations pursuant to this provision of the investor rights agreement.

Short-Form Registration Rights

The holders of our registrable securities are also entitled to short form registration rights. Pursuant to the investor rights agreement, if we are eligible to file a registration statement on Form S-3, upon the written request of a majority in interest of these holders to sell registrable securities at an aggregate price of at least $1.0 million, we will be required to use commercially reasonable efforts to effect a registration of such shares. We are required to effect only two registrations in any twelve month period pursuant to this provision of the investor rights agreement. The right to have such shares registered on Form S-3 is further subject to other specified conditions and limitations.

Piggyback Registration Rights

The holders of our registrable securities are also entitled to piggyback registration rights. If we register any of our securities either for our own account or for the account of other security holders, the holders of our outstanding registrable securities are entitled to include their shares in the registration. Subject to certain exceptions contained in the investor rights agreement, we and the underwriters may limit the number of shares included in the underwritten offering to the number of shares which we and the underwriters determine in our sole discretion will not jeopardize the success of the offering.

Indemnification

Our investor rights agreement contains customary cross-indemnification provisions, under which we are obligated to indemnify holders of registrable securities in the event of material misstatements or omissions in the registration statement attributable to us, and they are obligated to indemnify us for material misstatements or omissions attributable to them.

Expiration of Registration Rights

The demand registration rights and short form registration rights granted under the investor rights agreement will terminate on the fifth anniversary of the closing of our initial public offering.

Anti-Takeover Effects of Delaware Law and our Certificate of Incorporation and Bylaws

Certain provisions of the Delaware General Corporation Law and of our certificate of incorporation and bylaws could have the effect of delaying, deferring or discouraging another party from acquiring control of us. These provisions, which are summarized below, are expected to discourage certain types of coercive takeover practices and inadequate takeover bids and, as a consequence, they might also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions are also designed in part to encourage anyone seeking to acquire control of us to first negotiate with our board of directors. These provisions might also have the effect of preventing changes in our management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders might otherwise deem to be in their best interests. However, we believe that the advantages gained by protecting our ability to negotiate with any unsolicited and potentially unfriendly acquirer outweigh the disadvantages of discouraging such proposals, including those priced above the then-current market value of our common stock, because, among other reasons, the negotiation of such proposals could improve their terms.

Section 203 of the Delaware General Corporation Law

We are subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions:

- before the stockholder became interested, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances, but not the outstanding voting stock owned by the interested stockholder; or
- at or after the time the stockholder became interested, the business combination was approved by our board of directors and authorized at an annual or special meeting of the stockholders by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Section 203 defines a business combination to include:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, lease, pledge or other disposition involving the interested stockholder of 10% or more of the assets of the corporation;
- subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;

- subject to exceptions, any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder; and

- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

In general, Section 203 defines an interested stockholder as any entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by the entity or person.

Provisions of our Restated Certificate of Incorporation and Amended and Restated Bylaws

Our certificate of incorporation and bylaws include a number of provisions that may have the effect of delaying, deferring or preventing another party from acquiring control of us and encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Board composition and filling vacancies. Our certificate of incorporation provides for the division of our board of directors into three classes serving staggered three-year terms, with one class being elected each year. Our certificate of incorporation also provides that directors may be removed only for cause and then only by the affirmative vote of the holders of 75% or more of the shares then entitled to vote at an election of directors. Furthermore, any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of our board, may only be filled by the affirmative vote of a majority of our directors then in office even if less than a quorum. The classification of directors, together with the limitations on removal of directors and treatment of vacancies, has the effect of making it more difficult for stockholders to change the composition of our board of directors.

No written consent of stockholders. Our certificate of incorporation provides that all stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting, and that stockholders may not take any action by written consent in lieu of a meeting. This limit may lengthen the amount of time required to take stockholder actions and would prevent the amendment of our bylaws or removal of directors by our stockholders without holding a meeting of stockholders.

Meetings of stockholders. Our certificate of incorporation and bylaws provide that only a majority of the members of our board of directors then in office may call special meetings of stockholders and only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of stockholders. Our bylaws limit the business that may be conducted at an annual meeting of stockholders to those matters properly brought before the meeting.

Advance notice requirements. Our bylaws establish advance notice procedures with regard to stockholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our stockholders. These procedures provide that notice of stockholder proposals must be timely given in writing to our corporate secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary date of the annual meeting for the preceding year. Our bylaws specify the requirements as to form and content of all stockholders' notices. These requirements may preclude stockholders from bringing matters before the stockholders at an annual or special meeting.

Amendment to certificate of incorporation and by-laws. Any amendment of our certificate of incorporation must first be approved by a majority of our board of directors, and if required by law or

our certificate of incorporation, must thereafter be approved by a majority of the outstanding shares entitled to vote on the amendment and a majority of the outstanding shares of each class entitled to vote thereon as a class, except that the amendment of the provisions relating to stockholder action, board composition, limitation of liability and the amendment of our bylaws and certificate of incorporation must be approved by not less than 75% of the outstanding shares entitled to vote on the amendment, and not less than 75% of the outstanding shares of each class entitled to vote thereon as a class. Our bylaws may be amended by the affirmative vote of a majority of the directors then in office, subject to any limitations set forth in the bylaws; and may also be amended by the affirmative vote of at least 75% of the outstanding shares entitled to vote on the amendment, or, if our board of directors recommends that the stockholders approve the amendment, by the affirmative vote of the majority of the outstanding shares entitled to vote on the amendment, in each case voting together as a single class.

Undesignated preferred stock. Our certificate of incorporation provides for 5,000,000 authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of our stockholders, our board of directors could cause shares of preferred stock to be issued without stockholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent stockholder or stockholder group. In this regard, our certificate of incorporation grants our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Choice of forum. Our certificate of incorporation provides that, unless we consent in writing to the selection of an alternative form, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for: (1) any derivative action or proceeding brought on our behalf; (2) any action asserting a claim of breach of a fiduciary duty or other wrongdoing by any of our directors, officers, employees or agents to us or our stockholders; (3) any action asserting a claim against us arising pursuant to any provision of the General Corporation Law of the State of Delaware or our certificate of incorporation or bylaws; (4) any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or bylaws; or (5) any action asserting a claim governed by the internal affairs doctrine. Our certificate of incorporation also provides that any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock will be deemed to have notice of and to have consented to this choice of forum provision. It is possible that a court of law could rule that the choice of forum provision contained in our restated certificate of incorporation is inapplicable or unenforceable if it is challenged in a proceeding or otherwise.

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company, LLC.

Listing

Our common stock is listed on The NASDAQ Global Market under the trading symbol "RARX."

DESCRIPTION OF DEBT SECURITIES

This section describes the general terms and provisions of our debt securities that we may issue from time to time. We may issue debt securities, in one or more series, as either senior or subordinated debt or as senior or subordinated convertible debt. While the terms we have summarized below will apply generally to any future debt securities we may offer under this prospectus, the applicable prospectus supplement or free writing prospectus will describe the specific terms of any debt securities offered through that prospectus supplement or free writing prospectus. The terms of any debt securities we offer under a prospectus supplement or free writing prospectus may differ from the terms we describe below. Unless the context requires otherwise, whenever we refer to the "indentures," we are also referring to any supplemental indentures that specify the terms of a particular series of debt securities.

We will issue any senior debt securities under the senior indenture that we will enter into with the trustee named in the senior indenture. We will issue any subordinated debt securities under the subordinated indenture that we will enter into with the trustee named in the subordinated indenture. We have filed forms of these documents as exhibits to the registration statement, of which this prospectus is a part, and supplemental indentures and forms of debt securities containing the terms of the debt securities being offered will be filed as exhibits to the registration statement of which this prospectus is a part or will be incorporated by reference from reports that we file with the SEC.

The indentures will be qualified under the Trust Indenture Act of 1939, as amended, or the Trust Indenture Act. We use the term "trustee" to refer to either the trustee under the senior indenture or the trustee under the subordinated indenture, as applicable.

The following summaries of material provisions of the senior debt securities, the subordinated debt securities and the indentures are subject to, and qualified in their entirety by reference to, all of the provisions of the indenture applicable to a particular series of debt securities. We urge you to read the applicable prospectus supplement or free writing prospectus and any related free writing prospectuses related to the debt securities that we may offer under this prospectus, as well as the complete applicable indenture that contains the terms of the debt securities. Except as we may otherwise indicate, the terms of the senior indenture and the subordinated indenture are identical.

General

We will describe in the applicable prospectus supplement or free writing prospectus the terms of the series of debt securities being offered, including:

- the title;
- the principal amount being offered, and if a series, the total amount authorized and the total amount outstanding;
- any limit on the amount that may be issued;
- whether or not we will issue the series of debt securities in global form, and, if so, the terms and who the depository will be;
- the maturity date;
- whether and under what circumstances, if any, we will pay additional amounts on any debt securities held by a person who is not a United States person for tax purposes, and whether we can redeem the debt securities if we have to pay such additional amounts;
- the annual interest rate, which may be fixed or variable, or the method for determining the rate and the date interest will begin to accrue, the dates interest will be payable and the regular record dates for interest payment dates or the method for determining such dates;

- whether or not the debt securities will be secured or unsecured, and the terms of any secured debt;
- the terms of the subordination of any series of subordinated debt;
- the place where payments will be payable;
- restrictions on transfer, sale or other assignment, if any;
- our right, if any, to defer payment of interest and the maximum length of any such deferral period;
- the date, if any, after which, the conditions upon which, and the price at which, we may, at our option, redeem the series of debt securities pursuant to any optional or provisional redemption provisions and the terms of those redemption provisions;
- the date, if any, on which, and the price at which we are obligated, pursuant to any mandatory sinking fund or analogous fund provisions or otherwise, to redeem, or at the holder's option, to purchase, the series of debt securities and the currency or currency unit in which the debt securities are payable;
- whether the indenture will restrict our ability or the ability of our subsidiaries, if any at such time, to:
    - incur additional indebtedness;
    - issue additional securities;
    - create liens;
    - pay dividends or make distributions in respect of our capital stock or the capital stock of our subsidiaries;
    - redeem capital stock;
    - place restrictions on our subsidiaries' ability to pay dividends, make distributions or transfer assets;
    - make investments or other restricted payments;
    - sell or otherwise dispose of assets;
    - enter into sale-leaseback transactions;
    - engage in transactions with stockholders or affiliates;
    - issue or sell stock of our subsidiaries; or
    - effect a consolidation or merger;
- whether the indenture will require us to maintain any interest coverage, fixed charge, cash flow-based, asset-based or other financial ratios;
- a discussion of certain material or special United States federal income tax considerations applicable to the debt securities;
- information describing any book-entry features;
- provisions for a sinking fund purchase or other analogous fund, if any;
- the applicability of the provisions in the indenture on discharge;

- whether the debt securities are to be offered at a price such that they will be deemed to be offered at an "original issue discount" as defined in paragraph (a) of Section 1273 of the Internal Revenue Code of 1986, as amended;

- the denominations in which we will issue the series of debt securities, if other than denominations of $1,000 and any integral multiple thereof;

- the currency of payment of debt securities if other than U.S. dollars and the manner of determining the equivalent amount in U.S. dollars; and

- any other specific terms, preferences, rights or limitations of, or restrictions on, the debt securities, including any additional events of default or covenants provided with respect to the debt securities, and any terms that may be required by us or advisable under applicable laws or regulations or advisable in connection with the marketing of the debt securities.

Conversion or Exchange Rights

We will set forth in the applicable prospectus supplement or free writing prospectus the terms on which a series of debt securities may be convertible into or exchangeable for our common stock, our preferred stock or other securities (including securities of a third-party). We will include provisions as to whether conversion or exchange is mandatory, at the option of the holder or at our option. We may include provisions pursuant to which the number of shares of our common stock, our preferred stock or other securities (including securities of a third-party) that the holders of the series of debt securities receive would be subject to adjustment.

Consolidation, Merger or Sale

Unless we provide otherwise in the prospectus supplement or free writing prospectus applicable to a particular series of debt securities, the indentures will not contain any covenant that restricts our ability to merge or consolidate, or sell, convey, transfer or otherwise dispose of all or substantially all of our assets. However, any successor to or acquirer of such assets must assume all of our obligations under the indentures or the debt securities, as appropriate. If the debt securities are convertible into or exchangeable for other securities of ours or securities of other entities, the person with whom we consolidate or merge or to whom we sell all of our property must make provisions for the conversion of the debt securities into securities that the holders of the debt securities would have received if they had converted the debt securities before the consolidation, merger or sale.

Events of Default Under the Indenture

Unless we provide otherwise in the prospectus supplement or free writing prospectus applicable to a particular series of debt securities, the following are events of default under the indentures with respect to any series of debt securities that we may issue:

- if we fail to pay interest when due and payable and our failure continues for 90 days and the time for payment has not been extended;

- if we fail to pay the principal, premium or sinking fund payment, if any, when due and payable at maturity, upon redemption or repurchase or otherwise, and the time for payment has not been extended;

- if we fail to observe or perform any other covenant contained in the debt securities or the indentures, other than a covenant specifically relating to another series of debt securities, and our failure continues for 90 days after we receive notice from the trustee or holders of at least 25% in aggregate principal amount of the outstanding debt securities of the applicable series; and

- if specified events of bankruptcy, insolvency or reorganization occur.

We will describe in each applicable prospectus supplement or free writing prospectus any additional events of default relating to the relevant series of debt securities.

If an event of default with respect to debt securities of any series occurs and is continuing, other than an event of default specified in the last bullet point above, the trustee or the holders of at least 25% in aggregate principal amount of the outstanding debt securities of that series, by notice to us in writing, and to the trustee if notice is given by such holders, may declare the unpaid principal, premium, if any, and accrued interest, if any, due and payable immediately. If an event of default specified in the last bullet point above occurs with respect to us, the unpaid principal, premium, if any, and accrued interest, if any, of each issue of debt securities then outstanding shall be due and payable without any notice or other action on the part of the trustee or any holder.

The holders of a majority in principal amount of the outstanding debt securities of an affected series may waive any default or event of default with respect to the series and its consequences, except defaults or events of default regarding payment of principal, premium, if any, or interest, unless we have cured the default or event of default in accordance with the indenture. Any waiver shall cure the default or event of default.

Subject to the terms of the indentures, if an event of default under an indenture shall occur and be continuing, the trustee will be under no obligation to exercise any of its rights or powers under such indenture at the request or direction of any of the holders of the applicable series of debt securities, unless such holders have offered the trustee reasonable indemnity or security satisfactory to it against any loss, liability or expense. The holders of a majority in principal amount of the outstanding debt securities of any series will have the right to direct the time, method and place of conducting any proceeding for any remedy available to the trustee, or exercising any trust or power conferred on the trustee, with respect to the debt securities of that series, provided that:

- the direction so given by the holder is not in conflict with any law or the applicable indenture; and
- subject to its duties under the Trust Indenture Act, the trustee need not take any action that might involve it in personal liability or might be unduly prejudicial to the holders not involved in the proceeding.

A holder of the debt securities of any series will have the right to institute a proceeding under the indentures or to appoint a receiver or trustee, or to seek other remedies if:

- the holder has given written notice to the trustee of a continuing event of default with respect to that series;
- the holders of at least 25% in aggregate principal amount of the outstanding debt securities of that series have made written request, and such holders have offered reasonable indemnity to the trustee or security satisfactory to it against any loss, liability or expense or to be incurred in compliance with instituting the proceeding as trustee; and
- the trustee does not institute the proceeding, and does not receive from the holders of a majority in aggregate principal amount of the outstanding debt securities of that series other conflicting directions within 90 days after the notice, request and offer.

These limitations do not apply to a suit instituted by a holder of debt securities if we default in the payment of the principal, premium, if any, or interest on, the debt securities, or other defaults that may be specified in the applicable prospectus supplement or free writing prospectus.

We will periodically file statements with the trustee regarding our compliance with specified covenants in the indentures.

Modification of Indenture; Waiver

Subject to the terms of the indenture for any series of debt securities that we may issue, we and the trustee may change an indenture without the consent of any holders with respect to the following specific matters:

- to fix any ambiguity, defect or inconsistency in the indenture;
- to comply with the provisions described above under "—Consolidation, Merger or Sale;"
- to comply with any requirements of the SEC in connection with the qualification of any indenture under the Trust Indenture Act;
- to add to, delete from or revise the conditions, limitations, and restrictions on the authorized amount, terms, or purposes of issue, authentication and delivery of debt securities, as set forth in the indenture;
- to provide for the issuance of and establish the form and terms and conditions of the debt securities of any series as provided under "Description of Debt Securities—General," to establish the form of any certifications required to be furnished pursuant to the terms of the indenture or any series of debt securities, or to add to the rights of the holders of any series of debt securities;
- to evidence and provide for the acceptance of appointment hereunder by a successor trustee;
- to provide for uncertificated debt securities and to make all appropriate changes for such purpose;
- to add to our covenants such new covenants, restrictions, conditions or provisions for the benefit of the holders, to make the occurrence, or the occurrence and the continuance, of a default in any such additional covenants, restrictions, conditions or provisions an event of default or to surrender any right or power conferred to us in the indenture; or
- to change anything that does not materially adversely affect the interests of any holder of debt securities of any series.

In addition, under the indentures, the rights of holders of a series of debt securities may be changed by us and the trustee with the written consent of the holders of at least a majority in aggregate principal amount of the outstanding debt securities of each series that is affected. However, subject to the terms of the indenture for any series of debt securities that we may issue or as otherwise provided in the prospectus supplement or free writing prospectus applicable to a particular series of debt securities, we and the trustee may make the following changes only with the consent of each holder of any outstanding debt securities affected:

- extending the stated maturity of the series of debt securities;
- reducing the principal amount, reducing the rate of or extending the time of payment of interest, or reducing any premium payable upon the redemption or repurchase of any debt securities; or
- reducing the percentage of debt securities, the holders of which are required to consent to any amendment, supplement, modification or waiver.

Discharge

Each indenture provides that, subject to the terms of the indenture and any limitation otherwise provided in the prospectus supplement or free writing prospectus applicable to a particular series of

debt securities, we can elect to be discharged from our obligations with respect to one or more series of debt securities, except for specified obligations, including obligations to:

- register the transfer or exchange of debt securities of the series;
- replace stolen, lost or mutilated debt securities of the series;
- maintain paying agencies;
- hold monies for payment in trust;
- recover excess money held by the trustee;
- compensate and indemnify the trustee; and
- appoint any successor trustee.

In order to exercise our rights to be discharged, we must deposit with the trustee money or government obligations sufficient to pay all the principal of, any premium and interest on, the debt securities of the series on the dates payments are due.

Form, Exchange and Transfer

We will issue the debt securities of each series only in fully registered form without coupons and, unless we otherwise specify in the applicable prospectus supplement or free writing prospectus, in denominations of $1,000 and any integral multiple thereof. The indentures provide that we may issue debt securities of a series in temporary or permanent global form and as book-entry securities that will be deposited with, or on behalf of, The Depository Trust Company or another depository named by us and identified in a prospectus supplement or free writing prospectus with respect to that series.

At the option of the holder, subject to the terms of the indentures and the limitations applicable to global securities described in the applicable prospectus supplement or free writing prospectus, the holder of the debt securities of any series can exchange the debt securities for other debt securities of the same series, in any authorized denomination and of like tenor and aggregate principal amount.

Subject to the terms of the indentures and the limitations applicable to global securities set forth in the applicable prospectus supplement or free writing prospectus, holders of the debt securities may present the debt securities for exchange or for registration of transfer, duly endorsed or with the form of transfer endorsed thereon duly executed if so required by us or the security registrar, at the office of the security registrar or at the office of any transfer agent designated by us for this purpose. Unless otherwise provided in the debt securities that the holder presents for transfer or exchange, we will make no service charge for any registration of transfer or exchange, but we may require payment of any taxes or other governmental charges.

We will name in the applicable prospectus supplement or free writing prospectus the security registrar, and any transfer agent in addition to the security registrar, that we initially designate for any debt securities. We may at any time designate additional transfer agents or rescind the designation of any transfer agent or approve a change in the office through which any transfer agent acts, except that we will be required to maintain a transfer agent in each place of payment for the debt securities of each series. If we elect to redeem the debt securities of any series, we will not be required to:

- issue, register the transfer of, or exchange any debt securities of that series during a period beginning at the opening of business 15 days before the day of mailing of a notice of redemption of any debt securities that may be selected for redemption and ending at the close of business on the day of the mailing; or
- register the transfer of or exchange any debt securities so selected for redemption, in whole or in part, except the unredeemed portion of any debt securities we are redeeming in part.

Information Concerning the Trustee

The trustee, other than during the occurrence and continuance of an event of default under an indenture, undertakes to perform only those duties as are specifically set forth in the applicable indenture. Upon an event of default under an indenture, the trustee must use the same degree of care as a prudent person would exercise or use in the conduct of his or her own affairs.

Subject to this provision, the trustee is under no obligation to exercise any of the powers given it by the indentures at the request of any holder of debt securities unless it is offered reasonable security and indemnity against the costs, expenses and liabilities that it might incur.

Payment and Paying Agents

Unless we otherwise indicate in the applicable prospectus supplement or free writing prospectus, we will make payment of the interest on any debt securities on any interest payment date to the person in whose name the debt securities, or one or more predecessor securities, are registered at the close of business on the regular record date for the interest.

We will pay principal of and any premium and interest on the debt securities of a particular series at the office of the paying agents designated by us, except that unless we otherwise indicate in the applicable prospectus supplement or free writing prospectus, we will make interest payments by check that we will mail to the holder or by wire transfer to certain holders. Unless we otherwise indicate in the applicable prospectus supplement or free writing prospectus, we will designate the corporate trust office of the trustee as our sole paying agent for payments with respect to debt securities of each series. We will name in the applicable prospectus supplement or free writing prospectus any other paying agents that we initially designate for the debt securities of a particular series. We will maintain a paying agent in each place of payment for the debt securities of a particular series.

All money we pay to a paying agent or the trustee for the payment of the principal of or any premium or interest on any debt securities that remains unclaimed at the end of two years after such principal, premium or interest has become due and payable will be repaid to us, and the holder of the debt security thereafter may look only to us for payment thereof.

Governing Law

The indentures and the debt securities will be governed by and construed in accordance with the laws of the State of New York, except to the extent that the Trust Indenture Act is applicable.

Ranking of Debt Securities

The subordinated debt securities will be subordinate and junior in priority of payment to certain of our other indebtedness to the extent described in a prospectus supplement or free writing prospectus. The subordinated indenture does not limit the amount of subordinated debt securities that we may issue. It also does not limit us from issuing any other secured or unsecured debt.

The senior debt securities will rank equally in right of payment to all our other senior unsecured debt. The senior indenture does not limit the amount of senior debt securities that we may issue. It also does not limit us from issuing any other secured or unsecured debt.

DESCRIPTION OF WARRANTS

The following description, together with the additional information we may include in any applicable prospectus supplements, summarizes the material terms and provisions of the warrants that we may offer under this prospectus and the related warrant agreements and warrant certificates. While the terms summarized below will apply generally to any warrants that we may offer, we will describe the particular terms of any series of warrants in more detail in the applicable prospectus supplement. If we indicate in the prospectus supplement, the terms of any warrants offered under that prospectus supplement may differ from the terms described below. Specific warrant agreements will contain additional important terms and provisions and will be incorporated by reference as an exhibit to the registration statement, which includes this prospectus.

General

We may issue warrants for the purchase of common stock, preferred stock and/or debt securities in one or more series. We may issue warrants independently or together with common stock, preferred stock and/or debt securities, and the warrants may be attached to or separate from these securities.

We will evidence each series of warrants by warrant certificates that we will issue under a separate warrant agreement. We will enter into the warrant agreement with a warrant agent. We will indicate the name and address of the warrant agent in the applicable prospectus supplement relating to a particular series of warrants.

We will describe in the applicable prospectus supplement the terms of the series of warrants, including:

- the offering price and aggregate number of warrants offered;
- the currency for which the warrants may be purchased;
- if applicable, the designation and terms of the securities with which the warrants are issued and the number of warrants issued with each such security or each principal amount of such security;
- if applicable, the date on and after which the warrants and the related securities will be separately transferable;
- in the case of warrants to purchase debt securities, the principal amount of debt securities purchasable upon exercise of one warrant and the price at, and currency in which, this principal amount of debt securities may be purchased upon such exercise;
- in the case of warrants to purchase common stock or preferred stock, the number of shares of common stock or preferred stock, as the case may be, purchasable upon the exercise of one warrant and the price at which these shares may be purchased upon such exercise;
- the effect of any merger, consolidation, sale or other disposition of our business on the warrant agreement and the warrants;
- the terms of any rights to redeem or call the warrants;
- any provisions for changes to or adjustments in the exercise price or number of securities issuable upon exercise of the warrants;
- the periods during which, and places at which, the warrants are exercisable;
- the manner of exercise;
- the dates on which the right to exercise the warrants will commence and expire;
- the manner in which the warrant agreement and warrants may be modified;
- federal income tax consequences of holding or exercising the warrants;
- the terms of the securities issuable upon exercise of the warrants; and
- any other specific terms, preferences, rights or limitations of or restrictions on the warrants.

DESCRIPTION OF UNITS

We may issue units comprised of shares of common stock, shares of preferred stock, debt securities and warrants in any combination. We may issue units in such amounts and in as many distinct series as we wish. This section outlines certain provisions of the units that we may issue. If we issue units, they will be issued under one or more unit agreements to be entered into between us and a bank or other financial institution, as unit agent. The information described in this section may not be complete in all respects and is qualified entirely by reference to the unit agreement with respect to the units of any particular series. The specific terms of any series of units offered will be described in the applicable prospectus supplement. If so described in a particular supplement, the specific terms of any series of units may differ from the general description of terms presented below. We urge you to read any prospectus supplement related to any series of units we may offer, as well as the complete unit agreement and unit certificate that contain the terms of the units. If we issue units, forms of unit agreements and unit certificates relating to such units will be incorporated by reference as exhibits to the registration statement, which includes this prospectus.

Each unit that we may issue will be issued so that the holder of the unit is also the holder of each security included in the unit. Thus, the holder of a unit will have the rights and obligations of a holder of each included security. The unit agreement under which a unit is issued may provide that the securities included in the unit may not be held or transferred separately, at any time or at any time before a specified date. The applicable prospectus supplement may describe:

- the designation and terms of the units and of the securities comprising the units, including whether and under what circumstances those securities may be held or transferred separately;
- any provisions of the governing unit agreement;
- the price or prices at which such units will be issued;
- the applicable United States federal income tax considerations relating to the units;
- any provisions for the issuance, payment, settlement, transfer or exchange of the units or of the securities comprising the units; and
- any other terms of the units and of the securities comprising the units.

The provisions described in this section, as well as those described under "Description of Capital Stock," "Description of Debt Securities" and "Description of Warrants" will apply to the securities included in each unit, to the extent relevant and as may be updated in any prospectus supplements.

Issuance in Series

We may issue units in such amounts and in as many distinct series as we wish. This section summarizes terms of the units that apply generally to all series. Most of the financial and other specific terms of a particular series of units will be described in the applicable prospectus supplement.

Unit Agreements

We will issue the units under one or more unit agreements to be entered into between us and a bank or other financial institution, as unit agent. We may add, replace or terminate unit agents from time to time. We will identify the unit agreement under which each series of units will be issued and the unit agent under that agreement in the applicable prospectus supplement.

The following provisions will generally apply to all unit agreements unless otherwise stated in the applicable prospectus supplement:

Modification without Consent

We and the applicable unit agent may amend any unit or unit agreement without the consent of any holder:

- to cure any ambiguity; any provisions of the governing unit agreement that differ from those described below;
- to correct or supplement any defective or inconsistent provision; or
- to make any other change that we believe is necessary or desirable and will not adversely affect the interests of the affected holders in any material respect.

We do not need any approval to make changes that affect only units to be issued after the changes take effect. We may also make changes that do not adversely affect a particular unit in any material respect, even if they adversely affect other units in a material respect. In those cases, we do not need to obtain the approval of the holder of the unaffected unit; we need only obtain any required approvals from the holders of the affected units.

Modification with Consent

We may not amend any particular unit or a unit agreement with respect to any particular unit unless we obtain the consent of the holder of that unit, if the amendment would:

- impair any right of the holder to exercise or enforce any right under a security included in the unit if the terms of that security require the consent of the holder to any changes that would impair the exercise or enforcement of that right; or
- reduce the percentage of outstanding units or any series or class the consent of whose holders is required to amend that series or class, or the applicable unit agreement with respect to that series or class, as described below.

Any other change to a particular unit agreement and the units issued under that agreement would require the following approval:

- If the change affects only the units of a particular series issued under that agreement, the change must be approved by the holders of a majority of the outstanding units of that series; or
- If the change affects the units of more than one series issued under that agreement, it must be approved by the holders of a majority of all outstanding units of all series affected by the change, with the units of all the affected series voting together as one class for this purpose.

These provisions regarding changes with majority approval also apply to changes affecting any securities issued under a unit agreement, as the governing document.

In each case, the required approval must be given by written consent.

Unit Agreements Will Not Be Qualified under Trust Indenture Act

No unit agreement will be qualified as an indenture, and no unit agent will be required to qualify as a trustee, under the Trust Indenture Act. Therefore, holders of units issued under unit agreements will not have the protections of the Trust Indenture Act with respect to their units.

Mergers and Similar Transactions Permitted; No Restrictive Covenants or Events of Default

The unit agreements will not restrict our ability to merge or consolidate with, or sell our assets to, another corporation or other entity or to engage in any other transactions. If at any time we merge or consolidate with, or sell our assets substantially as an entirety to, another corporation or other entity, the successor entity will succeed to and assume our obligations under the unit agreements. We will then be relieved of any further obligation under these agreements.

The unit agreements will not include any restrictions on our ability to put liens on our assets, nor will they restrict our ability to sell our assets. The unit agreements also will not provide for any events of default or remedies upon the occurrence of any events of default.

Governing Law

The unit agreements and the units will be governed by Delaware law.

Form, Exchange and Transfer

We will issue each unit in global—i.e., book-entry—form only. Units in book-entry form will be represented by a global security registered in the name of a depositary, which will be the holder of all the units represented by the global security. Those who own beneficial interests in a unit will do so through participants in the depositary's system, and the rights of these indirect owners will be governed solely by the applicable procedures of the depositary and its participants. We will describe book-entry securities, and other terms regarding the issuance and registration of the units in the applicable prospectus supplement.

Each unit and all securities comprising the unit will be issued in the same form.

If we issue any units in registered, non-global form, the following will apply to them.

The units will be issued in the denominations stated in the applicable prospectus supplement. Holders may exchange their units for units of smaller denominations or combined into fewer units of larger denominations, as long as the total amount is not changed.

- Holders may exchange or transfer their units at the office of the unit agent. Holders may also replace lost, stolen, destroyed or mutilated units at that office. We may appoint another entity to perform these functions or perform them ourselves.

- Holders will not be required to pay a service charge to transfer or exchange their units, but they may be required to pay for any tax or other governmental charge associated with the transfer or exchange. The transfer or exchange, and any replacement, will be made only if our transfer agent is satisfied with the holder's proof of legal ownership. The transfer agent may also require an indemnity before replacing any units.

- If we have the right to redeem, accelerate or settle any units before their maturity, and we exercise our right as to less than all those units or other securities, we may block the exchange or transfer of those units during the period beginning 15 days before the day we mail the notice of exercise and ending on the day of that mailing, in order to freeze the list of holders to prepare the mailing. We may also refuse to register transfers of or exchange any unit selected for early settlement, except that we will continue to permit transfers and exchanges of the unsettled portion of any unit being partially settled. We may also block the transfer or exchange of any unit in this manner if the unit includes securities that are or may be selected for early settlement.

Only the depositary will be entitled to transfer or exchange a unit in global form, since it will be the sole holder of the unit.

Payments and Notices

In making payments and giving notices with respect to our units, we will follow the procedures as described in the applicable prospectus supplement.

PLAN OF DISTRIBUTION

We may sell securities:

- through underwriters;
- through dealers;
- through agents;
- directly to purchasers; or
- through a combination of any of these methods or any other method permitted by law.

In addition, we may issue the securities as a dividend or distribution or in a subscription rights offering to our existing security holders.

We may directly solicit offers to purchase securities, or agents may be designated to solicit such offers. In the prospectus supplement relating to such offering, we will name any agent that could be viewed as an underwriter under the Securities Act and describe any commissions that we must pay to any such agent. Any such agent will be acting on a best efforts basis for the period of its appointment or, if indicated in the applicable prospectus supplement, on a firm commitment basis. This prospectus may be used in connection with any offering of our securities through any of these methods or other methods described in the applicable prospectus supplement.

The distribution of the securities may be effected from time to time in one or more transactions:

- at a fixed price, or prices, which may be changed from time to time;
- at market prices prevailing at the time of sale;
- at prices related to such prevailing market prices; or
- at negotiated prices.

Each prospectus supplement will describe the method of distribution of the securities and any applicable restrictions.

The prospectus supplement with respect to the securities of a particular series will describe the terms of the offering of the securities, including the following:

- the name of the agent or any underwriters;
- the public offering or purchase price;
- any discounts and commissions to be allowed or paid to the agent or underwriters;
- all other items constituting underwriting compensation;
- any discounts and commissions to be allowed or paid to dealers; and
- any exchanges on which the securities will be listed.

If any underwriters or agents are used in the sale of the securities in respect of which this prospectus is delivered, we will enter into an underwriting agreement, sales agreement or other agreement with them at the time of sale to them, and we will set forth in the prospectus supplement relating to such offering the names of the underwriters or agents and the terms of the related agreement with them.

In connection with the offering of securities, we may grant to the underwriters an option to purchase additional securities with an additional underwriting commission, as may be set forth in the

accompanying prospectus supplement. If we grant any such option, the terms of such option will be set forth in the prospectus supplement for such securities.

If a dealer is used in the sale of the securities in respect of which the prospectus is delivered, we will sell such securities to the dealer, as principal. The dealer, who may be deemed to be an "underwriter" as that term is defined in the Securities Act, may then resell such securities to the public at varying prices to be determined by such dealer at the time of resale.

If we offer securities in a subscription rights offering to our existing security holders, we may enter into a standby underwriting agreement with dealers, acting as standby underwriters. We may pay the standby underwriters a commitment fee for the securities they commit to purchase on a standby basis. If we do not enter into a standby underwriting arrangement, we may retain a dealer-manager to manage a subscription rights offering for us.

Agents, underwriters, dealers and other persons may be entitled under agreements which they may enter into with us to indemnification by us against certain civil liabilities, including liabilities under the Securities Act, and may be customers of, engage in transactions with or perform services for us in the ordinary course of business.

If so indicated in the applicable prospectus supplement, we will authorize underwriters or other persons acting as our agents to solicit offers by certain institutions to purchase securities from us pursuant to delayed delivery contracts providing for payment and delivery on the date stated in the prospectus supplement. Each contract will be for an amount not less than, and the aggregate amount of securities sold pursuant to such contracts shall not be less nor more than, the respective amounts stated in the prospectus supplement. Institutions with whom the contracts, when authorized, may be made include commercial and savings banks, insurance companies, pension funds, investment companies, educational and charitable institutions and other institutions, but shall in all cases be subject to our approval. Delayed delivery contracts will not be subject to any conditions except that:

- the purchase by an institution of the securities covered under that contract shall not at the time of delivery be prohibited under the laws of the jurisdiction to which that institution is subject; and

- if the securities are also being sold to underwriters acting as principals for their own account, the underwriters shall have purchased such securities not sold for delayed delivery. The underwriters and other persons acting as our agents will not have any responsibility in respect of the validity or performance of delayed delivery contracts.

Offered securities may also be offered and sold, if so indicated in the prospectus supplement, in connection with a remarketing upon their purchase, in accordance with a redemption or repayment pursuant to their terms, or otherwise, by one or more remarketing firms, acting as principals for their own accounts or as agents for us. Any remarketing firm will be identified and the terms of its agreement, if any, with us and its compensation will be described in the applicable prospectus supplement. Remarketing firms may be deemed to be underwriters in connection with their remarketing of offered securities.

Certain agents, underwriters and dealers, and their associates and affiliates, may be customers of, have borrowing relationships with, engage in other transactions with, or perform services, including investment banking services, for us or one or more of our respective affiliates in the ordinary course of business.

In order to facilitate the offering of the securities, any underwriters may engage in transactions that stabilize, maintain or otherwise affect the price of the securities or any other securities the prices of which may be used to determine payments on such securities. Specifically, any underwriters may over allot in connection with the offering, creating a short position for their own accounts. In addition, to

cover overallotments or to stabilize the price of the securities or of any such other securities, the underwriters may bid for, and purchase, the securities or any such other securities in the open market. Finally, in any offering of the securities through a syndicate of underwriters, the underwriting syndicate may reclaim selling concessions allowed to an underwriter or a dealer for distributing the securities in the offering if the syndicate repurchases previously distributed securities in transactions to cover syndicate short positions, in stabilization transactions or otherwise. Any of these activities may stabilize or maintain the market price of the securities above independent market levels. Any such underwriters are not required to engage in these activities and may end any of these activities at any time.

We may engage in at the market offerings into an existing trading market in accordance with Rule 415(a)(4) under the Securities Act. In addition, we may enter into derivative transactions with third parties, or sell securities not covered by this prospectus to third parties in privately negotiated transactions. If the applicable prospectus supplement so indicates, in connection with those derivatives, the third parties may sell securities covered by this prospectus and the applicable prospectus supplement, including in short sale transactions. If so, the third party may use securities pledged by us or borrowed from us or others to settle those sales or to close out any related open borrowings of stock, and may use securities received from us in settlement of those derivatives to close out any related open borrowings of stock. The third party in such sale transactions will be an underwriter and, if not identified in this prospectus, will be named in the applicable prospectus supplement (or a post-effective amendment). In addition, we may otherwise loan or pledge securities to a financial institution or other third party that in turn may sell the securities short using this prospectus and an applicable prospectus supplement. Such financial institution or other third party may transfer its economic short position to investors in our securities or in connection with a concurrent offering of other securities.

Under Rule 15c6-1 of the Exchange Act, trades in the secondary market generally are required to settle in two business days, unless the parties to any such trade expressly agree otherwise. The applicable prospectus supplement may provide that the original issue date for your securities may be more than two scheduled business days after the trade date for your securities. Accordingly, in such a case, if you wish to trade securities on any date prior to the second business day before the original issue date for your securities, you will be required, by virtue of the fact that your securities initially are expected to settle in more than two scheduled business days after the trade date for your securities, to make alternative settlement arrangements to prevent a failed settlement.

The securities may be new issues of securities and may have no established trading market. The securities may or may not be listed on a national securities exchange. We can make no assurance as to the liquidity of or the existence of trading markets for any of the securities.

The specific terms of any lock-up provisions in respect of any given offering will be described in the applicable prospectus supplement.

The underwriters, dealers and agents may engage in transactions with us, or perform services for us, in the ordinary course of business for which they receive compensation.

The anticipated date of delivery of offered securities will be set forth in the applicable prospectus supplement relating to each offer.

LEGAL MATTERS

Certain legal matters in connection with this offering will be passed upon for us by Goodwin Procter LLP, Boston, Massachusetts. Any underwriters will also be advised about the validity of the securities and other legal matters by their own counsel, which will be named in the prospectus supplement.

EXPERTS

The consolidated financial statements incorporated in this Prospectus by reference from Ra Pharmaceuticals, Inc.'s Annual Report on Form 10-K have been audited by Deloitte & Touche LLP, an independent registered public accounting firm, as stated in their report, which is incorporated herein by reference. Such financial statements have been so incorporated in reliance upon the report of such firm given upon their authority as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

This prospectus is part of a registration statement that we have filed with the SEC. Certain information in the registration statement has been omitted from this prospectus in accordance with the rules of the SEC. For further information, we refer you to the registration statement and the exhibits and schedules filed as a part of the registration statement. Statements contained in this prospectus or incorporated by reference concerning the contents of any contract or any other document are not necessarily complete. If a contract or document has been filed or incorporated by reference as an exhibit to the registration statement, we refer you to the copy of the contract or document that has been filed. Each statement in this prospectus or incorporated by reference relating to a contract or document filed as an exhibit is qualified in all respects by the filed exhibit. The reports and other information we file with the SEC can be read and copied at the SEC's Public Reference Room at 100 F Street, NE, Washington D.C. 20549. Copies of these materials can be obtained at prescribed rates from the Public Reference Section of the SEC at the principal offices of the SEC, 100 F Street, NE, Washington D.C. 20549. You may obtain information regarding the operation of the public reference room by calling 1(800) SEC-0330. The SEC also maintains a web site (*http://www.sec.gov*) that contains reports, proxy and information statements and other information regarding issuers like us that file electronically with the SEC.

We are subject to the reporting and information requirements of the Exchange Act and, as a result, we file periodic reports, proxy statements and other information with the SEC. These periodic reports, proxy statements and other information will be available for inspection and copying at the SEC's public reference room and the web site of the SEC referred to above.

INCORPORATION BY REFERENCE

The SEC allows us to incorporate by reference the information and reports we file with it, which means that we can disclose important information to you by referring you to these documents. The information incorporated by reference is an important part of this prospectus, and information that we file later with the SEC will automatically update and supersede the information already incorporated by reference. We are incorporating by reference the documents listed below, which we have already filed with the SEC, and any future filings we make with the SEC under Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act, including all filings made after the date of the filing of this registration statement and prior to the effectiveness of this registration statement, except as to any portion of any future report or document that is not deemed filed under such provisions, after the date of this prospectus and prior to the termination of this offering:

- Annual Report on Form 10-K for the year ended December 31, 2016;
- the information specifically incorporated by reference into our Annual Report on Form 10-K for the year ended December 31, 2016 from our definitive proxy statement on Schedule 14A (other than information furnished rather than filed), which was filed with the SEC on April 28, 2017;
- Quarterly Reports on Form 10-Q filed with the SEC for the quarters ended March 31, 2017 and June 30, 2017;
- Current Reports on Form 8-K filed with the SEC on June 26, 2017; and
- the description of our common stock contained in our registration statement on Form 8-A filed with the SEC on October 21, 2016, including any amendments or reports filed for the purposes of updating this description.

We will furnish without charge to you, on written or oral request, a copy of any or all of the documents incorporated by reference in this prospectus, including exhibits to these documents. You should direct any requests for documents to Investor Relations, Ra Pharmaceuticals, Inc., 87 Cambridge Park Drive, Cambridge, Massachusetts 02140; telephone: (617) 401-4060.

You also may access these filings on our website at www.rapharma.com. We do not incorporate the information on our website into this prospectus or any supplement to this prospectus and you should not consider any information on, or that can be accessed through, our website as part of this prospectus or any supplement to this prospectus (other than those filings with the SEC that we specifically incorporate by reference into this prospectus or any supplement to this prospectus).

Any statement contained in a document incorporated or deemed to be incorporated by reference in this prospectus will be deemed modified, superseded or replaced for purposes of this prospectus to the extent that a statement contained in this prospectus modifies, supersedes or replaces such statement.

8,400,000 Shares

Common Stock

Prospectus Supplement

Credit Suisse Jefferies BMO Capital Markets

SunTrust Robinson Humphrey

February 14, 2018