

TREVENA INC
Form S-1/A
November 28, 2014

Use these links to rapidly review the document

[TABLE OF CONTENTS](#)

[INDEX TO FINANCIAL STATEMENTS](#)

As filed with the Securities and Exchange Commission on November 28, 2014

Registration No. 333-200386

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**

Washington, D.C. 20549

AMENDMENT NO. 1
TO

FORM S-1
REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933

TREVENA, INC.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation or organization)

2834
(Primary Standard Industrial
Classification Code Number)
1018 West 8th Avenue, Suite A
King of Prussia, PA 19406
(610) 354-8840

26-1469215
(I.R.S. Employer
Identification Number)

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

John M. Limongelli, Esq.
Senior Vice President, General Counsel and Secretary
Trevena, Inc.
1018 West 8th Avenue, Suite A
King of Prussia, PA 19406
(610) 354-8840

Edgar Filing: TREVENA INC - Form S-1/A

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

Copies to:

**Brent B. Siler, Esq.
Derek O. Colla, Esq.
Cooley LLP
11951 Freedom Drive
Reston, Virginia 20190
Telephone: (703) 456-8000
Fax: (703) 456-8100**

**Peter N. Handrinos, Esq.
Michael E. Sullivan, Esq.
Latham & Watkins LLP
John Hancock Tower
200 Clarendon Street
Boston, MA 02116
Telephone: (617) 948-6000
Fax: (617) 948-6001**

**Approximate date of commencement of proposed sale to the public:
As soon as practicable after the effective date of this registration statement.**

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

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

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

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

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 under the Securities Exchange Act of 1934. (Check one):

Large Accelerated Filer

Accelerated Filer

Non-accelerated Filer

Smaller Reporting Company

(Do not check if a
smaller reporting company)

The registrant hereby amends this Registration Statement on such date or dates as may be necessary to delay its effective date until the registrant shall file a further amendment that specifically states that this Registration Statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933, as amended, or until the registration statement shall become effective on such date as the Commission, acting pursuant to said Section 8(a), may determine.

Table of Contents

Subject to Completion, dated November 28, 2014

The information in this preliminary prospectus is not complete and may be changed. These securities may not be sold until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell nor does it seek an offer to buy these securities in any jurisdiction where the offer or sale is not permitted.

PROSPECTUS

\$40,000,000

Trevena, Inc.

Common Stock

This is an offering of \$40,000,000 of shares of the common stock of Trevena, Inc. All of the shares of common stock are being sold by us.

Our common stock trades on the NASDAQ Global Select Market under the symbol "TRVN." On November 28, 2014, the last reported trading price of our stock was \$5.22 per share.

We are an "emerging growth company" as that term is used in the Jumpstart Our Business Startups Act of 2012 and, as such, have elected to comply with certain reduced public company reporting requirements.

Investing in our common stock involves risks. See "Risk Factors" beginning on page 14 of this prospectus.

	Per Share	Total
Price to the public	\$	\$
Underwriting discounts and commissions ¹	\$	\$
Proceeds to Trevena (before expenses)	\$	\$

¹ We refer you to "Underwriting" beginning on page 165 of this prospectus for additional information regarding underwriter compensation.

We have granted the underwriters the option to purchase up to \$6,000,000 of additional shares of common stock on the same terms and conditions set forth above.

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

The underwriters expect to deliver the shares on or about _____, 2014.

Barclays

**Cowen and
Company**

Jefferies

JMP Securities

Needham & Company

Prospectus dated _____, 2014.

TABLE OF CONTENTS

	Page
<u>Prospectus Summary</u>	<u>1</u>
<u>Risk Factors</u>	<u>14</u>
<u>Special Note Regarding Forward-Looking Statements</u>	<u>50</u>
<u>Use of Proceeds</u>	<u>51</u>
<u>Price Range of Common Stock</u>	<u>52</u>
<u>Dividend Policy</u>	<u>52</u>
<u>Capitalization</u>	<u>53</u>
<u>Dilution</u>	<u>54</u>
<u>Selected Financial Data</u>	<u>55</u>
<u>Management's Discussion and Analysis of Financial Condition and Results of Operations</u>	<u>56</u>
<u>Business</u>	<u>78</u>
<u>Management</u>	<u>121</u>
<u>Executive Compensation</u>	<u>131</u>
<u>Certain Relationships and Related Party Transactions</u>	<u>146</u>
<u>Principal Stockholders</u>	<u>150</u>
<u>Description of Capital Stock</u>	<u>153</u>
<u>Shares Eligible For Future Sale</u>	<u>159</u>
<u>Material U.S. Federal Income Tax Consequences to Non-U.S. Holders</u>	<u>161</u>
<u>Underwriting</u>	<u>165</u>
<u>Legal Matters</u>	<u>170</u>
<u>Experts</u>	<u>170</u>
<u>Where You Can Find Additional Information</u>	<u>170</u>
<u>Index to Financial Statements</u>	<u>F-1</u>

We have not authorized anyone to provide any information or to make any representations other than those contained in this prospectus or in any free writing prospectuses we have prepared. We take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. This prospectus is an offer to sell only the shares offered hereby, but only under circumstances and in jurisdictions where it is lawful to do so. The information contained in this prospectus is current only as of its date.

For investors outside the United States: We have not and the underwriters have not done anything that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons who come into possession of this prospectus and any applicable free writing prospectus in jurisdictions outside the United States are required to inform themselves about and to observe any restrictions as to this offering and the distribution of this prospectus and any such free writing prospectus applicable to that jurisdiction.

Table of Contents

PROSPECTUS SUMMARY

This summary highlights information contained elsewhere in this prospectus and does not contain all of the information that you should consider in making your investment decision. Before investing in our common stock, you should carefully read this entire prospectus, including our financial statements and the related notes thereto and the information set forth under the sections "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations," in each case included in this prospectus. Unless the context otherwise requires, we use the terms "Trevena," "company," "we," "us" and "our" in this prospectus to refer to Trevena, Inc.

Company Overview

We are a clinical stage biopharmaceutical company that discovers, develops and intends to commercialize therapeutics that use a novel approach to target G protein coupled receptors, or GPCRs. Using our proprietary product platform, we have identified and advanced three differentiated product candidates into the clinic as follows:

TRV130: We recently announced top-line data from our Phase 2a/b clinical trial of TRV130 in postoperative pain. At doses of 2 mg and 3 mg of TRV130 administered every three hours, the trial achieved its primary endpoint of statistically greater pain reduction than placebo for 48 hours, which we believe demonstrates proof of concept for TRV130. The 3 mg dose of TRV130 also showed statistically superior analgesic efficacy over the 48-hour trial period compared to 4 mg of morphine administered every four hours. Additionally, in the first three hours of dosing, when pain was most severe, the 1 mg, 2 mg and 3 mg doses of TRV130 demonstrated superior analgesic efficacy in the trial compared to placebo, and the 2 mg and 3 mg doses of TRV130 demonstrated superior analgesic efficacy compared to 4 mg of morphine. There were no serious adverse events reported in the trial, which we believe suggests that these levels of pain relief can be achieved safely. Over the 48-hour trial period, the tolerability of TRV130 at doses of 2 mg and 3 mg administered every three hours was similar to that of 4 mg of morphine administered every four hours. Based on these data, we plan to move into Phase 3 preparations, which we expect to occur in parallel with a second Phase 2 trial for TRV130 that we plan to commence in December 2014. We also anticipate that we will initiate a Phase 3 clinical trial for TRV130 in the first quarter of 2016. These data complement the data generated in our Phase 1b trial, in which TRV130 showed superior efficacy with an improved tolerability profile following a single dose of TRV130 relative to a 10 mg dose of morphine in a human evoked-pain model. We hold a U.S. patent covering the composition of matter and methods of use for TRV130. We have retained all worldwide development and commercialization rights to TRV130, and plan to commercialize it in acute care markets such as hospitals and ambulatory surgery centers if it receives regulatory approval.

TRV734: We have completed a first Phase 1 single ascending dose clinical trial for TRV734, an oral follow-on to TRV130 for the treatment of moderate to severe acute and chronic pain. We have completed enrollment in a second Phase 1 multiple ascending dose clinical trial and expect to report data from this trial early in the first quarter of 2015. We have retained all worldwide development and commercialization rights to TRV734.

TRV027: We have completed a Phase 2a clinical trial and in early 2014 we initiated a Phase 2b clinical trial of TRV027 for acute heart failure, or AHF. Enrollment in this trial is ongoing, with over 250 patients recruited out of planned enrollment of approximately 500 patients. More than 65 sites in 12 countries are now open and recruiting, and we expect patient enrollment will conclude in the third quarter of 2015. We expect to report top-line data from this trial in the fourth quarter of 2015. Actavis plc, or Actavis, has the exclusive option to license TRV027 from

Table of Contents

us. We plan for TRV027 to be commercialized in the acute care hospital market if it receives regulatory approval.

We also have identified a new product candidate, TRV250, from our preclinical δ -opioid receptor program focused on central nervous system, or CNS, indications and plan to advance TRV250 to preclinical studies in 2015 designed to support our submission of an investigational new drug application, or IND, to the U.S. Food and Drug Administration, or FDA.

Our Pipeline

Our Platform

GPCRs are a large family of cell surface receptors that trigger two signaling pathways, G protein and β -arrestin, and are implicated in cellular function and disease processes. More than 30% of all currently marketed therapeutics target GPCRs. Currently available therapeutics that target GPCRs, or GPCR ligands, are typically not signal specific, and therefore either inhibit both the G protein and β -arrestin pathways (an antagonist ligand) or activate both pathways (an agonist ligand). This lack of signal specificity often results in a suboptimal therapeutic profile for these drugs because in many cases one of the pathways is associated with a beneficial therapeutic effect and the other is associated with limiting that benefit or with an undesirable side effect (see Figure 1). We use our proprietary Advanced Biased Ligand Explorer, or ABLE, product platform to identify "biased" ligands, which are compounds that activate one of the two signaling pathways of the GPCR while inhibiting the other (see Figure 2). This signaling specificity is the basis for our drug discovery and development approach, which is to identify selective GPCR biased ligands and develop them into differentiated clinical products. While some GPCRs trigger other signaling pathways in addition to G protein and β -arrestin, most GPCRs trigger those two pathways.

Our ABLE product platform is a collection of proprietary biological information, *in vitro* assays, know-how and expertise that we use to identify unique GPCR-targeted biased ligands with attractive pharmaceutical properties. Our *in vitro* assays use cells that have the receptor of interest on the cell surface, where G protein and β -arrestin signaling from that receptor can be measured to determine if a particular ligand is biased, and if so whether it is a G protein or β -arrestin biased ligand. Our assays can also measure different cellular responses resulting from signaling through β -arrestin and can thereby help us to associate pharmacological responses with molecular signaling. Most components of

Table of Contents

our ABLE product platform are maintained as trade secrets, but the output of the product platform is reflected in the product candidates that we have advanced into clinical testing and the research we have published in numerous peer-reviewed journals. We believe that our ABLE product platform provides us with an important competitive advantage in identifying further opportunities for efficient and high-impact biased ligand drug discovery, development and commercialization.

We were founded in late 2007 to discover and develop product candidates based on biased ligands, a concept discovered by our scientific founder, Dr. Robert Lefkowitz, who was awarded the 2012 Nobel Prize in Chemistry in part for his elucidation of the multiple pathways that a GPCR engages. We believe that we are the first company to progress a GPCR biased ligand into clinical trials. The members of our executive management team have held senior positions at leading pharmaceutical and biotechnology companies and possess substantial experience across the spectrum of drug discovery, development and commercialization.

Figure 1: Mechanism of current GPCR-targeted drugs

Figure 2: Mechanism of our biased ligands the next generation of GPCR-targeted drugs

Table of Contents

CNS Portfolio

TRV130

TRV130 is a small molecule G protein biased ligand at the μ -opioid receptor that we are developing as a first-line treatment for patients experiencing moderate to severe acute pain where intravenous, or IV, administration is preferred. The μ -opioid receptor is a well-established target for analgesics such as fentanyl and morphine, which are unbiased μ -opioid agonists. TRV130 activates the μ -opioid G protein pathway, associated with analgesia, and inhibits the β -arrestin pathway, which, in preclinical studies, was associated with limiting opioid analgesia, and with promoting opioid-induced respiratory depression and constipation. We believe that the management of moderate to severe, acute postoperative pain represents the largest opportunity for an intravenously administered μ -opioid therapy like TRV130. Accordingly, we have focused our initial clinical trials on the treatment of surgical patients. We believe that delivering better pain relief or mitigating dose limiting side effects typically associated with the activation of the μ -opioid receptor will position TRV130, if approved, to more effectively treat postoperative pain than currently available μ -opioid therapies.

According to data from IMS Health, a healthcare information firm, in 2013 there were approximately 47 million hospital inpatient stays and outpatient visits during which reimbursement claims for injectable opioids were made, 20 million of which involved a surgical procedure. Given its pharmacokinetic, tolerability and efficacy profile in our Phase 1 and Phase 2a/b clinical trials, we believe that both the inpatient and outpatient settings could be appropriate for TRV130 use. Despite the adoption of postoperative pain management guidelines, significant unmet need remains. In a 2012 survey of 300 surgical patients in the United States, over 80% of patients reported postoperative pain after the first analgesic medication had been administered, and 40% of those patients reported this pain to be moderate or severe. Currently available μ -opioid agonists, such as morphine and fentanyl, are the most effective class of analgesics for moderate to severe acute postoperative pain, but their effectiveness is limited in part because their doses are limited by severe side effects such as respiratory depression, nausea and vomiting, constipation and postoperative ileus, which is a condition that most commonly occurs after surgery involving interruption of movement of the intestines in which the bowel enters spasm and stops passing food and waste.

We have announced top-line data from our Phase 2a/b clinical trial of TRV130 in postoperative pain. At doses of 2 mg and 3 mg of TRV130 administered every three hours, the trial achieved its primary endpoint of statistically greater pain reduction than placebo for 48 hours, which we believe demonstrates proof of concept for TRV130. The 3 mg dose of TRV130 also showed statistically superior analgesic efficacy over the 48-hour trial period compared to 4 mg of morphine administered every four hours. Additionally, in the first three hours of dosing, when pain was most severe, the 1 mg, 2 mg and 3 mg doses of TRV130 demonstrated superior analgesic efficacy in the trial compared to placebo, and the 2 mg and 3 mg doses of TRV130 demonstrated superior analgesic efficacy compared to 4 mg of morphine. There were no serious adverse events reported in the trial, which we believe suggests that these levels of pain relief can be achieved safely. Over the 48-hour trial period, the tolerability of TRV130 at doses of 2 mg and 3 mg administered every three hours was similar to that of 4 mg of morphine administered every four hours. Based on these data, we plan to move into Phase 3 preparations, which we expect to occur in parallel with a second Phase 2 trial that we plan to commence in December 2014.

In our Phase 1b clinical trial in healthy subjects using an evoked-pain model, TRV130 showed superior analgesia compared to a high dose of morphine following a single dose administration, while causing less respiratory depression, less severe nausea and less vomiting. Together with our top-line Phase 2a/b data, we believe these results suggest that TRV130 may have an improved clinical profile in terms of efficacy, safety and tolerability compared to unbiased μ -opioid agonists, which are the current standard of care.

Table of Contents

We plan to initiate a second Phase 2 clinical trial in the fourth quarter of 2014 in soft tissue pain to inform Phase 3 development, since efficacy in both hard and soft tissue pain would be required by the FDA for a broad label in the treatment of acute moderate to severe pain. This trial will use flexible, as-needed dosing to allow patients to control the balance of efficacy and tolerability as their needs change over time. We expect to report top-line data from this second Phase 2 clinical trial in mid-2015. Prior to later-phase clinical development, we are also conducting or planning additional Phase 1 clinical testing in healthy subjects to add to our clinical understanding of TRV130.

We intend to retain full commercialization rights in the United States for TRV130. After the availability of the final Phase 2a/b clinical data for TRV130, we may seek collaborators for commercializing TRV130 outside of the United States to offset risk and preserve capital. We may also seek to collaborate with a third party to evaluate novel formulations of TRV130 for chronic pain and breakthrough pain. We have an issued U.S. patent that covers TRV130, compositions comprising TRV130 and methods of using TRV130, and this patent is expected to expire no earlier than 2032.

TRV734

TRV734 is a small molecule G protein biased ligand targeting the μ -opioid receptor, which we are developing as a first-line, orally administered compound for the treatment of moderate to severe acute and chronic pain. Like TRV130, TRV734 takes advantage of a well-established mechanism of pain relief by targeting the μ -opioid receptor, but does so with enhanced selectivity for the G protein signaling pathway, which in preclinical studies was linked to analgesia, as opposed to the β -arrestin signaling pathway, which in preclinical studies was associated with limiting analgesic efficacy and with promoting opioid-induced respiratory depression and constipation. Subject to successful non-clinical and clinical development and regulatory approval, we believe TRV734 may have an improved profile of efficacy relative to tolerability, or therapeutic profile, as compared to current commonly prescribed oral analgesics, such as oxycodone. We have filed patent applications covering TRV734 and methods of using TRV734.

In a Phase 1 single ascending dose clinical trial in healthy subjects, using pupil constriction as a surrogate for the analgesic efficacy of opioid drugs, orally administered TRV734 showed pharmacokinetics and pharmacodynamics across a dose range that was generally safe and well tolerated. These data supported further development, and we have completed enrollment in a second Phase 1 clinical trial, which is a multiple ascending dose trial evaluating the safety, tolerability, pharmacodynamics and pharmacokinetics of TRV734 given as a single dose and as multiple ascending doses in healthy volunteers. The aim of this trial is to support Phase 2 development, and top line data are expected early in the first quarter of 2015. We intend to seek a collaborator with experience in developing and commercializing controlled-substance therapeutics in acute and chronic care pain markets, thereby leveraging their expertise while retaining rights to commercialize TRV734 in treatment settings for which we can leverage our commercial strategy for TRV130.

TRV250

In November 2014, we identified a new product candidate, TRV250, a small molecule G protein biased ligand targeting the δ -opioid receptor. Based on the initial profile of TRV250, we anticipate focusing our initial development efforts on the treatment of treatment-refractory migraine headaches. According to Decision Resources, a healthcare consulting company, the acute episodic migraine market encompassed approximately 12 million drug-treated patients in 2013 in the United States, representing approximately \$2.2 billion of sales. We estimate that approximately 20% to 30% of these patients either do not respond to or cannot tolerate the market-leading triptan drug class, and an additional 30% would benefit from improved efficacy compared to these drugs.

Table of Contents

We believe TRV250 also may have utility in other CNS areas such as depression, Parkinson's disease or neuropathic pain. We intend to conduct preclinical work beginning in 2015 designed to support the filing of an IND for TRV250. We also intend to seek a collaborator for TRV250 with CNS development and worldwide commercialization expertise, while potentially retaining commercialization rights in the United States.

Cardiovascular Program

TRV027

We are developing TRV027 as a first-line IV treatment in combination with standard diuretic therapy for AHF patients. TRV027 is a peptide β -arrestin biased ligand that targets the angiotensin II type 1 receptor, or AT1R, which is a GPCR expressed on cells in the cardiovascular system. TRV027 inhibits G protein signaling and activates β -arrestin signaling. In our Phase 2a clinical trial, TRV027 rapidly reduced blood pressure and preserved renal, or kidney, function, while preserving cardiac performance. We are enrolling patients in a Phase 2b clinical trial to evaluate the safety and efficacy of TRV027 in AHF. Over 250 patients have been recruited out of planned enrollment of approximately 500 patients. More than 65 sites in 12 countries are open and recruiting, and we expect patient enrollment to conclude in the third quarter of 2015. We expect to report data from this trial by the end of the fourth quarter of 2015. If subsequent Phase 3 development is successful and TRV027 is approved by regulatory authorities, we believe TRV027 would be used as a first-line in-hospital AHF treatment. We also believe TRV027 could improve AHF symptoms, shorten length of hospital stay in the short term, and potentially lower readmission rates and mortality rates in the long term.

There are over 20 million people living with heart failure in the United States and Europe, according to the American Heart Association and the European Society of Cardiology. AHF, also sometimes referred to as acute decompensated heart failure, is heart failure requiring hospitalization. AHF patients present with severe dyspnea, a serious shortness of breath sometimes described as "air hunger," and fluid overload, leading to an inability to perform simple functions such as standing and walking short distances. This can also lead to organ dysfunction, including dysfunction in the kidneys and heart. The National Hospital Discharge Survey reported over five million hospital discharges in the United States in 2010 where heart failure was listed as a component of the diagnosis, over one million of which listed heart failure as the primary diagnosis. TRV027 has shown beneficial effects on the three key organ systems affected in heart failure, the blood vessels, heart and kidneys in our preclinical studies and Phase 1b and 2a clinical trials. In combination with standard diuretics, we believe these effects may translate into improvements in symptoms and outcomes such as hospital readmission rates, length of hospital stay and mortality rates if TRV027 successfully completes Phase 3 development and is approved by regulatory authorities.

Safety and tolerability issues limit the effectiveness of currently available AHF treatments. We believe that TRV027's tolerability profile differentiates it from current therapies. In healthy subjects in our Phase 1 clinical trial, there were no serious adverse events, even at doses 20 times higher than the expected therapeutic dose. In addition, there were no TRV027-related serious adverse events in a Phase 2a clinical trial in medically fragile, advanced chronic heart failure subjects and no clinically significant adverse events in subjects with heart failure and concomitant renal impairment. Finally, in preclinical toxicology studies, TRV027 had a favorable profile at doses up to 500 times the expected therapeutic dose.

In May 2013, we entered into an option agreement and a license agreement with Forest Laboratories Holdings Limited, or Forest, under which we granted to Forest an exclusive option to license TRV027, which may be exercised at any time before we deliver our Phase 2b clinical trial results to Forest and during a specified period of time thereafter. In July 2014, Actavis plc, or Actavis, acquired Forest, including Forest's option to TRV027. If Actavis exercises its option, the license

Table of Contents

agreement between us and Actavis will become effective, and Actavis will have an exclusive worldwide license to develop and commercialize TRV027 and specified related compounds. Actavis will be responsible for subsequent development, regulatory approval and commercialization of TRV027 at Actavis's expense. If Actavis exercises the option, we would receive a \$65 million option exercise fee and could potentially receive up to \$365 million depending upon the achievement of future development and commercial milestones. We could also receive tiered royalties between 10% and 20% on net sales of licensed products worldwide, with the royalty rates on net sales of licensed products in the United States being somewhat higher than the royalty rates on net sales of licensed products outside the United States. We have three issued U.S. patents covering the composition of matter and method of use of TRV027 that are expected to expire no earlier than 2031 and 2029, respectively.

Our Strategy

Our goal is to build a leading biopharmaceutical company leveraging our expertise in biased ligands to develop and commercialize innovative, best-in-class drugs targeting established GPCRs. Key elements of our business strategy to achieve this goal are to:

rapidly advance development of our three clinical-stage product candidates, TRV130, TRV734 and TRV027, to commercialization;

establish commercialization and marketing capabilities in the United States, initially in acute care markets, for any of our product candidates that are approved or that we anticipate may be approved;

expand our CNS product portfolio by advancing TRV250, our preclinical δ -opioid receptor product candidate; and

leverage our ABLE product platform to continue to discover innovative biased ligand therapeutics and expand our product platform's impact through external collaborations.

Financial Overview

Our revenue to date has been generated primarily through research grants and a research collaboration. We have not generated any commercial product revenue. As of September 30, 2014, we had \$72.2 million of cash and cash equivalents and an accumulated deficit of \$118.7 million.

In September 2014, we announced we had entered into a \$35.0 million senior secured tranching term loan credit facility with Oxford Finance LLC and Square 1 Bank, of which we have drawn \$2.0 million as of the date of this prospectus. The facility also provides for up to two additional term loan tranches of \$16.5 million each. Based on the top-line results of the Phase 2a/b clinical trial of TRV130 announced in November 2014, we believe we have met the conditions to draw the second tranche of \$16.5 million tranche from the credit facility. We may opt to draw the third term loan tranche if we receive positive data from the Phase 2 clinical trial of TRV027.

We believe that existing cash and the available borrowings under the second tranche of our credit facility, excluding any potential future draw from our credit facility if we receive positive data from the Phase 2 study of TRV027, plus the net proceeds from the offering will be sufficient to fund our operations through the fourth quarter of 2016.

Table of Contents

Risks Associated with Our Business

Our business is subject to a number of risks of which you should be aware before making an investment decision. These risks are discussed more fully in the "Risk Factors" section of this prospectus. These risks include the following:

We will need substantial additional funding to pursue our business objectives. If we are unable to raise capital when needed, we could be forced to delay, reduce or eliminate our drug development programs or potential commercialization efforts.

We are early in our clinical development efforts and have only two product candidates, TRV027 and TRV130, in Phase 2, and one more, TRV734, in Phase 1. If we, or Actavis if it exercises its option to license TRV027, are unable to commercialize our product candidates or experience significant delays in doing so, our business will be materially harmed.

Advancing TRV250, our preclinical δ -opioid receptor product candidate, may not lead to the filing of an IND or future clinical development.

If Actavis exercises its option to license TRV027, that relationship will be significant to our business. If Actavis' development and commercialization of TRV027 is not successful, our business could be adversely affected.

We have incurred significant losses since our inception. We expect to continue to incur losses over the next several years and may never achieve or maintain profitability.

We face substantial competition, which may result in others discovering, developing or commercializing drugs before or more successfully than we do.

Our future success depends on our ability to retain key executives and to attract, retain and motivate qualified personnel.

Corporate Information

We were incorporated under the laws of the State of Delaware in November 2007. Our principal executive office is located at 1018 West 8th Avenue, Suite A, King of Prussia, Pennsylvania 19406. Our telephone number is (610) 354-8840. Our website address is www.trevenainc.com. The information contained on our website is not incorporated by reference into this prospectus, and you should not consider any information contained on, or that can be accessed through, our website as part of this prospectus or in deciding whether to purchase our common stock.

"Trevena", the Trevena logo and other trademarks or service marks of Trevena, Inc. appearing in this prospectus are the property of Trevena, Inc. This prospectus contains additional trade names, trademarks and service marks of others, which are the property of their respective owners.

Implications of Being an Emerging Growth Company

As a company with less than \$1 billion in revenue during our last fiscal year, we qualify as an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. For so long as we remain an emerging growth company, we are permitted and intend to rely on exemptions from specified disclosure requirements that are applicable to other public companies that are not emerging growth companies. These exemptions include:

Edgar Filing: TREVENA INC - Form S-1/A

Being permitted to provide only two years of audited financial statements, in addition to any required unaudited interim financial statements, with correspondingly reduced "Management's Discussion and Analysis of Financial Condition and Results of Operations" disclosure;

Table of Contents

Not being required to comply with the auditor attestation requirements in the assessment of our internal control over financial reporting;

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 shareholder approval of any golden parachute payments not previously approved.

We may take advantage of these provisions through 2019 or such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company if we have more than \$1 billion in annual revenue, have more than \$700 million in market value of our capital stock held by non-affiliates or issue more than \$1 billion of non-convertible debt over a three-year period. We may choose to take advantage of some, but not all, of the available exemptions. We have taken advantage of some reduced reporting burdens in this prospectus. Accordingly, the information contained herein may be different than the information you receive from other public companies in which you hold stock.

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 provision allows an emerging growth company to delay the adoption of some 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.

Table of Contents

The Offering

Common stock offered by Trevena	\$40,000,000 of shares of common stock.
Total common stock to be outstanding after this offering	34,039,461 shares (35,188,886 shares if the underwriters elect to exercise their option to purchase additional shares from us in full).
Option to purchase additional shares of common stock	The underwriters have an option to purchase a maximum of \$6,000,000 of additional shares from us. The underwriters can exercise this option at any time within 30 days from the date of this prospectus.
Use of proceeds	We expect the net proceeds to us from this offering, after expenses, to be approximately \$37.0 million, or approximately \$42.6 million if the underwriters exercise their option to purchase additional shares from us in full. We intend to use the net proceeds from this offering, together with our existing cash and cash equivalents and the \$16.5 million we believe we are entitled to draw from the second tranche of our credit facility, as follows:

to fund clinical development expenses, including the completion of our ongoing Phase 2b clinical trial for TRV027, the initiation and completion of the next Phase 2 clinical trial and up to two Phase 3 clinical trials for TRV130 and the completion of a multiple ascending dose trial and other activities to support Phase 2 development for TRV734;

to fund preclinical research and development activities, including work to support the filing of an IND for TRV250; and

for working capital and general corporate purposes.

See "Use of Proceeds" on page 51 for additional information.

Risk factors	See the section titled "Risk Factors" beginning on page 14 and the other information included in this prospectus for a discussion of factors you should carefully consider before deciding to invest in our common stock.
--------------	---

NASDAQ Global Select Market symbol	TRVN
------------------------------------	------

The number of shares of our common stock that will be outstanding after this offering is based on 26,376,626 shares of common stock outstanding as of September 30, 2014 and assumes the sale of \$40,000,000 of shares of common stock at an assumed public offering price of \$5.22 per share, which was the last reported sale price of our common stock on the NASDAQ Global Select Market on November 28, 2014. A 5% increase or decrease in the assumed public offering price of \$5.22 per share would decrease or increase the number of shares of our common stock issued in this offering by approximately 5%.

Table of Contents

The number of shares of our common stock that will be outstanding after this offering set forth above excludes:

3,552,124 shares of our common stock issuable upon the exercise of stock options outstanding under our 2008 Equity Incentive Plan and 2013 Equity Incentive Plan as of September 30, 2014, at a weighted average exercise price of \$3.72 per share;

30,258 shares of our common stock issuable upon exercise of warrants outstanding as of September 30, 2014, at a weighted average exercise price of \$5.62 per share;

33,000 shares of our common stock issuable upon the exercise of stock options granted after September 30, 2014, at a weighted average exercise price of \$5.18 per share; and

868,235 shares of our common stock reserved for future issuance as of September 30, 2014 under our 2013 Equity Incentive Plan and our employee stock purchase plan.

Except as otherwise indicated herein, all information in this prospectus, including the number of shares that will be outstanding after this offering, assumes or gives effect to:

no exercise of options or warrants outstanding as of September 30, 2014; and

no exercise of the underwriters' option to purchase additional shares in this offering.

Table of Contents**Summary Financial Data**

The following tables set forth our summary financial data for the periods indicated. The following summary financial data for the years ended December 31, 2012 and 2013 are derived from our audited financial statements, which have been audited by Ernst & Young LLP, our independent registered public accounting firm, appearing elsewhere in this prospectus. We have derived the following summary of our statement of operations data for the nine months ended September 30, 2013 and 2014 and the balance sheet data as of September 30, 2014 from our unaudited condensed financial statements appearing elsewhere in this prospectus.

The financial data for the nine months ended September 30, 2013 and 2014 and as of September 30, 2014 includes, in the opinion of our management, all adjustments, consisting only of normal recurring adjustments that are necessary for a fair presentation of our financial position and results of operations for these periods. Our historical results are not necessarily indicative of the results to be expected in the future, and our operating results for the nine months ended September 30, 2014 are not necessarily indicative of the results that may be expected for the entire year ending December 31, 2014.

This summary financial data should be read together with the historical financial statements and related notes to those statements, as well as "Management's Discussion and Analysis of Financial Condition and Results of Operations," which are included elsewhere in this prospectus.

	Year Ended December 31,		Nine Months Ended September 30,	
	2012	2013	2013	2014
(in thousands, except share and per share data)				
Statement of Operations Data:				
Total revenue	\$ 808	\$ 135	\$ 135	\$
Operating expenses:				
General and administrative	3,123	4,718	2,843	7,034
Research and development	13,295	18,762	12,240	29,671
Total operating expenses	16,418	23,480	15,083	36,705
Loss from operations	(15,610)	(23,345)	(14,948)	(36,705)
Total other income (expense)	(26)	94	(1,398)	301
Net loss and comprehensive loss	(15,636)	(23,251)	(16,346)	(36,404)
Accretion of redeemable convertible preferred stock	(316)	(334)	(248)	(28)
Net loss attributable to common stockholders	\$ (15,952)	\$ (23,585)	\$ (16,594)	\$ (36,432)
Net loss per share basic and diluted	\$ (23.70)	\$ (29.71)	\$ (22.23)	\$ (1.58)

Edgar Filing: TREVENA INC - Form S-1/A

Weighted average shares of common stock outstanding used in computing net loss per share basic and diluted	673,191	793,806	746,587	23,036,366
--	---------	---------	---------	------------

Table of Contents

The following table presents our summary balance sheet data:

on an actual basis as of September 30, 2014; and

on an as adjusted basis to give effect to our sale of \$40,000,000 of shares of common stock in this offering, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

As of September 30, 2014

Actual As adjusted
(in thousands)

Balance Sheet Data:

Cash and cash equivalents	\$ 72,225	\$ 109,225
Total assets	73,956	110,956
Total liabilities	9,696	9,696
Total stockholders' equity	64,259	101,259

Table of Contents

RISK FACTORS

Investing in our common stock involves a high degree of risk. Before you invest in our common stock, you should carefully consider the following risks, as well as general economic and business risks, and all of the other information contained in this prospectus. Any of the following risks could have a material adverse effect on our business, operating results and financial condition and cause the trading price of our common stock to decline, which would cause you to lose all or part of your investment. When determining whether to invest, you should also refer to the other information contained in this prospectus, including our financial statements and the related notes thereto.

Risks Related to Our Financial Position and Capital Needs

We have incurred significant losses since our inception. We expect to incur losses over the next several years and may never achieve or maintain profitability.

Since inception, we have incurred significant operating losses. Our net loss was \$15.6 million and \$23.3 million for the years ended December 31, 2012 and 2013, respectively, and \$36.4 million for the nine months ended September 30, 2014. As of September 30, 2014, we had an accumulated deficit of \$118.7 million. To date, we have financed our operations primarily through private placements and a public offering of our equity securities and through grant revenue. Virtually all of our revenue to date has been grant revenue. We have devoted substantially all of our financial resources and efforts to research and development, including preclinical studies and clinical trials. We are still in the early stages of development of our product candidates, and we have not completed development of any drugs. We expect to continue to incur significant expenses and operating losses over the next several years. Our net losses may fluctuate significantly from quarter to quarter and year to year. We anticipate that our expenses will increase substantially as we:

continue to enroll our Phase 2b clinical trial of TRV027 and conduct Phase 2 and Phase 3 clinical trials of TRV130, our lead product candidates;

complete Phase 1 clinical trials of TRV734 and initiate a Phase 2 trial of TRV734;

initiate activities to support the filing of an IND for TRV250, our δ -opioid receptor product candidate;

seek to discover additional product candidates;

conduct late-stage clinical trials and seek regulatory approvals for any product candidates that successfully complete clinical trials;

ultimately establish a sales, marketing and distribution infrastructure and scale up external manufacturing capabilities to commercialize any products that we choose not to license to a third party and for which we may obtain regulatory approval;

maintain, expand and protect our intellectual property portfolio;

hire additional clinical and scientific personnel; and

add operational, financial and management information systems and personnel, including personnel to support our product development and planned future commercialization efforts.

Edgar Filing: TREVENA INC - Form S-1/A

To become and remain profitable, we must succeed in developing and eventually commercializing products that generate significant revenue. This will require us to be successful in a range of challenging activities, including completing preclinical testing and clinical trials of our product candidates, discovering additional product candidates, potentially entering into collaboration and license agreements, obtaining regulatory approval for product candidates and manufacturing, marketing and selling any products for which we may obtain regulatory approval. We are only in the preliminary stages

Table of Contents

of some of these activities and have not begun others. We may never succeed in these activities and, even if we do, may never achieve profitability.

Because of the numerous risks and uncertainties associated with pharmaceutical product development, we are unable to accurately predict the timing or amount of increased expenses or when, or if, we will be able to achieve profitability. If we are required by the United States Food and Drug Administration, or FDA, or foreign regulatory authorities, to perform studies in addition to those currently expected, or if there are any delays in completing our clinical trials or the development of any of our product candidates, our expenses could increase.

Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable would depress the value of our company and could impair our ability to raise capital, expand our business, maintain our research and development efforts, diversify our product offerings or even continue our operations. A decline in the value of our company could also cause you to lose all or part of your investment.

We will need substantial additional funding, which may not be available to us on acceptable terms, or at all. If we are unable to raise capital when needed, we could be forced to delay, reduce or eliminate our product development programs or commercialization efforts.

We expect our expenses to increase in connection with our ongoing activities, particularly as we continue to enroll the Phase 2b clinical trial for TRV027, complete the Phase 2 clinical program for TRV130 and then initiate and complete Phase 3 clinical trials, continue clinical development of TRV734, and continue research and development and initiate additional clinical trials of, and seek regulatory approval for, these and other product candidates. In addition, if we obtain regulatory approval for any of our product candidates, we expect to incur significant commercialization expenses related to product manufacturing, marketing, sales and distribution. Accordingly, we will need to obtain substantial additional funding in connection with our continuing operations. If we are unable to raise capital when needed or on attractive terms, we could be forced to:

delay, reduce or eliminate our research and development programs or any future commercialization efforts;

relinquish or license on unfavorable terms our rights to technologies or product candidates that we otherwise would seek to develop or commercialize ourselves;

seek collaborators for one or more of our product candidates at an earlier stage than otherwise would be desirable or on terms that are less favorable than might otherwise be available; or

cease operations altogether.

We estimate that the net proceeds from this offering, together with our existing cash and cash equivalents as of September 30, 2014 and our anticipated draw of \$16.5 million from our credit facility based on the top-line results of the Phase 2a/b trial of TRV130 announced in November 2014, will enable us to fund our operating expenses and capital expenditure requirements through the fourth quarter of 2016, without giving effect to a potential option payment and, if the option is exercised, potential milestone payments we may receive under our option and license agreements with Actavis plc, or Actavis, and excluding any potential future drawdown from our credit facility if we receive positive data from the Phase 2 study of TRV027. We have based this estimate on assumptions that may prove to be wrong, and we could use up our capital resources sooner than we currently expect. We do not expect our existing capital resources, including the net proceeds from this offering, to enable us to complete Phase 3 development of TRV027 if Actavis chooses not to license the product candidate.

Table of Contents

Accordingly, we expect that we will need to raise substantial additional funds in the future. Our future capital requirements will depend on many factors, including:

the progress and results of the Phase 2 clinical programs for TRV130 and TRV027;

whether Actavis exercises its option to license TRV027;

the scope, progress, results and costs of preclinical development, laboratory testing and clinical trials for our other product candidates, including our ongoing Phase 1 clinical program for TRV734;

our ability to enter into collaborative agreements for the development and commercialization of our product candidates, including TRV734;

the number and development requirements of other product candidates that we pursue;

the costs, timing and outcome of regulatory review of our product candidates or any future product candidates, both in the United States and in territories outside the United States;

the costs and timing of future commercialization activities, including product manufacturing, marketing, sales and distribution, for any of our product candidates for which we receive marketing approval;

any product liability or other lawsuits related to our products;

the expenses needed to attract and retain skilled personnel;

the revenue, if any, received from commercial sales of our product candidates for which we receive marketing approval; and

the costs involved in preparing, filing and prosecuting patent applications, maintaining and enforcing our intellectual property rights and defending any intellectual property-related claims, both in the United States and in territories outside the United States.

Identifying potential product candidates and conducting preclinical testing and clinical trials is a time-consuming, expensive and uncertain process that takes years to complete, and we may never generate the necessary data or results required to obtain regulatory approval and achieve product sales. In addition, our product candidates, if approved, may not achieve commercial success. Our commercial revenue, if any, will be derived from sales of products that we do not expect to be commercially available for many years, if at all. Accordingly, we will need to continue to rely on additional financing to achieve our business objectives. Adequate additional financing may not be available to us on acceptable terms, or at all. In addition, we may seek additional capital due to favorable market conditions or strategic considerations, even if we believe we have sufficient funds for our current or future operating plans.

Raising additional capital may cause dilution to our stockholders, including purchasers of common stock in this offering, restrict our operations or require us to relinquish rights to our technologies or product candidates.

Until such time, if ever, as we can generate substantial product revenue, we expect to finance our cash needs through a combination of equity offerings, debt financings, grants and license and development agreements in connection with any collaborations. We do not have any committed external source of funds other than the \$65 million option payment from Actavis if it exercises the option and, in such case, possible milestone and royalty payments under the license agreement, the \$16.5 million second tranche that we believe we have met the conditions to

draw under the credit facility with Oxford Finance and Square 1 Bank and the \$16.5 million third tranche under that credit facility that we would be entitled to draw if we receive positive data from the Phase 2 clinical trial of TRV027. To

Table of Contents

the extent that we raise additional capital through the sale of equity or convertible debt securities, your ownership interest will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect your rights as a common stockholder. Preferred equity financing and additional debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends.

If we raise additional funds through collaborations, strategic alliances or marketing, distribution or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or product candidates or grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce or terminate our product development or future commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

Our limited operating history may make it difficult for you to evaluate the success of our business to date and to assess our future viability.

We commenced active operations in late 2007, and our operations to date have been limited to organizing and staffing our company, business planning, raising capital, developing our ABLE product platform, identifying potential product candidates, undertaking preclinical studies and conducting clinical trials. Our three product candidates are early in development, and our preclinical program has not yet identified a product candidate. We have not yet demonstrated our ability to successfully complete later stage clinical trials, obtain regulatory approvals, manufacture a commercial scale product, or arrange for a third party to do so on our behalf, or conduct sales and marketing activities necessary for successful product commercialization. Consequently, any predictions you make about our future success or viability may not be as accurate as they could be if we had a longer operating history.

In addition, as a young business, we may encounter unforeseen expenses, difficulties, complications, delays and other known and unknown factors. We will need to expand our capabilities to support commercial activities. We may not be successful in adding such capabilities.

We expect our financial condition and operating results to continue to fluctuate significantly from quarter to quarter and year to year due to a variety of factors, many of which are beyond our control. Accordingly, you should not rely upon the results of any past quarterly or annual periods as indications of future operating performance.

Risks Related to the Discovery and Development of Our Product Candidates

Our research and development is focused on discovering and developing novel drugs based on biased ligands, and the approach we are taking to discover and develop drugs is not proven and may never lead to marketable products.

The discovery and development of drugs based on biased ligands is an emerging field, and the scientific discoveries that form the basis for our efforts to discover and develop product candidates are relatively new. The scientific evidence to support the feasibility of developing differentiated product candidates based on these discoveries is both preliminary and limited. We believe that we are the first company to conduct a clinical trial of a product candidate based on the concept of biased ligands. Therefore, we do not know if our approach will be successful.

Table of Contents

We are very early in our development efforts and have only two product candidates, TRV027 and TRV130, in Phase 2, and one more, TRV734, in Phase 1. If we are unable to successfully complete development and commercialization of our product candidates or experience significant delays in doing so, our business will be materially harmed.

We are very early in our development efforts and have only two product candidates, TRV027 and TRV130, in Phase 2 development, and one more, TRV734, in Phase 1 development. We have invested substantially all of our efforts and financial resources in the identification and development of biased ligands. Our ability to generate product revenue, which we do not expect will occur for many years, if ever, will depend heavily on the successful development and eventual commercialization of our product candidates. The success of our product candidates will depend on several factors, including the following:

successful completion of preclinical studies and clinical trials;

receipt of marketing approvals from applicable regulatory authorities;

obtaining, maintaining and protecting our intellectual property portfolio, including patents and trade secrets, and regulatory exclusivity for our product candidates;

making arrangements with third-party manufacturers for, or establishing, commercial manufacturing capabilities;

launching commercial sales of the products, if and when approved, whether alone or in collaboration with others;

acceptance of our products, if and when approved, by patients, the medical community and third-party payors;

effectively competing with other therapies;

obtaining and maintaining healthcare coverage of our products and adequate reimbursement; and

maintaining a continued acceptable safety profile of our products following approval.

If we do not achieve one or more of these factors in a timely manner or at all, we could experience significant delays or an inability to successfully commercialize our product candidates, which would materially harm our business.

We may not be successful in our efforts to expand our pipeline of product candidates.

One element of our strategy is to expand our pipeline of therapeutics based on biased ligands and advance these product candidates through clinical development for the treatment of a variety of indications. Although our research and development efforts to date have resulted in a number of development programs based on biased ligands, we may not be able to develop product candidates that are safe and effective. Even if we are successful in continuing to expand our pipeline, the potential product candidates that we identify may not be suitable for clinical development, including as a result of being shown to have harmful side effects or other characteristics that indicate that they are unlikely to receive marketing approval and achieve market acceptance. If we do not successfully develop and commercialize product candidates based upon our technological approach, we will not be able to obtain product revenue in future periods, which would make it unlikely that we would ever achieve profitability.

Table of Contents

Preclinical and clinical drug development involves a lengthy and expensive process, with an uncertain outcome. We may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of our product candidates.

Clinical testing is expensive and can take many years to complete, and the risk of failure is high. It is impossible to predict when or if any of our product candidates will prove effective or safe in humans or will receive regulatory approval. Before obtaining marketing approval from regulatory authorities for the sale of any product candidate, we must complete preclinical studies and then conduct extensive clinical trials to demonstrate the safety and efficacy of our product candidates in humans. A failure of one or more clinical trials can occur at any stage of testing. The outcome of preclinical testing and early clinical trials may not be predictive of the success of later clinical trials, and interim results of a clinical trial do not necessarily predict final results. Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their products. We may experience numerous unforeseen events during, or as a result of, clinical trials that could delay or prevent our ability to receive marketing approval or subsequently to commercialize our product candidates, including:

regulators or institutional review boards may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;

we may experience delays in reaching, or fail to reach, agreement on acceptable clinical trial contracts or clinical trial protocols with prospective trial sites;

clinical trials of our product candidates may produce negative or inconclusive results, and we may decide, or regulators may require us, to conduct additional clinical trials or abandon product development programs;

the number of patients required for clinical trials of our product candidates may be larger than we anticipate, enrollment in these clinical trials may be slower than we anticipate or participants may drop out of these clinical trials at a higher rate than we anticipate;

our third-party contractors may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;

we may have to suspend or terminate clinical trials of our product candidates for various reasons, including a finding that the participants are being exposed to unacceptable health risks;

regulators or institutional review boards may require that we or our investigators suspend or terminate clinical research for various reasons, including noncompliance with regulatory requirements or a finding that the participants are being exposed to unacceptable health risks;

the cost of clinical trials of our product candidates may be greater than we anticipate;

the supply or quality of our product candidates or other materials necessary to conduct clinical trials of our product candidates may be insufficient or inadequate; and

our product candidates may have undesirable side effects or other unexpected characteristics, causing us or our investigators, regulators or institutional review boards to suspend or terminate the trials.

Edgar Filing: TREVENA INC - Form S-1/A

If we are required to conduct additional clinical trials or other testing of our product candidates beyond those that we currently contemplate, if we are unable to successfully complete clinical trials of our product candidates or other testing, if the results of these trials or tests are not positive or are only modestly positive or if there are safety concerns, we may:

be delayed in obtaining marketing approval for our product candidates;

Table of Contents

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 safety warnings;

be subject to additional post-marketing testing requirements; or

have the product removed from the market after obtaining marketing approval.

Our product development costs also will increase if we experience delays in testing or in receiving marketing approvals. We do not know whether any of our preclinical studies or clinical trials will begin as planned, will need to be restructured or will be completed on schedule, or at all. Significant preclinical study or clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize our product candidates or allow our competitors to bring products to market before we do and impair our ability to successfully commercialize our product candidates and may harm our business and results of operations.

If we experience delays or difficulties in the enrollment of patients in clinical trials, our receipt of necessary regulatory approvals could be delayed or prevented.

We may not be able to initiate or continue clinical trials for our product candidates if we are unable to locate and enroll a sufficient number of eligible patients to participate in these trials as required by the FDA or similar regulatory authorities outside the United States. Some of our competitors have ongoing clinical trials for product candidates that treat the same indications as our product candidates, and patients who would otherwise be eligible for our clinical trials may instead enroll in clinical trials of our competitors' product candidates. Patient enrollment is affected by other factors including:

the severity of the disease under investigation;

the eligibility criteria for the study in question;

the perceived risks and benefits of the product candidate under study;

the efforts to facilitate timely enrollment in clinical trials;

the patient referral practices of physicians;

the ability to monitor patients adequately during and after treatment; and

the proximity and availability of clinical trial sites for prospective patients.

Our inability to enroll a sufficient number of patients for our clinical trials would result in significant delays and could require us to abandon one or more clinical trials altogether. For example, we face significant competition to recruit and enroll heart failure patients for our clinical trial of TRV027 due to a number of trials in heart failure currently being conducted by other sponsors. Enrollment delays in our clinical trials may result in increased development costs for our product candidates, which would cause the value of our company to decline and limit our ability to obtain additional financing.

If serious adverse or unacceptable side effects are identified during the development of our product candidates, we may need to abandon or limit our development of some of our product candidates.

If our product candidates are associated with adverse side effects in clinical trials or have characteristics that are unexpected, we may need to abandon their development or limit development

Table of Contents

to more narrow uses or subpopulations in which the side effects or other characteristics are less prevalent, less severe or more acceptable from a risk-benefit perspective. In our industry, many compounds that initially showed promise in early stage testing have later been found to cause side effects that prevented further development of the compound. In the event that our clinical trials reveal a high and unacceptable severity and prevalence of side effects, our trials could be suspended or terminated and the FDA or comparable foreign regulatory authorities could order us to cease further development or deny approval of our product candidates for any or all targeted indications. Drug-related side effects could affect patient recruitment or the ability of enrolled patients to complete the trial and could result in potential product liability claims.

Additionally if one or more of our product candidates receives marketing approval, and we or others later identify undesirable side effects caused by such products, a number of potentially significant negative consequences could result, including:

regulatory authorities may withdraw approvals of such product;

regulatory authorities may require additional warnings on the label;

we may be required to create a medication guide outlining the risks of such side effects for distribution to patients, if one is not required before approval;

we could be sued and held liable for harm caused to patients; and

our reputation may suffer.

Any of these events could prevent us from achieving or maintaining market acceptance of the particular product candidate, if approved.

TRV027 is a biased ligand targeted at the angiotensin II type 1 receptor, or AT1R, and has been shown to drop blood pressure in subjects with chronic heart failure. One subject in the Phase 2a clinical trial in advanced chronic heart failure was withdrawn from therapy after experiencing low blood pressure, or hypotension. If TRV027 drops blood pressure too much or causes prolonged low blood pressure, this could lead to adverse effects that could compromise the development, approval and market potential of TRV027.

TRV130 is predominantly metabolized by two liver enzymes, CYP2D6 and CYP3A4, that are common metabolic pathways for drugs. Because of competitive use of these pathways, we will need to conduct additional drug interaction studies and TRV130 may be limited in its co-administration with other drugs using these pathways as their safety and effectiveness, as well as TRV130's, may be adversely affected. This could limit our commercial opportunity due to the common co-administration of drugs in patients with moderate to severe acute pain requiring IV therapy. In addition, since CYP2D6 enzyme activity varies in the population, different dosing may be required in the product label for individuals that have low levels of CYP2D6 activity, which could limit the commercial opportunity of the drug, if approved. We are in discussion with the FDA on this question and cannot assure you that the FDA will not require us to utilize different dosing for this population and/or prospectively characterize individuals' CYP2D6 activity prior to administering TRV130.

TRV130 and TRV734 are both biased ligands targeted at the μ -opioid receptor. Common adverse reactions for agonists of the μ -opioid receptor include respiratory depression, constipation, nausea, vomiting and addiction. In rare cases, μ -opioid receptor agonists can cause respiratory arrest requiring immediate medical intervention. Since TRV130 and TRV734 also modulate the μ -opioid receptor, these adverse reactions and risks could apply to the use of TRV130 and TRV734. One healthy subject in the 0.25 mg dosing cohort of our Phase 1 clinical trial of TRV130 experienced a severe episode of vasovagal syncope during which he fainted and his pulse stopped. These were considered severe adverse events. Although this individual recovered without medical intervention and experienced no known adverse consequences from this, certain potential triggers of vasovagal syncope were removed from the

Table of Contents

trial protocol, and dose escalation proceeded up to 7 mg/hr (28-fold higher than the 0.25 mg/hr dose at which the syncope occurred) without further incident, it is possible that serious adverse vasovagal events could occur in other patients dosed with TRV130. We have to date administered TRV130 to only 371 subjects at doses up to 7mg/dose.

Agonists at the δ -opioid receptor have been associated with a risk of seizures. TRV250, our δ -opioid receptor product candidate, targets the same receptor as other programs that have been associated with seizures and, accordingly, it is possible that it will be associated with similar side effects.

We may expend our limited resources to pursue a particular product candidate or indication and fail to capitalize on product candidates or indications that may be more profitable or for which there is a greater likelihood of success.

Because we have limited financial and managerial resources, we focus on research programs and product candidates that we identify for specific indications. As a result, we may forego or delay pursuit of opportunities with other product candidates or for other indications that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. In addition, under our option agreement with Actavis, we have agreed to conduct, at our expense, a Phase 2b clinical trial of TRV027 in AHF. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable products. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate.

Risks Related to the Commercialization of Our Product Candidates

Even if any of our product candidates receives marketing approval, it may fail to achieve the degree of market acceptance by physicians, patients, third-party payors and others in the medical community necessary for commercial success.

If any of our product candidates receives marketing approval, it may nonetheless fail to gain sufficient market acceptance by physicians, patients, third-party payors and others in the medical community. If our product candidates do not achieve an adequate level of acceptance, we may not generate significant product revenue and we may not become profitable. The degree of market acceptance of our product candidates, if approved for commercial sale, will depend on a number of factors, including:

the efficacy, safety and potential advantages compared to alternative treatments;

the timing of market introduction of the product candidate as well as competitive products;

our ability to offer the product for sale profitably and at competitive prices;

the convenience and ease of administration compared to alternative treatments;

the willingness of the target patient population to try new therapies and of physicians to prescribe these therapies;

the strength of sales, marketing and distribution support;

the availability of third-party coverage and adequate reimbursement;

the prevalence and severity of any side effects;

the clinical indications for which the product is approved; and

any restrictions on the use of our products together with other medications.

If we are unable to establish sales, marketing and distribution capabilities or to enter into agreements with third parties to market and sell our product candidates, we may not be successful in commercializing our product candidates if and when they are approved.

We currently do not have a marketing or sales organization for the marketing, sales and distribution of pharmaceutical products and have no experience in this area. To commercialize any product candidates that receive marketing approval, we would need to build marketing, sales, distribution, managerial and other non-technical capabilities or make arrangements with third parties to perform these services, and we may not be successful in doing so. If we successfully develop and obtain regulatory approval for any of our product candidates, we expect to build a targeted specialist sales force to market or co-promote the product in the United States. There are substantial risks involved with establishing our own sales, marketing and distribution capabilities. For example, recruiting and training a sales force is expensive and time consuming and could delay any product launch. If the commercial launch of a product candidate for which we recruit a sales force and establish marketing capabilities is delayed or does not occur for any reason, we would have prematurely or unnecessarily incurred these commercialization expenses. This may be costly, and our investment would be lost if we cannot retain or reposition our sales and marketing personnel.

There are a number of factors that may inhibit our efforts to commercialize our products on our own, including:

our inability to recruit, train and retain adequate numbers of effective sales and marketing personnel;

the inability of sales personnel to obtain access to physicians or persuade adequate numbers of physicians to prescribe any future products;

the lack of complementary or other products to be offered by sales personnel, which may put us at a competitive disadvantage from the perspective of sales efficiency relative to companies with more extensive product lines; and

unforeseen costs and expenses associated with creating an independent sales and marketing organization.

As an alternative to establishing our own sales force, we may choose to partner with third parties that have well-established direct sales forces to sell, market and distribute our products. In the case of TRV027, should Actavis elect to license TRV027, it would thereafter have responsibility for further clinical development, regulatory approval and commercialization. If we are unable to enter into collaborations with third parties for the commercialization of approved products, if any, on acceptable terms or at all, or if any such partner, including Actavis if it exercises its option to license TRV027, does not devote sufficient resources to the commercialization of our product or otherwise fails in commercialization efforts, we may not be able to successfully commercialize any of our product candidates that receive regulatory approval.

We face substantial competition, which may result in others discovering, developing or commercializing products before or more successfully than we do.

The development and commercialization of new drug products is highly competitive. We face competition with respect to our current product candidates, and will face competition with respect to any product candidates that we may seek to develop or commercialize in the future, from major pharmaceutical companies, specialty pharmaceutical companies and biotechnology companies

worldwide. In addition to existing therapeutic treatments for the indications we are targeting with our product candidates, which our goal would be to displace if any of our product candidates achieves regulatory approval, we also face potential competition from other drug candidates in development by other companies. With respect to competition for TRV027, we are aware of three product candidates in mid-to late-stage clinical development for AHF. These are serelaxin, being developed by Novartis, which has completed a single Phase 3 clinical trial, omecamtiv mercarbil, being developed by Cytokinetics and Amgen, which has completed a Phase 2b clinical trial, and ularitide, being developed by Cardiorentis and currently in a Phase 3 clinical trial. With respect to competition for TRV130, the most advanced and directly competitive product candidates are reformulations of existing opioids, such as a fentanyl iontophoresis patch, in development by The Medicines Company, and sufentanil nanotab, in development by AcclRx, and a peripherally-restricted κ -opioid agonist (CR845) in development by Cara Therapeutics Inc. Some of these potential competitive compounds are being developed by large, well-financed and experienced pharmaceutical and biotechnology companies or have been partnered with such companies, which may give them development, regulatory and marketing advantages over us, or Actavis, if it exercises its option for TRV027.

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 may develop. Our competitors also may obtain FDA or other regulatory approval for their products more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the market. In addition, our ability to compete may be affected in many cases by insurers or other third-party payors seeking to encourage the use of generic products. Generic products are currently on the market for the indications that we are pursuing. If our product candidates achieve marketing approval, we expect that they will be priced at a significant premium over competing generic products.

Some of the companies against which we are competing or against which we may compete in the future have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved products than we do. 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 and other early stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These third parties compete with us in recruiting and retaining qualified scientific and management personnel, establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs.

Even if we or our collaborators are able to commercialize any of our product candidates, the product candidates may become subject to unfavorable pricing regulations, third-party coverage and reimbursement policies or healthcare reform initiatives.

Both our and our collaborators' ability to commercialize any of our product candidates successfully will depend, in part, on the extent to which coverage and adequate reimbursement for these products and related treatments will be available from government payor programs at the federal and state level authorities, including Medicare and Medicaid, private health insurers, managed care plans and other organizations. Government authorities and third-party payors, such as private health insurers and health maintenance organizations, decide which medications they will pay for and establish reimbursement levels. A primary trend in the U.S. healthcare industry and elsewhere is cost containment. Government authorities and third-party payors have attempted to control costs by limiting coverage and the amount of reimbursement for particular medications. Increasingly, third-party payors are requiring that drug companies provide them with predetermined discounts from list prices and are challenging the prices

charged for medical products. Coverage and reimbursement may not be available for any drug that we or our collaborators commercialize and, even if these are available, the level of reimbursement may not be satisfactory. Inadequate reimbursement levels may adversely affect the demand for, or the price of, any product candidate for which we or our collaborators obtain marketing approval. Obtaining and maintaining adequate reimbursement for our products may be difficult. We may be required to conduct expensive pharmacoeconomic studies to justify coverage and reimbursement or the level of reimbursement relative to other therapies. If coverage and adequate reimbursement are not available or reimbursement is available only to limited levels, we or our collaborators may not be able to successfully commercialize any product candidates for which marketing approval is obtained.

There may be significant delays in obtaining coverage and reimbursement for newly approved drugs, and coverage may be more limited than the indications for which the drug is approved by the FDA or similar regulatory authorities outside the United States. Moreover, eligibility for coverage and reimbursement does not imply that a drug will be paid for in all cases or at a rate that covers our costs, including research, development, manufacture, sale and distribution expenses. Interim reimbursement levels for new drugs, if applicable, also may not be sufficient to cover our costs and may not be made permanent. Reimbursement rates may vary according to the use of the drug and the clinical setting in which it is used, may be based on reimbursement levels already set for lower cost drugs and may be incorporated into existing payments for other services. Net prices for drugs may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that presently restrict imports of drugs from countries where they may be sold at lower prices than in the United States. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own reimbursement policies. Our or our collaborators' inability to promptly obtain coverage and adequate reimbursement rates from both government-funded and private payors for any approved drugs that we develop could adversely affect our operating results, our ability to raise capital needed to commercialize drugs and our overall financial condition.

The regulations that govern marketing approvals, pricing, coverage and reimbursement for new drugs vary widely from country to country. Current and future legislation may significantly change the approval requirements in ways that could involve additional costs and cause delays in obtaining approvals. Some countries require approval of the sale price of a drug before it can be marketed. In many countries, the pricing review period begins after marketing or licensing approval is granted. In some foreign markets, prescription pharmaceutical pricing remains subject to continuing governmental control even after initial approval is granted. As a result, we or our collaborators might obtain marketing approval for a drug in a particular country, but then be subject to price regulations that delay commercial launch of the drug, possibly for lengthy time periods, and negatively impact our ability to generate revenue from the sale of the drug in that country. Adverse pricing limitations may hinder our ability to recoup our investment in one or more product candidates, even if our product candidates obtain marketing approval.

There can be no assurance that our product candidates, if they are approved for sale in the United States or in other countries, will be considered medically reasonable and necessary for a specific indication, that they will be considered cost-effective by third-party payors, that coverage or an adequate level of reimbursement will be available, or that third-party payors' reimbursement policies will not adversely affect our ability to profitably sell our product candidates if they are approved for sale.

Product liability lawsuits against us could cause us to incur substantial liabilities and limit commercialization of any products that we may develop.

We face an inherent risk of product liability exposure related to the testing of our product candidates in human clinical trials and will face an even greater risk if we commercially sell any products that we may develop. For example, we may be sued if any product we develop allegedly

Edgar Filing: TREVENA INC - Form S-1/A

causes injury or is found to be otherwise unsuitable during clinical testing, manufacturing, marketing or sale. Any such product liability claims may include allegations of defects in manufacturing, defects in design, a failure to warn of dangers inherent in the product, negligence, strict liability or a breach of warranties. If we cannot successfully defend ourselves against claims that our product candidates or products caused injuries, we will incur substantial liabilities. Regardless of merit or eventual outcome, liability claims may result in:

decreased demand for any product candidates or products that we may develop;

injury to our reputation and significant negative media attention;

withdrawal of clinical trial participants;

initiation of investigations by regulators;

significant costs to defend the related litigation;

product recalls, withdrawals or labeling, marketing or promotional restrictions;

substantial monetary awards to trial participants or patients;

loss of revenue;

reduced resources of our management to pursue our business strategy; and

the inability to commercialize any products that we may develop.

We currently maintain \$15 million in product liability insurance coverage, which may not be adequate to cover all liabilities that we may incur. We will likely need to increase our insurance coverage as we expand our clinical trials or if we commence commercialization of our product candidates. Insurance coverage is increasingly expensive. We may not be able to maintain insurance coverage at a reasonable cost or in an amount adequate to satisfy any liability that may arise.

Risks Related to Our Dependence on Third Parties

If Actavis exercises its option to license TRV027, that relationship will become even more important to our business, and any future relationships or collaborations we may elect to pursue may also be important to us. If we are unable to maintain our relationship with Actavis or any of these collaborations, or if our relationship with Actavis or these collaborators is not successful, our business could be adversely affected.

We have limited capabilities for product development and do not yet have any capability for sales, marketing or distribution. We have an option agreement and a license agreement with Actavis, which provide Actavis with an option to license TRV027. If Actavis exercises this option, it will be responsible for subsequent development, regulatory approval and commercialization of TRV027 and we will be eligible to receive milestone payments and royalties on product sales. This relationship, any future collaboration with Actavis, and any future collaborations we might enter into with another third party, may pose a number of risks, including the following:

collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations;

collaborators may not perform their obligations as expected;

collaborators may elect not to continue or renew development or commercialization programs or may not pursue commercialization of any product candidates that achieve regulatory approval based on clinical trial results, changes in the collaborators' strategic focus or available funding, or external factors, such as an acquisition, that divert resources or create competing priorities;

Edgar Filing: TREVENA INC - Form S-1/A

collaborators may delay clinical trials, provide insufficient funding for a clinical trial program, stop a clinical trial or abandon a product candidate, repeat or conduct new clinical trials or require a new formulation of a product candidate for clinical testing;

collaborators could fail to make timely regulatory submissions for a product candidate;

collaborators may not comply with all applicable regulatory requirements or may fail to report safety data in accordance with all applicable regulatory requirements;

collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our products or product candidates if the collaborators believe that competitive products are more likely to be successfully developed or can be commercialized under terms that are more economically attractive than ours;

product candidates discovered in collaboration with us may be viewed by our collaborators as competitive with their own product candidates or products, which may cause collaborators to cease to devote resources to the commercialization of our product candidates;

a collaborator with marketing and distribution rights to one or more of our product candidates that achieve regulatory approval may not commit sufficient resources to the marketing and distribution of such product or products;

disagreements with collaborators, including disagreements over proprietary rights, contract interpretation or the preferred course of development, might cause delays or termination of the research, development or commercialization of product candidates, might lead to additional responsibilities for us with respect to product candidates, or might result in litigation or arbitration, any of which would be time-consuming and expensive;

collaborators may not properly maintain or defend our intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our intellectual property or proprietary information or expose us to potential litigation;

collaborators may infringe the intellectual property rights of third parties, which may expose us to litigation and potential liability; and

collaborations may be terminated at the convenience of the collaborator and, if terminated, we could be required to raise additional capital to pursue further development or commercialization of the applicable product candidates.

If our potential collaboration with Actavis, or any other collaborations we might enter into in the future, do not result in the successful development and commercialization of products or if one of our collaborators terminates its agreement with us, we may not receive any future research funding or milestone or royalty payments under the collaboration. If we do not receive the funding we expect under these agreements, our development of our product platform and product candidates could be delayed and we may need additional resources to develop our product candidates and our product platform. All of the risks relating to our product development, regulatory approval and commercialization described in this prospectus also apply to the activities of our therapeutic program collaborators.

If Actavis exercises its option to license TRV027 from us, the license agreement will contain a restriction on our engaging in activities relating to certain product candidates that may compete with TRV027 for a specified period of time. This restriction may have the effect of preventing us from undertaking development and other efforts for TRV027 that we would otherwise prefer to pursue. Additionally, subject to its contractual obligations to us, if Actavis or a future collaborator of ours is involved in a business combination, the collaborator might deemphasize or terminate development or

commercialization of any product candidate licensed to it by us. If one of our collaborators terminates its agreement with us, we may find it more difficult to attract new collaborators and our reputation in the business and financial communities could be adversely affected.

For our product candidates other than TRV027, we may in the future determine to collaborate with pharmaceutical and biotechnology companies for the development and potential commercialization of these candidates. We face significant competition in seeking appropriate collaborators. Our ability to reach a definitive agreement for collaboration will depend, among other things, upon our assessment of the collaborator's resources and expertise, the terms and conditions of the proposed collaboration and the proposed collaborator's evaluation of a number of factors. If we are unable to reach agreements with suitable collaborators on a timely basis, on acceptable terms, or at all, we may have to curtail the development of a product candidate, reduce or delay its development program or one or more of our other development programs, delay its potential commercialization or reduce the scope of any sales or marketing activities or increase our expenditures and undertake development or commercialization activities at our own expense. If we elect to fund and undertake development or commercialization activities on our own, we may need to obtain additional expertise and additional capital, which may not be available to us on acceptable terms or at all. If we fail to enter into collaborations and do not have sufficient funds or expertise to undertake the necessary development and commercialization activities, we may not be able to further develop our product candidates or bring them to market or continue to develop our product platform and our business may be materially and adversely affected.

We rely, and expect to continue to rely, on third parties to conduct our preclinical studies and clinical trials, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials or complying with applicable regulatory requirements.

We rely on third-party contract research organizations and clinical research organizations to conduct some of our preclinical studies and all of our clinical trials for TRV027, TRV130 and TRV734. We expect to continue to rely on third parties, such as contract research organizations, clinical research organizations, clinical data management organizations, medical institutions and clinical investigators, to conduct some of our preclinical studies and all of our clinical trials. The agreements with these third parties might terminate for a variety of reasons, including a failure to perform by the third parties. If we need to enter into alternative arrangements, that could delay our product development activities.

Our reliance on these third parties for research and development activities will reduce our control over these activities but will not relieve us of our responsibilities. For example, we will remain responsible for ensuring that each of our preclinical studies and clinical trials are conducted in accordance with the general investigational plan and protocols for the trial and for ensuring that our preclinical studies are conducted in accordance with good laboratory practice, or GLP, as appropriate. Moreover, the FDA requires us to comply with standards, commonly referred to as good clinical practices, or GCPs, for conducting, recording and reporting the results of clinical trials to assure that data and reported results are credible and accurate and that the rights, integrity and confidentiality of trial participants are protected. Regulatory authorities enforce these requirements through periodic inspections of trial sponsors, clinical investigators and trial sites. If we or any of our clinical research organizations fail to comply with applicable GCPs, the clinical data generated in our clinical trials may be deemed unreliable and the FDA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. We cannot assure you that upon inspection by a given regulatory authority, such regulatory authority will determine that any of our clinical trials complies with GCP regulations. In addition, our clinical trials must be conducted with product produced under current good manufacturing practice, or cGMP, regulations. Our failure to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory approval process. We also are required to register ongoing clinical trials and post the results

of completed clinical trials on a government-sponsored database, ClinicalTrials.gov, within specified timeframes. Failure to do so can result in fines, adverse publicity and civil and criminal sanctions.

The third parties with whom we have contracted to help perform our preclinical studies or clinical trials may also have relationships with other entities, some of which may be our competitors. If these third parties do not successfully carry out their contractual duties, meet expected deadlines or conduct our preclinical studies or clinical trials in accordance with regulatory requirements or our stated protocols, we will not be able to obtain, or may be delayed in obtaining, marketing approvals for our product candidates and will not be able to, or may be delayed in our efforts to, successfully commercialize our product candidates.

If any of our relationships with these third-party contract research organizations or clinical research organizations terminate, we may not be able to enter into arrangements with alternative contract research organizations or clinical research organizations or to do so on commercially reasonable terms. Switching or adding additional contract research organizations or clinical research organizations involves additional cost and requires management time and focus. In addition, there is a natural transition period when a new contract research organization or clinical research organization commences work. As a result, delays could occur, which could compromise our ability to meet our desired development timelines. Though we carefully manage our relationships with our contract research organizations or clinical research organizations, there can be no assurance that we will not encounter similar challenges or delays in the future.

We contract with third parties for the manufacture of our product candidates for preclinical and clinical testing and expect to continue to do so for commercialization. This reliance on third parties increases the risk that we will not have sufficient quantities of our product candidates or products or such quantities at an acceptable cost, which could delay, prevent or impair our development or commercialization efforts.

We do not have any manufacturing facilities or personnel. We rely, and expect to continue to rely, on third parties for the manufacture of our product candidates for preclinical and clinical testing, as well as for commercial manufacture, if any, of our product candidates receive marketing approval. This reliance on third parties increases the risk that we will not have sufficient quantities of our product candidates or products or such quantities at an acceptable cost or quality, which could delay, prevent or impair our development or commercialization efforts. For example, in March 2011, TRV027 was put on clinical hold by the FDA following an FDA audit at the company then manufacturing the TRV027 drug product. We replaced this drug product with new drug product manufactured by another company and the FDA lifted the clinical hold in June 2011.

We also expect to rely on third-party manufacturers or third-party collaborators for the manufacture of commercial supply of any product candidates for which our collaborators or we obtain marketing approval. We may be unable to establish any agreements with third-party manufacturers or to do so on acceptable terms. Even if we are able to establish agreements with third-party manufacturers, reliance on third-party manufacturers entails additional risks, including:

reliance on the third party for regulatory compliance and quality assurance;

the possible breach of the manufacturing agreement by the third party;

manufacturing delays if our third-party manufacturers give greater priority to the supply of other products over our product candidates or otherwise do not satisfactorily perform according to the terms of the agreement between us;

the possible misappropriation of our proprietary information, including our trade secrets and know-how; and

the possible termination or nonrenewal of the agreement by the third party at a time that is costly or inconvenient for us.

The facilities used by our contract manufacturers to manufacture our product candidates must be approved by the FDA pursuant to inspections that will be conducted after we submit an NDA to the FDA. We do not control the manufacturing process of, and are completely dependent on, our contract manufacturers for compliance with cGMP regulations for manufacture of our product candidates. Third-party manufacturers may not be able to comply with the cGMP regulations or similar regulatory requirements outside the United States. Our failure, or the failure of our third-party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us, including clinical holds, fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of product candidates or products, operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supplies of our products.

Our product candidates and any products that we may develop may compete with other product candidates and products for access to manufacturing facilities. There are a limited number of manufacturers that operate under cGMP regulations and that might be capable of manufacturing for us. Any performance failure on the part of our existing or future manufacturers could delay clinical development or marketing approval. We do not currently have arrangements in place for redundant supply or a second source for bulk drug substance. If our current contract manufacturers cannot perform as agreed, we may be required to replace such manufacturers. We may incur added costs and delays in identifying and qualifying any replacement manufacturers.

The U.S. Drug Enforcement Administration, or DEA, restricts the importation of a controlled substance finished drug product when the same substance is commercially available in the United States, which could reduce the number of potential alternative manufacturers for our μ -opioid receptor targeted product candidates, including TRV130 and TRV734. In addition, a DEA quota system controls and limits the availability and production of controlled substances and the DEA also has authority to grant or deny requests for quota of controlled substances, which will likely include the active ingredients in TRV130 and TRV734. Supply disruptions could result from delays in obtaining DEA approvals for controlled substances or from the receipt of quota of controlled substances that are insufficient to meet future product demand. The quota system also may limit our ability to build inventory as a method for mitigating possible supply disruptions if TRV130 or TRV734 are approved for sale in the United States.

Our current and anticipated future dependence upon others for the manufacture of our product candidates or products may adversely affect our future profit margins and our ability to commercialize any products that receive marketing approval on a timely and competitive basis.

We also expect to rely on other third parties to store and distribute drug supplies for our clinical trials. Any performance failure on the part of our distributors could delay clinical development or marketing approval of our product candidates or commercialization of our products, producing additional losses and depriving us of potential product revenue.

We rely on clinical data and results obtained by third parties that could ultimately prove to be inaccurate or unreliable.

As part of our strategy to mitigate development risk, we seek to develop product candidates with validated mechanisms of action and we utilize biomarkers to assess potential clinical efficacy early in the development process. This strategy necessarily relies upon clinical data and other results obtained by third parties that may ultimately prove to be inaccurate or unreliable. Further, such clinical data and

results may be based on products or product candidates that are significantly different from our product candidates. If the third-party data and results we rely upon prove to be inaccurate, unreliable or not applicable to our product candidates, we could make inaccurate assumptions and conclusions about our product candidates and our research and development efforts could be compromised.

Risks Related to Our Intellectual Property

If we are unable to obtain and maintain patent protection for our technology and products or if the scope of the patent protection obtained is not sufficiently broad, our competitors could develop and commercialize technology and products similar or identical to ours, and our ability to successfully commercialize our technology and products may be impaired.

Our success depends in large part on our ability to obtain and maintain patent protection in the United States and other countries with respect to our product candidates. We seek to protect our proprietary position by filing patent applications in the United States and abroad related to our product candidates.

The patent prosecution process is expensive and time-consuming, and we may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. It is also possible that we will fail to identify patentable aspects of our research and development output before it is too late to obtain patent protection. If Actavis exercises its option to license TRV027, it will have the first right to prosecute, maintain and enforce TRV027 patents and these obligations may have an effect on our strategy regarding the preparation, filing and prosecution of patent applications, or maintenance of the patents, covering our product candidates. Moreover, should we enter into other collaborations we may be required to consult with or cede control to collaborators regarding the prosecution, maintenance and enforcement of our patents. Therefore, these patents and applications may not be prosecuted and enforced in a manner consistent with the best interests of our business.

The patent position of biotechnology and pharmaceutical companies generally is highly uncertain, involves complex legal and factual questions and has in recent years been the subject of much litigation. In addition, the laws of foreign countries may not protect our rights to the same extent as the laws of the United States. For example, European patent law restricts the patentability of methods of treatment of the human body more than United States law does. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after a first filing, or in some cases at all. Therefore, we cannot know with certainty whether we were the first to make the inventions claimed in our owned or licensed patents or pending patent applications, or that we were the first to file for patent protection of such inventions. As a result, the issuance, scope, validity, enforceability and commercial value of our patent rights are highly uncertain. Our pending and future patent applications may not result in patents being issued which protect our technology or products, in whole or in part, or which effectively prevent others from commercializing competitive technologies and products. Changes in either the patent laws or interpretation of the patent laws in the United States and other countries may diminish the value of our patents or narrow the scope of our patent protection.

Recent patent reform legislation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents. On September 16, 2011, the Leahy-Smith America Invents Act, or the Leahy-Smith Act, was signed into law. The Leahy-Smith Act includes a number of significant changes to United States patent law. These include provisions that affect the way patent applications are prosecuted and may also affect patent litigation. The United States Patent Office recently developed new regulations and procedures to govern administration of the Leahy-Smith Act, and many of the substantive changes to patent law associated with the Leahy-Smith Act, and in particular, the first to file provisions, only became effective

on March 16, 2013. Accordingly, it is not clear what, if any, impact the Leahy-Smith Act will have on the operation of our business. However, the Leahy-Smith Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents, all of which could have a material adverse effect on our business and financial condition.

Moreover, we may be subject to a third-party preissuance submission of prior art to the U.S. Patent and Trademark Office, or become involved in opposition, derivation, reexamination, *inter partes* review, post-grant review or interference proceedings challenging our patent rights or the patent rights of others. An adverse determination in any such submission, proceeding or litigation could reduce the scope of, render unenforceable, or invalidate, our patent rights, allow third parties to commercialize our technology or products and compete directly with us, without payment to us, or result in our inability to manufacture or commercialize products without infringing third-party patent rights. In addition, if the breadth or strength of protection provided by our patents and patent applications is threatened, it could dissuade companies from collaborating with us to license, develop or commercialize current or future product candidates.

Even if our patent applications issue as patents, they may not issue in a form that will provide us with any meaningful protection, prevent competitors from competing with us or otherwise provide us with any competitive advantage. Our competitors may be able to circumvent our owned or licensed patents by developing similar or alternative technologies or products in a non-infringing manner.

The issuance of a patent does not foreclose challenges to its inventorship, scope, validity or enforceability. Therefore, our owned and licensed patents may be challenged in the courts or patent offices in the United States and abroad. Such challenges may result in loss of exclusivity or freedom to operate or in patent claims being narrowed, invalidated or held unenforceable, in whole or in part, which could limit our ability to stop others from using or commercializing similar or identical technology and products, or limit the duration of the patent protection of our technology and products. Given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting such product candidates might expire before or shortly after such product candidates are commercialized. As a result, our owned and licensed patent portfolio may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours.

We may become involved in lawsuits to protect or enforce our patents or other intellectual property, which could be expensive, time consuming and unsuccessful.

Competitors may infringe our issued patents or other intellectual property. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time consuming. Any claims we assert against perceived infringers could provoke these parties to assert counterclaims against us alleging that we infringe their patents. In addition, in a patent infringement proceeding, a court may decide that a patent of ours is invalid or unenforceable, in whole or in part, construe the patent's claims narrowly or refuse to stop the other party from using the technology at issue on the grounds that our patents do not cover the technology in question. An adverse result in any litigation proceeding could put one or more of our patents at risk of being invalidated, rendered unenforceable, or interpreted narrowly.

We may need to license certain intellectual property from third parties, and such licenses may not be available or may not be available on commercially reasonable terms.

A third party may hold intellectual property, including patent rights, that are important or necessary to the development of our products. It may be necessary for us to use the patented or proprietary technology of third parties to commercialize our products, in which case we would be

required to obtain a license from these third parties on commercially reasonable terms, or our business could be harmed, possibly materially.

Third parties may initiate legal proceedings alleging that we are infringing their intellectual property rights, the outcome of which would be uncertain and could have a material adverse effect on the success of our business.

Our commercial success depends upon our ability, and the ability of our collaborators, to develop, manufacture, market and sell our product candidates and use our proprietary technologies without infringing the proprietary rights of third parties. There is considerable intellectual property litigation in the biotechnology and pharmaceutical industries. We may become party to, or threatened with, future adversarial proceedings or litigation regarding intellectual property rights with respect to our products and technology, including interference or derivation proceedings before the U.S. Patent and Trademark Office. Third parties may assert infringement claims against us based on existing patents or patents that may be granted in the future.

If we are found to infringe a third party's intellectual property rights, we could be required to obtain a license from such third party to continue developing and marketing our products and technology. However, we may not be able to obtain any required license on commercially reasonable terms or at all. Even if we were able to obtain a license, it could be non-exclusive, thereby giving our competitors access to the same technologies licensed to us. We could be forced, including by court order, to cease commercializing the infringing technology or product. In addition, we could be found liable for monetary damages, including treble damages and attorneys' fees if we are found to have willfully infringed a patent. A finding of infringement could prevent us from commercializing our product candidates or force us to cease some of our business operations, which could materially harm our business. Claims that we have misappropriated the confidential information or trade secrets of third parties could have a similar negative impact on our business.

If we fail to comply with our obligations in our intellectual property licenses and funding arrangements with third parties, we could lose rights that are important to our business.

We are currently party to license agreements for technologies that we use in conducting our drug discovery activities. In the future, we may become party to licenses that are important for product development and commercialization. If we fail to comply with our obligations under current or future license and funding agreements, our counterparties may have the right to terminate these agreements, in which event we might not be able to develop, manufacture or market any product or utilize any technology that is covered by these agreements or may face other penalties under the agreements. Such an occurrence could materially and adversely affect the value of a product candidate being developed under any such agreement or could restrict our drug discovery activities. Termination of these agreements or reduction or elimination of our rights under these agreements may result in our having to negotiate new or reinstated agreements with less favorable terms, or cause us to lose our rights under these agreements, including our rights to important intellectual property or technology.

We may be subject to claims by third parties asserting that our employees or we have misappropriated their intellectual property, or claiming ownership of what we regard as our own intellectual property.

Many of our employees were previously employed at universities or other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that our employees do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that these employees or we have used or disclosed intellectual property, including trade secrets or other proprietary information, of any such employee's former employer. Litigation may be necessary to defend against these claims.

In addition, while it is our policy to require our employees and contractors who may be involved in the development of intellectual property to execute agreements assigning such intellectual property to us, we may be unsuccessful in executing such an agreement with each party who in fact develops intellectual property that we regard as our own. Our and their assignment agreements may not be self-executing or may be breached, and we may be forced to bring claims against third parties, or defend claims they may bring against us, to determine the ownership of what we regard as our intellectual property.

If we fail in prosecuting or defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in prosecuting or defending against such claims, litigation could result in substantial costs and be a distraction to management.

Intellectual property litigation could cause us to spend substantial resources and distract our personnel from their normal responsibilities.

Even if resolved in our favor, litigation or other legal proceedings relating to intellectual property claims may cause us to incur significant expenses, and could distract our technical and management personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could compromise our ability to compete in the marketplace.

If we are unable to protect the confidentiality of our trade secrets, our business and competitive position would be harmed.

In addition to seeking patent protection for our product candidates, we also rely on trade secrets, including unpatented know-how, technology and other proprietary information, to maintain our competitive position. We limit disclosure of such trade secrets where possible but we also seek to protect these trade secrets, in part, by entering into non-disclosure and confidentiality agreements with parties who do have access to them, such as our employees, corporate collaborators, outside scientific collaborators, contract manufacturers, consultants, advisors and other third parties. We also enter into confidentiality and invention or patent assignment agreements with our employees and consultants. Despite these efforts, any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret is difficult, expensive and time-consuming, and the outcome is unpredictable. In addition, some courts inside and outside the United States are less willing or unwilling to protect trade secrets. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor, we would have no right to prevent them, or those to whom they communicate it, from using that technology or information to compete with us. If any of our trade secrets were to be disclosed to or independently developed by a competitor, our competitive position would be harmed.

Risks Related to Regulatory Approval of Our Product Candidates and Other Legal Compliance Matters

If we are not able to obtain, or if there are delays in obtaining, required regulatory approvals, we will not be able to timely commercialize, or to commercialize at all, our product candidates, and our ability to generate revenue will be materially impaired.

Our product candidates and the activities associated with their development and commercialization, including their design, testing, manufacture, safety, efficacy, recordkeeping, labeling, storage, approval, advertising, promotion, sale and distribution, are subject to comprehensive regulation by the FDA and other regulatory agencies in the United States and by the EMA and similar regulatory authorities outside the United States. Failure to obtain marketing approval for our product candidates will prevent us from commercializing these product candidates and will significantly limit our ability to generate revenue in the future. To date, we have not received approvals to market any of our product candidates from regulatory authorities in any jurisdiction and we may never be successful in obtaining any such approvals.

We have only limited experience in filing and supporting the applications necessary to gain marketing approvals and expect to rely on third-party contract research organizations to assist us in this process. Securing marketing approval requires the submission of extensive preclinical and clinical data and supporting information to regulatory authorities for each therapeutic indication to establish the product candidate's safety and efficacy. Securing marketing approval also requires the submission of information about the product manufacturing process to, and inspection of manufacturing facilities by, the regulatory authorities. Our product candidates may not be effective, may be only moderately effective or may prove to have undesirable or unintended side effects, toxicities or other characteristics that may preclude our obtaining marketing approval or prevent or limit commercial use. If any of our product candidates receives marketing approval, the accompanying label may limit the approved use of our drug in this way, which could limit sales of the product.

The process of obtaining marketing approvals, both in the United States and abroad, is expensive, may take many years if approval is obtained at all, and can vary substantially based upon a variety of factors, including the type, complexity and novelty of the product candidates involved. Changes in marketing approval policies during the development period, changes in or the enactment of additional statutes or regulations, or changes in regulatory review for each submitted product application, may cause delays in the approval or rejection of an application. Regulatory authorities have substantial discretion in the approval process and may refuse to accept any application or may decide that our data are insufficient for approval and require additional preclinical studies or clinical trials. In addition, varying interpretations of the data obtained from preclinical and clinical testing could delay, limit or prevent marketing approval of a product candidate. Any marketing approval we ultimately obtain may be limited or subject to restrictions or post-approval commitments that render the approved product not commercially viable.

If we experience delays in obtaining approval, the commercial prospects for our product candidates may be harmed and our ability to generate revenue may be materially impaired. Furthermore, even if we were to obtain approval, regulatory authorities may approve any of our product candidates for fewer or more limited indications than we request, may not approve the price we intend to charge for our products, may grant approval contingent on the performance of costly post-marketing clinical trials, or may approve a product candidate with a label that does not include the labeling claims necessary or desirable for the successful commercialization of that product candidate. Any of these scenarios could compromise the commercial prospects for our product candidates.

We anticipate that our μ -opioid receptor targeted product candidates, including TRV130 and TRV734, will require Risk Evaluation and Mitigation Strategies, which could delay the approval of these product candidates and increase the cost, burden and liability associated with the commercialization of these product candidates.

The FDA Amendments Act of 2007 implemented safety-related changes to product labeling and provided the FDA with expanded authority to require the adoption of a Risk Evaluation and Mitigation Strategy, or REMS, to assure safe use of the product candidates, either as a condition of product candidate approval or on the basis of new safety information. We anticipate that our μ -opioid receptor product candidates, if approved, will require a REMS, and it is possible that our other product candidates may require a REMS. The REMS may include medication guides for patients, special communication plans to health care professionals or elements to assure safe uses such as restricted distribution methods, patient registries and/or other risk minimization tools. We cannot predict the specific REMS that will be required as part of the FDA's approval of our product candidates. Any of these limitations on approval or marketing could restrict the commercial promotion, distribution, prescription or dispensing of our product candidates, if approved. Depending on the extent of the REMS requirements, these requirements may significantly increase our costs to commercialize these product candidates and could negatively affect sales. Furthermore, risks of our product candidates that are not adequately addressed through proposed REMS for such product candidates also may prevent or delay their approval for commercialization.

Our μ -opioid receptor targeted product candidates, including TRV130 and TRV734, may be classified as controlled substances, the making, use, sale, importation, exportation and distribution of which are subject to regulation by state, federal and foreign law enforcement and other regulatory agencies.

Our μ -opioid receptor targeted product candidates, including TRV130 and TRV734, may be classified as controlled substances, which are subject to state, federal and foreign laws and regulations regarding their manufacture, use, sale, importation, exportation and distribution. Controlled substances are regulated under the federal Controlled Substances Act of 1970, or CSA, and regulations of the DEA.

The DEA regulates controlled substances as Schedule I, II, III, IV or V substances. Schedule I substances by definition have no established medicinal use and may not be marketed or sold in the United States. A pharmaceutical product may be listed as Schedule II, III, IV or V, with Schedule II substances considered to present the highest risk of abuse and Schedule V substances the lowest relative risk of abuse among such substances. We expect TRV130 and TRV734 to be regulated by the DEA as Schedule II controlled substances.

Various states also independently regulate controlled substances. Though state controlled substances laws often mirror federal law, because the states are separate jurisdictions, they may separately schedule drugs as well. While some states automatically schedule a drug when the DEA does so, in other states there must be rulemaking or a legislative action. State scheduling may delay commercial sale of any controlled substance drug product for which we obtain federal regulatory approval and adverse scheduling could impair the commercial attractiveness of such product. We or our collaborators must also obtain separate state registrations in order to be able to obtain, handle and distribute controlled substances for clinical trials or commercial sale, and failure to meet applicable regulatory requirements could lead to enforcement and sanctions from the states in addition to those from the DEA or otherwise arising under federal law.

For any of our product candidates classified as controlled substances, we and our suppliers, manufacturers, contractors, customers and distributors are required to obtain and maintain applicable registrations from state, federal and foreign law enforcement and regulatory agencies and comply with state, federal and foreign laws and regulations regarding the manufacture, use, sale, importation, exportation and distribution of controlled substances. There is a risk that DEA regulations may limit

the supply of the compounds used in clinical trials for our product candidates, and, in the future, the ability to produce and distribute our products in the volume needed to both meet commercial demand and build inventory to mitigate possible supply disruptions.

Regulations associated with controlled substances govern manufacturing, labeling, packaging, testing, dispensing, production and procurement quotas, recordkeeping, reporting, handling, shipment and disposal. These regulations increase the personnel needs and the expense associated with development and commercialization of product candidates including controlled substances. The DEA, and some states, conduct periodic inspections of registered establishments that handle controlled substances. Failure to obtain and maintain required registrations or comply with any applicable regulations could delay or preclude us from developing and commercializing our product candidates containing controlled substances and subject us to enforcement action. The DEA may seek civil penalties, refuse to renew necessary registrations or initiate proceedings to revoke those registrations. In some circumstances, violations could lead to criminal proceedings. Because of their restrictive nature, these regulations could limit commercialization of any of our product candidates that are classified as controlled substances.

Failure to obtain marketing approval in international jurisdictions would prevent our product candidates from being marketed abroad.

To market and sell our products in the European Union and many other jurisdictions, we or our third-party collaborators must obtain separate marketing approvals and comply with numerous and varying regulatory requirements. The approval procedure varies among countries and can involve additional testing. The time required to obtain approval may differ substantially from that required to obtain FDA approval. The regulatory approval process outside the United States generally includes all of the risks associated with obtaining FDA approval. In addition, in many countries outside the United States, it is required that the product be approved for reimbursement before the product can be approved for sale in that country. We or our collaborators may not obtain approvals from regulatory authorities outside the United States on a timely basis, if at all. Approval by the FDA does not ensure approval by regulatory authorities in other countries or jurisdictions, and approval by one regulatory authority outside the United States does not ensure approval by regulatory authorities in other countries or jurisdictions or by the FDA. However, the failure to obtain approval in one jurisdiction may compromise our ability to obtain approval elsewhere. We may not be able to file for marketing approvals and may not receive necessary approvals to commercialize our products in any market.

Any product candidate for which we obtain marketing approval could be subject to post-marketing restrictions or withdrawal from the market and we may be subject to penalties if we fail to comply with regulatory requirements or if we experience unanticipated problems with our products, when and if any of them are approved.

Any product candidate for which we obtain marketing approval, along with the manufacturing processes, post-approval clinical data, labeling, advertising and promotional activities for such product, will be subject to ongoing requirements of and review by the FDA and other regulatory authorities. These requirements include submissions of safety and other post-marketing information and reports, registration and listing requirements, cGMP requirements relating to manufacturing, quality control, quality assurance and corresponding maintenance of records and documents, requirements regarding the distribution of samples to physicians and recordkeeping. Even if marketing approval of a product candidate is granted, the approval may be subject to limitations on the indicated uses for which the product may be marketed or to the conditions of approval, including the requirement to implement a REMS. If any of our product candidates receives marketing approval, the accompanying label may limit the approved use of our drug, which could limit sales of the product.

Edgar Filing: TREVENA INC - Form S-1/A

The FDA also may impose requirements for costly post-marketing studies or clinical trials and surveillance to monitor the safety or efficacy of the product. The FDA closely regulates the post-approval marketing and promotion of drugs to ensure drugs are marketed only for the approved indications and in accordance with the provisions of the approved labeling. The FDA imposes stringent restrictions on manufacturers' communications regarding off-label use and if we do not market our products for only their approved indications, we may be subject to enforcement action for off-label marketing. Violations of the Federal Food, Drug, and Cosmetic Act relating to the promotion of prescription drugs may lead to investigations alleging violations of federal and state health care fraud and abuse laws, as well as state consumer protection laws.

In addition, later discovery of previously unknown adverse events or other problems with our products, manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may yield various results, including:

restrictions on such products, manufacturers or manufacturing processes;

restrictions on the labeling or marketing of a product;

restrictions on product distribution or use;

requirements to conduct post-marketing studies or clinical trials;

warning letters;

withdrawal of the products from the market;

refusal to approve pending applications or supplements to approved applications that we submit;

recall of products;

fines, restitution or disgorgement of profits or revenue;

suspension or withdrawal of marketing approvals;

refusal to permit the import or export of our products;

product seizure; or

injunctions or the imposition of civil or criminal penalties.

The FDA's policies may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our product candidates. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained.

Our current and future relationships with customers and third-party payors in the United States and elsewhere may be subject, directly or indirectly, to applicable anti-kickback, fraud and abuse, false claims, transparency, health information privacy and security and other healthcare laws and regulations, which could expose us to criminal sanctions, civil penalties, contractual damages, reputational harm, administrative burdens and diminished profits and future earnings.

Edgar Filing: TREVENA INC - Form S-1/A

Healthcare providers, physicians and third-party payors in the United States and elsewhere will play a primary role in the recommendation and prescription of any product candidates for which we obtain marketing approval. Our future arrangements with third-party payors and customers may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations, including, without limitation, the federal Anti-Kickback Statute and the federal False Claims Act, which may constrain the business or financial arrangements and relationships through which we sell, market and distribute any drugs for which we obtain marketing approval. In addition, we may be subject to transparency laws and

Edgar Filing: TREVENA INC - Form S-1/A

patient privacy regulation by U.S. federal and state governments and by governments in foreign jurisdictions in which we conduct our business. The applicable federal, state and foreign healthcare laws and regulations that may affect our ability to operate include:

the federal Anti-Kickback Statute, which prohibits, among other things, persons from knowingly and willfully soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, order or recommendation of, any good or service, for which payment may be made under federal and state healthcare programs, such as Medicare and Medicaid;

federal civil and criminal false claims laws and civil monetary penalty laws, including the federal False Claims Act, which impose criminal and civil penalties, including civil whistleblower or *qui tam* actions, against individuals or entities for knowingly presenting, or causing to be presented, to the federal government, including the Medicare and Medicaid programs, claims for payment that are false or fraudulent or making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government; the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program or making false statements relating to healthcare matters;

HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, which impose obligations on covered healthcare providers, health plans, and healthcare clearinghouses, as well as their business associates that create, receive, maintain or transmit individually identifiable health information for or on behalf of a covered entity, with respect to safeguarding the privacy, security and transmission of individually identifiable health information;

the federal Open Payments program, which requires manufacturers of drugs, devices, biologics and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program, with specific exceptions, to report annually to the Centers for Medicare & Medicaid Services, or CMS, information related to "payments or other transfers of value" made to physicians, which is defined to include doctors, dentists, optometrists, podiatrists and chiropractors, and teaching hospitals and applicable manufacturers and applicable group purchasing organizations to report annually to CMS ownership and investment interests held by the physicians and their immediate family members, requirements for manufacturers to submit reports to CMS by the 90th day of each calendar year, and subsequent disclosure of such information by CMS on a publicly available website; and

analogous state and foreign laws and regulations, such as state anti-kickback and false claims laws, which may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers; state and foreign laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government or otherwise restrict payments that may be made to healthcare providers; state and foreign laws that require drug manufacturers to report information related to payments and other transfers of value to physicians and other healthcare providers or marketing expenditures; and state and foreign laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations may involve substantial costs. It is possible that governmental authorities will conclude that our business practices may not comply with current or future statutes, regulations or case law involving applicable fraud and abuse or other healthcare laws and regulations. If

our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, including, without limitation, damages, fines, imprisonment, exclusion from participation in government healthcare programs, such as Medicare and Medicaid, and the curtailment or restructuring of our operations, which could have a material adverse effect on our business. If any of the physicians or other healthcare providers or entities with whom we expect to do business, including our collaborators, is found not to be in compliance with applicable laws, it may be subject to criminal, civil or administrative sanctions, including exclusions from participation in government healthcare programs, which could also materially affect our business.

Recently enacted and future legislation may increase the difficulty and cost for us to obtain marketing approval of and commercialize our product candidates and affect the prices we may obtain.

In the United States and some foreign jurisdictions, there have been a number of legislative and regulatory changes and proposed changes regarding the healthcare system that could prevent or delay marketing approval of our product candidates, restrict or regulate post-approval activities and affect our ability to profitably sell any product candidates for which we obtain marketing approval.

Among policy makers and payors in the United States and elsewhere, there is significant interest in promoting changes in healthcare systems with the stated goals of containing healthcare costs, improving quality and expanding access. In the United States, the pharmaceutical industry has been a particular focus of these efforts and has been significantly affected by major legislative initiatives. In March 2010, President Obama signed into law the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Affordability Reconciliation Act, or collectively the PPACA, a sweeping law intended to broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against fraud and abuse, add new transparency requirements for the healthcare and health insurance industries, impose new taxes and fees on the health industry and impose additional health policy reforms.

Among the provisions of the PPACA of importance to our potential product candidates are:

an annual, nondeductible fee on any entity that manufactures or imports specified branded prescription drugs and biologic agents, apportioned among these entities according to their market share in certain government healthcare programs;

an increase in the statutory minimum rebates a manufacturer must pay under the Medicaid Drug Rebate Program to 23.1% and 13.0% of the average manufacturer price for branded and generic drugs, respectively;

expansion of healthcare fraud and abuse laws, including the False Claims Act and the Anti-Kickback Statute, new government investigative powers and enhanced penalties for non-compliance;

a new Medicare Part D coverage gap discount program, in which manufacturers must agree to offer 50% point-of-sale discounts off negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period, as a condition for a manufacturer's outpatient drugs to be covered under Medicare Part D;

extension of a manufacturer's Medicaid rebate liability to covered drugs dispensed to individuals who are enrolled in Medicaid managed care organizations;

expansion of eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to additional individuals and by adding new mandatory eligibility categories for certain individuals with income at or below 133% of the federal poverty level beginning in 2014, thereby potentially increasing a manufacturer's Medicaid rebate liability;

expansion of the entities eligible for discounts under the Public Health Service pharmaceutical pricing program;

the new requirements under the federal Open Payments program and its implementing regulations;

a new requirement to annually report drug samples that manufacturers and distributors provide to physicians; and

a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research.

In addition, other legislative changes have been proposed and adopted since the PPACA was enacted. These changes include aggregate reductions to Medicare payments to providers of 2% per fiscal year, which went into effect on April 1, 2013, and will remain in effect through 2024 unless additional Congressional action is taken. In January 2013, President Obama signed into law the American Taxpayer Relief Act of 2012, which, among other things, further reduced Medicare payments to several providers and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. These new laws may result in additional reductions in Medicare and other healthcare funding, which could have a material adverse effect on customers for our drugs, if approved, and, accordingly, our financial operations.

We expect that the PPACA, as well as other healthcare reform measures that may be adopted in the future, may result in more rigorous coverage criteria and in additional downward pressure on the price that we receive for any approved drug. Any reduction in reimbursement from Medicare or other government healthcare programs may result in a similar reduction in payments from private payors. The implementation of cost containment measures or other healthcare reforms may prevent us from being able to generate revenue, attain profitability or commercialize our drugs.

Legislative and regulatory proposals have been made to expand post-approval requirements and restrict sales and promotional activities for drugs. We cannot be sure whether additional legislative changes will be enacted, or whether the FDA regulations, guidance or interpretations will be changed, or what the impact of such changes on the marketing approvals of our product candidates, if any, may be. In addition, increased scrutiny by the U.S. Congress of the FDA's approval process may significantly delay or prevent marketing approval, as well as subject us to more stringent product labeling and post-marketing testing and other requirements.

Governments outside the United States tend to impose strict price controls, which may adversely affect our revenue, if any.

In some countries, particularly the countries of the European Union, the pricing of prescription pharmaceuticals is subject to governmental control. In these countries, pricing negotiations with governmental authorities can take considerable time after the receipt of marketing approval for a product. To obtain coverage and reimbursement or pricing approval in some countries, we may be required to conduct a clinical trial that compares the cost-effectiveness of our product candidate to other available therapies. If reimbursement of our products is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our business could be harmed, possibly materially.

If we fail to comply with environmental, health and safety laws and regulations, we could become subject to fines or penalties or incur costs that could harm our business.

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our operations involve the use of hazardous and flammable materials, including chemicals and biological materials. Our operations also produce hazardous waste products. We

generally contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials. In the event of contamination or injury resulting from our use of hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties for failure to comply with such laws and regulations.

Although we maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees resulting from the use of hazardous materials, this insurance may not provide adequate coverage against potential liabilities. We do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us in connection with our storage or disposal of biological, hazardous or radioactive materials.

In addition, we may incur substantial costs in order to comply with current or future environmental, health and safety laws and regulations. These current or future laws and regulations may impair our research, development or production efforts. Our failure to comply with these laws and regulations also may result in substantial fines, penalties or other sanctions.

Risks Related to Employee Matters and Managing Our Growth

Our future success depends on our ability to retain key executives and to attract, retain and motivate qualified personnel.

We are highly dependent on the research, development, clinical, business development and financial expertise of our executive officers. Although we have entered into employment agreements with these individuals, each of them may terminate their employment with us at any time. We do not maintain "key person" insurance for any of our executives or other employees.

Recruiting and retaining qualified management, scientific and clinical personnel, and if any of our product candidates achieve regulatory approval, potentially manufacturing and sales and marketing personnel, will also be critical to our success. The loss of the services of our executive officers or other key employees could impede the achievement of our research, development and commercialization objectives and seriously harm our ability to successfully implement our business strategy. Furthermore, replacing executive officers and key employees may be difficult and may take an extended period of time because of the limited number of individuals in our industry with the breadth of skills and experience required to successfully develop, gain regulatory approval of and commercialize products. Competition to hire from this limited pool is intense, and we may be unable to hire, train, retain or motivate these key personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for similar personnel. We also experience competition for the hiring of scientific and clinical personnel from universities and research institutions. In addition, we rely on consultants and advisors, including scientific, clinical and commercial advisors, to assist us in formulating our research and development and commercialization strategy. Our consultants and advisors may be employed by employers other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us. If we are unable to continue to attract and retain high quality personnel, our ability to pursue our growth strategy will be limited.

We expect to expand our development and regulatory capabilities and potentially create sales, marketing and distribution capabilities, and as a result, we may encounter difficulties in managing our growth, which could disrupt our operations.

We expect to experience significant growth in the number of our employees and the scope of our operations, particularly in the areas of drug development, regulatory affairs and, if any of our product candidates receives marketing approval, sales, marketing and distribution. To manage our anticipated future growth, we must continue to implement and improve our managerial, operational and financial systems, expand our facilities and continue to recruit and train additional qualified personnel. Due to

our limited financial resources and the limited experience of our management team in managing a company with such anticipated growth, we may not be able to effectively manage the expansion of our operations or recruit and train additional qualified personnel. The expansion of our operations may lead to significant costs and may divert our management and business development resources. Any inability to manage growth could delay the execution of our business plans or disrupt our operations.

Our employees may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements, which could expose us to liability and hurt our reputation.

We are exposed to the risk of employee fraud or other misconduct. Misconduct by employees could include intentional failures to comply with FDA regulations, provide accurate information to the FDA, report financial information or data accurately or disclose unauthorized activities to us. Employee misconduct could also involve the improper use or misrepresentation of information obtained in the course of clinical trials, which could result in regulatory sanctions and serious harm to our reputation. It is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business and financial results, including the imposition of significant fines or other sanctions.

Other Risks Related to our Business

We intend to conduct a substantial portion of the clinical trials for our product candidates outside of the United States and, if approved, we intend to market our product candidates abroad. Accordingly, we will be subject to the risks of doing business outside of the United States.

We intend to conduct a substantial portion of our clinical trials outside of the United States and, if approved, we intend to market our product candidates outside of the United States. We are thus subject to risks associated with doing business outside of the United States. With respect to our product candidates, we may choose to partner with third parties that have direct sales forces and established distribution systems, either to augment our own sales force and distribution systems outside of the United States or in lieu of our own sales force and distribution systems, which would indirectly expose us to these risks. Our business and financial results in the future could be adversely affected due to a variety of factors associated with conducting development and marketing of our product candidates, if approved, outside of the United States, including:

efforts to develop an international sales, marketing and distribution organization may increase our expenses, divert our management's attention from the development of product candidates or cause us to forgo profitable licensing opportunities in these geographies;

changes in a specific country's or region's political and cultural climate or economic condition;

unexpected changes in foreign laws and regulatory requirements;

difficulty of effective enforcement of contractual provisions in local jurisdictions;

inadequate intellectual property protection in foreign countries;

trade-protection measures, import or export licensing requirements such as Export Administration Regulations promulgated by the U.S. Department of Commerce and fines, penalties or suspension or revocation of export privileges;

regulations under the U.S. Foreign Corrupt Practices Act and similar foreign anti-corruption laws;

the effects of applicable foreign tax structures and potentially adverse tax consequences; and

significant adverse changes in foreign currency exchange rates which could make the cost of our clinical trials, to the extent conducted outside of the United States, more expensive.

Our business and operations would suffer in the event of system failures.

Despite our implementation of security measures, our internal computer systems and those of our contractors and consultants are vulnerable to damage from computer viruses, unauthorized access, natural disasters, terrorism, war and telecommunication and electrical failures. If such an event were to occur and cause interruptions in our operations, it could result in a material disruption to our product candidate development programs. For example, the loss of clinical trial data from completed, ongoing or planned clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. To the extent that any disruption or security breach were to result in a loss of or damage to our data or applications, or inappropriate disclosure of personal, confidential or proprietary information, we could incur liability and the further development of any of our product candidates could be delayed or abandoned.

Risks Related to this Offering and Ownership of Our Common Stock

An active trading market for our common stock may not continue to develop or be sustained.

Although our common stock is listed on the NASDAQ Global Select Market, or NASDAQ, we cannot assure you that an active, liquid trading market for our shares will continue to develop or be sustained. If an active market for our common stock does not continue to develop or is not sustained, it may be difficult for you to sell shares quickly or without depressing the market price for the shares or to sell your shares at all.

The trading price of the shares of our common stock has been and may continue to be volatile, and purchasers of our common stock could incur substantial losses.

Since our common stock commenced trading in January 2014, our stock price has been volatile. The stock market in general and the market for biopharmaceutical companies in particular have experienced extreme volatility that has often been unrelated to the operating performance of particular companies. As a result of this volatility, investors in our stock may not be able to sell their common stock at or above the price paid for the shares. The market price for our common stock may be influenced by many factors, including:

actual or anticipated variations in our operating results;

changes in financial estimates by us or by any securities analysts who might cover our stock;

the timing and results of our clinical trials for any of our product candidates;

failure or discontinuation of any of our development programs;

conditions or trends in our industry;

stock market price and volume fluctuations of comparable companies and, in particular, those that operate in the biopharmaceutical industry;

announcements by us or our competitors of significant acquisitions, strategic partnerships or divestitures;

developments or disputes concerning patent applications, issued patents or other proprietary rights;

announcements of investigations or regulatory scrutiny of our operations or lawsuits filed against us;

capital commitments;

investors' general perception of our company and our business;

recruitment or departure of key personnel;

announcements and expectations of additional financing efforts; and

sales of our common stock, including sales by our directors and officers or specific stockholders.

In addition, in the past, stockholders have initiated class action lawsuits against pharmaceutical and biotechnology companies following periods of volatility in the market prices of these companies' stock. Such litigation, if instituted against us, could cause us to incur substantial costs and divert management's attention and resources from our business.

If equity research analysts do not continue to publish research or reports or publish unfavorable research or reports about us, our business or our market, our stock price and trading volume could decline.

The trading market for our common stock is influenced by the research and reports that equity research analysts publish about us and our business. As a newly public company, we have only limited research coverage by equity research analysts. Equity research analysts may elect not to initiate or continue to provide research coverage of our common stock, and such lack of research coverage may adversely affect the market price of our common stock. We have no control over the analysts or the content and opinions included in their reports. The price of our stock could decline if one or more equity research analysts downgrade our stock or issue other unfavorable commentary or research. If one or more equity research analysts ceases coverage of our company or fails to publish reports on us regularly, demand for our stock could decrease, which in turn could cause our stock price or trading volume to decline.

If you purchase shares of our common stock in this offering, you will suffer immediate dilution of your investment.

The assumed public offering price of our common stock is substantially higher than the net tangible book value per share of our common stock. Therefore, if you purchase shares of our common stock in this offering, you will pay a price per share that substantially exceeds our as adjusted net tangible book value per share after this offering. Based on the assumed public offering price of \$5.22 per share, which was the last reported sale price of our common stock on the NASDAQ Global Select Market on November 28, 2014, you will experience immediate dilution of \$2.25 per share, representing the difference between our as adjusted net tangible book value per share after giving effect to this offering and the assumed public offering price.

In addition, as of September 30, 2014, we had outstanding stock options to purchase an aggregate of 3,552,124 shares of common stock at a weighted average exercise price of \$3.72 per share and warrants to purchase an aggregate of 30,258 shares of common stock at a weighted average exercise price of \$5.62 per share. To the extent these outstanding options and warrants are exercised, there will be further dilution to investors in this offering.

A significant portion of our total outstanding shares are restricted from immediate resale but may be sold into the market in the near future. This could cause the market price of our common stock to drop 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. If our stockholders sell, or the market perceives that our stockholders intend to sell,

substantial amounts of our common stock in the public market following this offering, the market price of our common stock could decline significantly.

Upon completion of this offering, based on the number of shares outstanding at September 30, 2014, we will have outstanding 34,039,461 shares of common stock, based on an assumed public offering price of \$5.22 per share, which was the last reported sale price of our common stock on the NASDAQ Global Select Market on November 28, 2014, and assuming no exercise of outstanding options or warrants. Substantially all of these shares are, and the shares sold in this offering will be, freely tradable in the public market, other than shares of common stock that are subject to lock-up agreements entered into by our directors, executive officers and stockholders associated with some of our affiliates and the underwriters, which will become eligible for sale in the public market beginning 90 days after the date of this prospectus. Barclays Capital Inc. may release these stockholders from their lock-up agreements with the underwriters at any time and without notice, which would allow for earlier sales of shares in the public market.

In addition, we have filed registration statements on Form S-8 registering the issuance of approximately 4.8 million shares of common stock subject to options or other equity awards issued or reserved for future issuance under our equity incentive plans. Shares registered under these registration statements on Form S-8 are available for sale in the public market subject to vesting arrangements and exercise of existing options, the grant of new options in the future, the lock-up agreements described above and the restrictions of Rule 144 in the case of our affiliates.

Additionally, the holders of an aggregate of approximately 15.2 million shares of our common stock and 22,580 shares of our common stock issuable upon the exercise of outstanding warrants, or their transferees, will have rights, subject to some conditions, to require us to file one or more registration statements covering their shares or to include their shares in registration statements that we may file for ourselves or other stockholders. If we were to register the resale of these shares, they could be freely sold in the public market. 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.

The issuance of additional stock in connection with financings, acquisitions, investments, our stock incentive plans or otherwise will dilute all other stockholders.

Our amended and restated certificate of incorporation authorizes us to issue up to 100,000,000 shares of common stock and up to 5,000,000 shares of preferred stock with such rights and preferences as may be determined by our board of directors. Subject to compliance with applicable rules and regulations, we may issue our shares of common stock or securities convertible into our common stock from time to time in connection with a financing, acquisition, investment, our stock incentive plans or otherwise. Any such issuance could result in substantial dilution to our existing stockholders and cause the trading price of our common stock to decline.

Our ability to utilize our net operating loss carryforwards and certain other tax attributes may be limited.

We have incurred substantial losses during our history. We do not anticipate generating revenue from sales of products for the foreseeable future, if ever, and we may never achieve profitability. To the extent that we continue to generate tax losses, unused losses will carry forward to offset future taxable income, if any, until such unused losses expire. Under Section 382 of the Internal Revenue Code of 1986, as amended, if a corporation undergoes an "ownership change," which is generally defined as a greater than 50% change, by value, in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards and other pre-change tax attributes to offset its post-change income may be limited. We have not completed our analysis to determine what, if any, impact any prior ownership change has had on our ability to utilize our net operating loss carryforwards. In addition, we may experience ownership changes in the future as a result of

Edgar Filing: TREVENA INC - Form S-1/A

subsequent shifts in our stock ownership, including this offering. As of December 31, 2013, we had federal net operating loss carryforwards of approximately \$12.7 million that could be limited if we have experienced, or if in the future we experience, an ownership change.

Provisions in our corporate charter documents and under Delaware law may prevent or frustrate attempts by our stockholders to change our management and hinder efforts to acquire a controlling interest in us, and the market price of our common stock may be lower as a result.

There are provisions in our amended and restated certificate of incorporation and amended and restated bylaws that may make it difficult for a third party to acquire, or attempt to acquire, control of our company, even if a change in control was considered favorable by you and other stockholders. For example, our board of directors has the authority to issue up to 5,000,000 shares of preferred stock. The board of directors can fix the price, rights, preferences, privileges, and restrictions of the preferred stock without any further vote or action by our stockholders. The issuance of shares of preferred stock may delay or prevent a change in control transaction. As a result, the market price of our common stock and the voting and other rights of our stockholders may be adversely affected. An issuance of shares of preferred stock may result in the loss of voting control to other stockholders.

Our charter documents also contain other provisions that could have an anti-takeover effect, including:

only one of our three classes of directors will be elected each year;

stockholders are not entitled to remove directors other than by a 66²/₃% vote and only for cause;

stockholders are not permitted to take actions by written consent;

stockholders cannot call a special meeting of stockholders; and

stockholders must give advance notice to nominate directors or submit proposals for consideration at stockholder meetings.

In addition, we are subject to the anti-takeover provisions of Section 203 of the Delaware General Corporation Law, which regulates corporate acquisitions by prohibiting Delaware corporations from engaging in specified business combinations with particular stockholders of those companies. These provisions could discourage potential acquisition proposals and could delay or prevent a change in control transaction. They 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.

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.

Upon completion of this offering, our executive officers, directors and current beneficial owners of 5% or more of our common stock and their respective affiliates will, in the aggregate, beneficially own 54.3% of our outstanding common stock, based on an assumed public offering price of \$5.22 per share, which was the last reported sale price of our common stock on the NASDAQ Global Select Market on November 28, 2014. As a result, these persons, acting together, would be able to control all matters requiring stockholder approval, including the election and removal of directors, the approval of any merger, consolidation, sale of all or substantially all of our assets, or other significant corporate transactions.

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 price at which shares are being sold in this offering 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.

We are an "emerging growth company" and as a result of the reduced disclosure and governance requirements applicable to emerging growth companies, our common stock may be less attractive to investors.

We are an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012, or JOBS Act, and we intend to take advantage of some of the exemptions from reporting requirements that are applicable to other public companies that are not emerging growth companies, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, or Sarbanes-Oxley Act, reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements, 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 if investors will find our common stock less attractive because we will 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. We may take advantage of these reporting exemptions until we are no longer an emerging growth company. We will remain an emerging growth company until the earliest of (a) December 31, 2019, (b) the last day of the fiscal year in which we have total annual gross revenue of at least \$1.0 billion, (c) the last day of the fiscal year in which we are deemed to be a large accelerated filer, which means the market value of our common stock that is held by non-affiliates exceeds \$700 million as of the prior June 30th, and (d) any date on which we have issued more than \$1.0 billion in non-convertible debt during the prior three-year period.

Under Section 107(b) of the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards until such time as those standards 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.

If we fail to maintain proper and effective internal controls, our ability to produce accurate financial statements on a timely basis could be impaired.

We are subject to the reporting requirements of the Securities Exchange Act of 1934, the Sarbanes-Oxley Act and the rules and regulations of NASDAQ. The Sarbanes-Oxley Act requires, among other things, that we maintain effective disclosure controls and procedures and internal controls over financial reporting. For our fiscal year ending December 31, 2014, we are obligated to perform system and process evaluation and testing of our internal controls over financial reporting to allow management to report on the effectiveness of our internal controls over financial reporting in our Form 10-K filing for that year, as required by Section 404 of the Sarbanes-Oxley Act. We will continue to incur substantial additional professional fees and internal costs to expand our accounting and finance functions and expend significant management efforts. Prior to our initial public offering, or IPO, we were never required to test our internal controls within a specified period, and, as a result, we may experience difficulty in meeting these reporting requirements in a timely manner.

We may discover weaknesses in our system of internal financial and accounting controls and procedures that could result in a material misstatement of our financial statements. Our internal control over financial reporting will not prevent or detect all error and all fraud. A control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud will be detected.

Edgar Filing: TREVENA INC - Form S-1/A

If we are not able to comply with the requirements of Section 404 of the Sarbanes-Oxley Act in a timely manner, or if we are unable to maintain proper and effective internal controls, we may not be able to produce timely and accurate financial statements. If that were to happen, the market price of our stock could decline and we could be subject to sanctions or investigations by the stock exchange on which our common stock is listed, the Securities and Exchange Commission, or SEC, or other regulatory authorities.

Our management might apply the net proceeds from this offering in ways with which you do not agree and in ways that may impair the value of your investment.

We intend to use the net proceeds from this offering for clinical development expenses, preclinical research and development efforts and for working capital and general corporate purposes. Our management has broad discretion as to the use of these proceeds and you will be relying on the judgment of our management regarding the application of these proceeds. We might apply these proceeds in ways with which you do not agree, or in ways that do not yield a favorable return. If our management applies these proceeds in a manner that does not yield a significant return, if any, on our investment of these net proceeds, it could compromise our ability to pursue our growth strategy and adversely affect the market price of our common stock.

Because we do not anticipate paying any cash dividends on our common stock in the foreseeable future, capital appreciation, if any, will be your sole source of gains and you may never receive a return on your investment.

You should not rely on an investment in our common stock to provide dividend income. We have not declared or paid cash dividends on our common stock to date and have no plans to pay cash dividends in the foreseeable future. We currently intend to retain our future earnings, if any, to fund the development and growth of our business. In addition, the terms of our term loan credit facility with Oxford Finance LLC and Square 1 Bank prohibits us from paying cash dividends. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future. Investors seeking cash dividends should not purchase our common stock.

We incur costs and demands upon management as a result of being a public company.

As a newly public company listed in the United States, we are incurring, and will continue to incur, significant legal, accounting and other costs, particularly after we cease to be an "emerging growth company." These costs could negatively affect our financial results. In addition, changing laws, regulations and standards relating to corporate governance and public disclosure, including regulations implemented by the SEC and stock exchanges, may increase legal and financial compliance costs and make some activities more time consuming. These laws, regulations and standards are subject to varying interpretations and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. We intend to invest resources to comply with evolving laws, regulations and standards, and this investment may result in increased general and administrative expenses and a diversion of management's time and attention from revenue-generating activities to compliance activities. If, notwithstanding our efforts to comply with new laws, regulations and standards, we fail to comply, regulatory authorities may initiate legal proceedings against us and our business may be harmed.

Failure to comply with these rules also might make it more difficult for us to obtain some types of insurance, including directors' and officers' liability insurance, and we might be forced to accept reduced policy limits and coverage or incur substantially higher costs to obtain the same or similar coverage. The impact of these events could also make it more difficult for us to attract and retain qualified persons to serve on our board of directors, on committees of our board of directors or as members of senior management.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains forward-looking statements that involve substantial risks and uncertainties. The forward-looking statements are contained principally in the sections entitled "Prospectus Summary," "Risk Factors," "Management's Discussion and Analysis of Financial Condition and Results of Operations" and "Business," but are also contained elsewhere in this prospectus. In some cases, you can identify forward-looking statements by the words "may," "might," "will," "could," "would," "should," "expect," "intend," "plan," "objective," "anticipate," "believe," "estimate," "predict," "project," "potential," "continue" and "ongoing," or the negative of these terms, or other comparable terminology intended to identify statements about the future. These statements 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 the information expressed or implied by these forward-looking statements. Although we believe that we have a reasonable basis for each forward-looking statement contained in this prospectus, we caution you that these statements are based on a combination of facts and factors currently known by us and our expectations of the future, about which we cannot be certain. Forward-looking statements include statements about:

our plans to develop and potentially commercialize our product candidates;

the exercise by Actavis of its option to license TRV027 and, if exercised, our ability to achieve milestones under the license;

our planned clinical trials and preclinical studies for our product candidates;

the timing of and our ability to obtain and maintain regulatory approvals for our product candidates;

the extent of clinical trials potentially required by the FDA for our product candidates;

the clinical utility and market acceptance of our product candidates;

our commercialization, marketing and manufacturing capabilities and strategy;

our intellectual property position; and

our ability to identify additional product candidates with significant commercial potential that are consistent with our commercial objectives.

You should refer to the "Risk Factors" section of this prospectus for a discussion of important factors that may cause our actual results to differ materially from those expressed or implied by our forward-looking statements. As a result of these factors, we cannot assure you that the forward-looking statements in this prospectus will prove to be accurate. Furthermore, if our forward-looking statements prove to be inaccurate, the inaccuracy may be material. In light of the significant uncertainties in these forward-looking statements, you should not regard these statements as a representation or warranty by us or any other person that we will achieve our objectives and plans in any specified time frame, or at all. We undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by law.

You should read this prospectus and the documents that we reference in this prospectus and have filed as exhibits to the registration statement, of which this prospectus is a part, completely and with the understanding that our actual future results may be materially different from what we expect. We qualify all of our forward-looking statements by these cautionary statements.

Edgar Filing: TREVENA INC - Form S-1/A

This prospectus includes statistical and other industry and market data that we obtained from industry publications and research, surveys and studies conducted by third parties. Industry publications and third-party research, surveys and studies generally indicate that their information has been obtained from sources believed to be reliable, although they do not guarantee the accuracy or completeness of such information.

USE OF PROCEEDS

We estimate that the net proceeds from our issuance and sale of shares of our common stock in this offering will be approximately \$37.0 million, or approximately \$42.6 million if the underwriters exercise their option to purchase additional shares in full, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

As of September 30, 2014, we had cash and cash equivalents of \$72.2 million. We currently estimate that we will use the net proceeds from this offering, together with our existing cash and cash equivalents and the \$16.5 million we believe we are entitled to draw from the second tranche of our credit facility, as follows:

to fund clinical development expenses, including the completion of our ongoing Phase 2b clinical trial for TRV027, the initiation and completion of the next Phase 2 clinical trial and up to two Phase 3 clinical trials for TRV130 and the completion of a multiple ascending dose trial and other activities to support Phase 2 development for TRV734;

to fund preclinical research and development activities, including work to support the filing of an IND for TRV250; and

for working capital and general corporate purposes.

Although it is difficult to predict future liquidity requirements, we believe that the net proceeds from this offering, our existing cash and cash equivalents and our expected draw of \$16.5 million from our credit facility, together with interest thereon, will be sufficient to fund our operations through the fourth quarter of 2016. However, the expected proceeds from this offering and our existing resources will not be sufficient to complete advanced clinical development of more than one of our product candidates, or if applicable, to prepare for commercializing any product candidate that achieves approval. Accordingly, we will continue to require substantial additional capital beyond the expected proceeds of this offering to continue our clinical development and potential commercialization activities. Because successful development of our product candidates is uncertain, we are unable to estimate the actual funds we will require to complete research and development and commercialize our products under development.

This expected use of net proceeds from this offering represents our intentions based upon our current plans and business conditions, and could change in the future as our plans and business conditions evolve. The amounts and timing of our actual expenditures may vary significantly depending on numerous factors, including the progress of our development, the status of and results from clinical trials, as well as any collaborations that we may enter into with third parties for our product candidates, and any unforeseen cash needs. As a result, our management will have broad discretion in the application of the net proceeds from this offering, and investors will be relying on the judgment of our management regarding the application of the net proceeds of this offering.

PRICE RANGE OF COMMON STOCK

Our common stock commenced trading on the NASDAQ Global Select Market under the symbol "TRVN" on January 31, 2014. The following table sets forth, for the periods indicated, the high and low reported sales prices of our common stock as reported on the NASDAQ Global Select Market:

	High	Low
2014		
First quarter (from January 31, 2014)	\$ 9.95	\$ 6.00
Second quarter	\$ 7.82	\$ 4.07
Third quarter	\$ 7.00	\$ 5.20
Fourth quarter (through November 28, 2014)	\$ 6.73	\$ 4.01

As of November 28, 2014, there were 40 holders of record of our common stock. The last reported sale price of the common stock on November 28, 2014 was \$5.22 per share.

DIVIDEND POLICY

We have never declared or paid any dividends on our common stock. We anticipate that we will retain all of our future earnings, if any, for use in the operation and expansion of our business and do not anticipate paying cash dividends in the foreseeable future. In addition, our ability to pay dividends, other than dividends payable solely in capital stock, is currently prohibited by the terms of our term loan credit facility with Oxford Finance LLC and Square 1 Bank.

CAPITALIZATION

The following table sets forth our cash and cash equivalents and capitalization as of September 30, 2014:

on an actual basis; and

on an as adjusted basis to give effect to our sale of \$40,000,000 of shares of common stock in this offering at an assumed public offering price of \$5.22 per share, which was the last reported sale price of our common stock on the NASDAQ Global Select Market on November 28, 2014, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The information in this table is illustrative only and our capitalization following the completion of this offering will depend on the actual public offering price and other terms of this offering determined at pricing. You should read this table together with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and the related notes appearing elsewhere in this prospectus.

	As of September 30, 2014	
	Actual (in thousands, except share and per share data)	As adjusted
Cash and cash equivalents	\$ 72,225	\$ 109,225
Long-term loan	\$ 1,774	\$ 1,774
Stockholders' equity:		
Common stock, \$0.001 par value; 100,000,000 shares authorized, 26,376,626 shares issued and outstanding, actual; 100,000,000 shares authorized, 34,039,461 shares issued and outstanding, as adjusted	26	34
Preferred stock, \$0.001 par value; 5,000,000 shares authorized, no shares issued and outstanding, actual and as adjusted		
Additional paid-in capital	182,906	219,898
Accumulated deficit	(118,673)	(118,673)
Total stockholders' equity	64,259	101,259
Total capitalization	\$ 66,033	\$ 103,033

The number of shares of common stock outstanding in the table above does not include:

3,552,124 shares of our common stock issuable upon the exercise of stock options outstanding under our 2008 Equity Incentive Plan and 2013 Equity Incentive Plan as of September 30, 2014, at a weighted average exercise price of \$3.72 per share;

Edgar Filing: TREVENA INC - Form S-1/A

30,258 shares of our common stock issuable upon exercise of warrants outstanding as of September 30, 2014, at a weighted average exercise price of \$5.62 per share;

33,000 shares of our common stock issuable upon the exercise of stock options granted after September 30, 2014 at a weighted average exercise price of \$5.18 per share; and

868,235 shares of our common stock reserved for future issuance under our 2013 Equity Incentive Plan and our employee stock purchase plan.

A 5% increase or decrease in the assumed public offering price of \$5.22 per share, which was the last reported sale price of our common stock on the NASDAQ Global Select Market on November 28, 2014, would decrease or increase the number of shares of our common stock issued in this offering by approximately 5% and the number of shares of common stock outstanding in the table above would decrease or increase commensurately.

Table of Contents**DILUTION**

If you invest in our common stock in this offering, your interest will be diluted to the extent of the difference between the public offering price per share and the as adjusted net tangible book value per share of our common stock immediately after this offering. Net tangible book value per share is determined by dividing our total tangible assets less total liabilities by the number of outstanding shares of our common stock.

As of September 30, 2014, we had a net tangible book value of \$64.3 million, or approximately \$2.44 per share of common stock.

Investors participating in this offering will incur immediate and substantial dilution. After giving effect to the issuance and sale of \$40,000,000 of shares of our common stock in this offering at an assumed public offering price of \$5.22 per share, which was the last reported sale price of our common stock on the NASDAQ Global Select Market on November 28, 2014, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, our as adjusted net tangible book value as of September 30, 2014 would have been approximately \$101.3 million, or approximately \$2.97 per share of common stock. This represents an immediate increase in the net tangible book value of \$0.53 per share to existing stockholders, and an immediate dilution in the net tangible book value of \$2.25 per share to investors purchasing shares of our common stock in this offering. The following table illustrates this per share dilution:

Assumed public offering price per share		\$	5.22
Actual net tangible book value per share as of September 30, 2014		\$	2.44
Increase in net tangible book value per share attributable to new investors participating in this offering			0.53
As adjusted net tangible book value per share after this offering			2.97
Dilution per share to investors participating in this offering		\$	2.25

If the underwriters exercise their option in full to purchase \$6,000,000 of additional shares of common stock in this offering at the assumed public offering price of \$5.22 per share, the as adjusted net tangible book value per share after the offering would be \$3.04 per share, the increase in the as adjusted net tangible book value per share to existing stockholders would be \$0.60 per share and the dilution to new investors purchasing common stock in this offering would be \$2.18 per share.

Table of Contents**SELECTED FINANCIAL DATA**

The following tables set forth our selected financial data for the periods indicated. The following selected financial data for the years ended December 31, 2012 and 2013 and the selected balance sheet data as of December 31, 2012 and 2013 are derived from our audited financial statements, which have been audited by Ernst & Young LLP, our independent registered public accounting firm, appearing elsewhere in this prospectus. The selected statement of operations data for the nine-month periods ended September 30, 2013 and 2014 and the selected balance sheet data as of September 30, 2014 are derived from unaudited condensed financial statements appearing elsewhere in this prospectus.

The financial data for the nine months ended September 30, 2013 and 2014 and as of September 30, 2014, in the opinion of management, includes all adjustments, consisting only of normal recurring adjustments, that are necessary for a fair presentation of the financial position and the results of operations for these periods. Our historical results are not necessarily indicative of the results to be expected in the future, and our operating results for the nine months ended September 30, 2014 are not necessarily indicative of the results that may be expected for the entire year ending December 31, 2014.

This selected financial data should be read together with the historical financial statements and related notes to those statements, as well as "Management's Discussion and Analysis of Financial Condition and Results of Operations," which are included elsewhere in this prospectus.

	Year Ended December 31,		Nine Months Ended September 30,	
	2012	2013	2013	2014
	(in thousands, except share and per share data)			
Statement of Operations Data:				
Total revenue	\$ 808	\$ 135	\$ 135	\$
Operating expenses:				
General and administrative	3,123	4,718	2,843	7,034
Research and development	13,295	18,762	12,240	29,671
Total operating expenses	16,418	23,480	15,083	36,705
Loss from operations	(15,610)	(23,345)	(14,948)	(36,705)
Total other income (expense)	(26)	94	(1,398)	301
Net loss and comprehensive loss	(15,636)	(23,251)	(16,346)	(36,404)
Accretion of redeemable convertible preferred stock	(316)	(334)	(248)	(28)
Net loss attributable to common stockholders	\$ (15,952)	\$ (23,585)	\$ (16,594)	\$ (36,432)
Net loss per share basic and diluted	\$ (23.70)	\$ (29.71)	\$ (22.23)	\$ (1.58)
Weighted average shares of common stock outstanding used in computing net loss per share basic and diluted	673,191	793,806	746,587	23,036,366

	As of December 31,		As of
	2012	2013	September 30, 2014
	(in thousands)		
Balance Sheet Data:			
Cash and cash equivalents	\$ 6,739	\$ 37,965	\$ 72,225
Total assets	8,088	42,393	73,956
Total liabilities	8,127	3,401	9,696
Total redeemable convertible preferred stock	58,958	120,562	
Total stockholders' (deficit) equity	(58,997)	(81,571)	64,259

Table of Contents

**MANAGEMENT'S DISCUSSION AND ANALYSIS OF
FINANCIAL CONDITION AND RESULTS OF OPERATIONS**

You should read the following discussion and analysis of our financial condition and results of operations together with our financial statements and related notes appearing in this prospectus. Some of the information contained in this discussion and analysis or set forth elsewhere in this prospectus, including information with respect to our plans and strategy for our business and related financing, includes forward looking statements that involve risks and uncertainties. As a result of many factors, including those factors set forth in the "Risk Factors" section of this prospectus, our actual results could differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis.

Overview

We are a clinical stage biopharmaceutical company that discovers, develops and intends to commercialize therapeutics that use a novel approach to target G protein coupled receptors, or GPCRs. Using our proprietary product platform, we have identified and advanced three differentiated product candidates into the clinic as follows:

TRV130: We recently announced top-line data from our Phase 2a/b clinical trial of TRV130 in postoperative pain. We plan to initiate a second Phase 2 trial in the fourth quarter of 2014 in soft tissue pain to inform Phase 3 development, since efficacy in both hard and soft tissue pain would be required by the FDA for a broad label in the treatment of acute moderate to severe pain. We expect to report top-line data from this second Phase 2 trial in mid-2015. Prior to later-phase clinical development, we are also conducting or planning additional Phase 1 work in healthy subjects to add to our clinical understanding of TRV130. We hold a U.S. patent covering the composition of matter and methods of use for TRV130 and have retained all worldwide development and commercialization rights to TRV130, and plan to commercialize it in acute care markets such as hospitals and ambulatory surgery centers if it receives regulatory approval. After the availability of the final Phase 2a/b clinical data for TRV130, we may seek collaborators for commercializing TRV130 outside of the United States to offset risk and preserve capital. We may also seek to collaborate with a third party to evaluate novel formulations of TRV130 for chronic pain and breakthrough pain.

TRV734: We have completed a first Phase 1 single ascending dose clinical trial for TRV734, an oral follow-on to TRV130 for the treatment of moderate to severe acute and chronic pain. We have completed enrollment in a second Phase 1 multiple ascending dose trial and expect to report data from this trial early in the first quarter of 2015. We have retained all worldwide development and commercialization rights to TRV734.

TRV027: We have completed a Phase 2a clinical trial and in early 2014 we initiated a Phase 2b clinical trial of TRV027 for acute heart failure, or AHF. Enrollment in this trial is ongoing, with over 250 patients recruited out of planned enrollment of approximately 500 patients. More than 65 sites in 12 countries are now open and recruiting, and we expect patient enrollment will conclude in the third quarter of 2015. We expect to report top-line data from this trial in the fourth quarter of 2015. Actavis plc, or Actavis, has the exclusive option to license TRV027 from us. We plan for TRV027 to be commercialized in the acute care hospital market if it receives regulatory approval.

In addition, we have identified a new product candidate, TRV250, from our preclinical δ -opioid receptor program focused on central nervous system, or CNS, indications and plan to advance TRV250 to preclinical studies in 2015 that would support our submission of an investigational new drug application, or IND, to the U.S. Food and Drug Administration, or FDA.

Table of Contents

We were incorporated and commenced operations in the fourth quarter of 2007. Our operations to date have included organizing and staffing our company, business planning, raising capital, developing TRV027, TRV130 and TRV734, and discovering a δ -opioid receptor targeted product candidate, TRV250. We have financed our operations primarily through private placements and a public offering of our equity securities and debt borrowings. As of September 30, 2014, we had an accumulated deficit of \$118.7 million. Our net loss was \$15.6 million and \$23.3 million for the years ended December 31, 2012 and 2013, respectively, and \$36.4 million for the nine months ended September 30, 2014. Our ability to become and remain profitable depends on our ability to generate revenue. We do not expect to generate significant revenue unless and until we or a collaborator obtain marketing approval for and commercialize TRV027, TRV130, TRV734 or TRV250.

We have received aggregate net proceeds of \$180.0 million through September 30, 2014 from public and private sales of our equity securities, including pursuant to the exercise of options and warrants, and \$9.5 million pursuant to grant and collaboration agreements. In September 2014, we announced we had entered into a \$35.0 million senior secured tranching term loan credit facility with Oxford Finance LLC and Square 1 Bank, of which we have drawn \$2.0 million. The facility also provides for up to two additional term loan tranches of \$16.5 million each. Based on the top-line results of the Phase 2a/b clinical trial of TRV130 announced in November 2014, we believe we have met the conditions to draw the \$16.5 million second tranche under the credit facility. We may opt to draw the third term loan tranche if we receive positive data from the Phase 2 clinical trial of TRV027.

We expect to incur significant expenses and operating losses for the foreseeable future as we continue the development and clinical trials of, and seek regulatory approval for, our product candidates. If we obtain regulatory approval for any of our product candidates, we expect to incur significant commercialization expenses. Furthermore, following the closing of our recent IPO, we have incurred and expect to continue to incur additional costs associated with operating as a public company. These costs include significant legal, accounting, investor relations and other expenses that we did not incur as a private company. We will need to obtain substantial additional funding in connection with our continuing operations. If we are unable to raise capital when needed or on attractive terms, we could be forced to delay, reduce or eliminate our research and development programs or any future commercialization efforts. We will seek to fund our operations through the sale of equity, debt financings or other sources, including potential additional collaborations. However, we may be unable to raise additional funds or enter into such other agreements when needed on favorable terms, or at all. If we fail to raise capital or enter into such other arrangements as, and when, needed, we may have to significantly delay, scale back or discontinue the development and/or commercialization of one or more of our product candidates.

Option and License Agreements with Actavis plc

On May 3, 2013, we entered into an option agreement and a license agreement with Actavis plc (formerly Forest Laboratories Holdings Limited), under which we granted to Actavis an exclusive option to license our product candidate, TRV027. If Actavis exercises this option, the license agreement will become effective and Actavis will have an exclusive worldwide license to develop and commercialize TRV027 and specified related compounds. Actavis will be responsible for subsequent development, regulatory approval and commercialization of TRV027 at Actavis' expense. At our request, Actavis will consider in good faith whether to grant us the right to co-promote the licensed products in the United States under terms to be agreed upon by the parties, but Actavis has no obligation to grant us such right.

Under the option agreement, we will conduct, at our expense, a Phase 2b clinical trial of TRV027 in AHF. Actavis may exercise its option during the pendency of the Phase 2b clinical trial or during a specified time period after we deliver the data from the Phase 2b clinical trial to Actavis. During the option period, we are not permitted to negotiate for or enter into any agreement with a third party for

Table of Contents

the development and commercialization of TRV027 and its related compounds. Under specified circumstances linked to adverse changes in the market or related to the results from the Phase 2b clinical trial of TRV027, Actavis has the right to renegotiate the terms of the license agreement. If Actavis exercises such right, we will be obligated to negotiate in good faith with Actavis for a period of time the terms of any new arrangement. If we and Actavis are unable to agree on the terms of any new arrangement, then the option agreement will terminate and for a specified period of time thereafter we may not offer a license to any third party on terms better than those last proposed by either us or Actavis during the negotiations. If Actavis does not exercise the option during the specified period, its option will expire and the license agreement will not become effective. In that case, we would be free to enter into a collaboration arrangement with another party for the development and commercialization of TRV027 or to pursue development and commercialization on our own.

We received no consideration upon the grant of the option to Actavis. If Actavis exercises the option, we would receive a \$65 million option exercise fee and could potentially receive up to \$365 million in additional payments depending upon the achievement of future development and commercial milestones. We also could receive tiered royalties between 10% and 20% on net sales of licensed products worldwide, subject to specified deductions and offsets, with the royalty rates on net sales of licensed products in the United States being somewhat higher than the royalty rates on net sales of licensed products outside the United States. The term of the royalty on sales of TRV027 for a given country would extend until the latest to occur of (i) ten years from first commercial sale of TRV027 in that country, (ii) the expiration of the last to expire patent claiming TRV027 that is sufficient to block the entrance of a generic version of the product, or (iii) the expiration of any period of exclusivity granted by applicable law or any regulatory authority in such country that confers exclusive marketing rights on the product.

If the license agreement becomes effective, Actavis has the right to grant sublicenses under the license agreement to affiliates and third parties. Any sublicensing does not act to relieve Actavis of any of its obligations under the license agreement, including Actavis' obligation to make milestone payments to us with respect to TRV027 or pay royalties to us on sales of TRV027 by such sublicensee. Under the license, both we and Actavis have the right to terminate the agreement in the event of an uncured material breach or insolvency of the other party. In addition, Actavis is permitted to terminate the license agreement without cause at any time upon prior written notice or immediately for product safety reasons. Following a termination of the license agreement, all licenses granted to Actavis would terminate, and Actavis would grant to us an exclusive royalty bearing license under specified patents and know-how to develop and commercialize reverted licensed products. If not terminated, the license agreement would remain in effect until the expiration of the last royalty term for the last licensed product.

Senior Secured Tranched Term Loan Credit Facility

In September 2014, we entered into a loan and security agreement with Oxford Finance LLC and Square 1 Bank, or the lenders, pursuant to which they have agreed to lend us up to \$35.0 million in a three-tranche series of term loans. Upon initially entering into the agreement, we borrowed \$2.0 million. In addition, we may borrow:

up to an additional \$16.5 million, at any time on or before June 30, 2015, subject to the satisfaction of specified conditions related to the results of our Phase 2 bunionectomy trial of TRV130, which we believe have now been satisfied; and

an additional \$16.5 million, at any time on or before March 31, 2016, subject to the satisfaction of specified conditions related to the results of our Phase 2b clinical trial of TRV027.

Borrowings accrue interest at a fixed rate of 6.50% per annum. We are required to make payments of interest only on borrowings under this agreement on a monthly basis through and including April 1,

Table of Contents

2016, which we refer to as the interest only termination date, after which payments of principal in equal monthly installments and accrued interest will be due until the loan matures on December 1, 2018. Both the interest only termination date and the maturity date may be modified as follows:

If we meet the conditions to draw the third tranche by March 31, 2016, the interest only termination date will be extended until October 1, 2016.

If we meet the conditions to draw the third tranche and we have received net cash proceeds of at least \$50.0 million from our existing option and license with Actavis or another strategic partnership satisfactory to the lenders, then the maturity date will be extended to September 1, 2019.

We paid the lenders a facility fee of \$175 thousand in connection with the execution of the agreement. Upon the last payment date of the amounts borrowed under the agreement, we will be required to pay a final payment fee ranging from 5.25% to 7.0% of the aggregate amounts borrowed. In addition, if we repay the borrowings prior to the maturity date, we will be obligated to pay a prepayment fee of 3.0% of the total amount prepaid if the prepayment occurs prior to the first anniversary of the funding of the applicable tranche, 2.0% percent of the total amount prepaid if the prepayment occurs between the first and second anniversary of the funding of the applicable tranche, and 1.0% of the total amount prepaid if the prepayment occurs on or after the second anniversary of the funding of the applicable tranche.

Our obligations are secured by a first priority security interest in substantially all of our assets, other than intellectual property. In addition, we have agreed not to pledge or otherwise encumber our intellectual property, with specified exceptions.

We used a placement agent in connection with the agreement. We paid the agent \$65 thousand upon execution of the agreement and will be obligated to pay up to an additional \$175 thousand if we draw on the second and third tranches.

In connection with entering into the agreement, we issued to the lenders warrants to purchase an aggregate of 7,678 shares of our common stock. These warrants are exercisable immediately and have an exercise price of \$5.86 per share. The warrants may be exercised on a cashless basis and will terminate on the earlier of September 19, 2024 or the closing of a merger or consolidation transaction in which we are not the surviving entity. If we draw on the second or third tranches, we will issue additional warrants to purchase shares of our common stock, each with an exercise price of \$5.86 per share and on substantially the same terms as those contained in the initial warrants. The number of shares underlying these additional warrants will depend on the amount of additional borrowings we make, but will not exceed 126,685.

Based on our announcement of top-line results from our Phase 2a/b trial of TRV130, we believe we have met the conditions to draw the second tranche, which will result in the increase in the final payment percentage to 6.1%, the payment of an additional placement agent fee and the issuance of warrants to purchase an aggregate of 63,342 additional shares.

Components of Operating Results

Revenue

To date, we have derived revenue principally from research grants as well as from one research collaboration arrangement. We have not generated any revenue from commercial product sales. In the future, if any of our product candidates currently under development is approved for commercial sale, we may generate revenue from product sales, or alternatively, we may choose to select a collaborator to commercialize our product candidates in all or selected markets.

Table of Contents

We do not expect to increase revenue because we have completed our grant programs and our research collaboration. We do not currently anticipate any revenue from new grant programs or research collaborations. We will not generate any commercial revenue until one of our product candidates receives regulatory approval, if ever.

General and Administrative Expenses

General and administrative expenses consist principally of salaries and related costs for executive and other personnel, including stock-based compensation and travel expenses. Other general and administrative expenses include facility-related costs, communication expenses and professional fees for legal, patent prosecution and maintenance consulting and accounting services.

We anticipate that our general and administrative expenses will increase in the future with continued research, development and potential commercialization of our product candidates. These increases will likely include greater costs for insurance, costs related to the hiring of additional personnel, payments to outside consultants and investor relations providers, and costs for lawyers and accountants, among other expenses. Additionally, if and when we believe a regulatory approval of a product candidate appears likely, we anticipate an increase in payroll and expense as a result of our preparation for commercial operations, especially as it relates to the sales and marketing of our product candidates.

Research and Development Expenses

Our research and development expenses consist primarily of costs incurred for the development of our product candidates. These costs include external costs and internal research and development costs.

External costs include:

expenses incurred under agreements with contract research organizations and investigative sites that conduct our clinical trials, preclinical studies and regulatory activities; and

the costs of acquiring, developing and manufacturing clinical trial materials.

Internal costs include:

personnel-related expenses, including salaries, benefits and stock-based compensation expense of our research and development personnel;

laboratory supplies;

allocated facilities, depreciation and other expenses, which include rent and utilities;

travel and training for research and development employees;

product liability insurance; and

laboratory service costs.

We track external costs by discovery program and subsequently by product candidate once a product candidate has been selected for development. TRV130 and TRV734 were both selected from the μ -opioid receptor discovery program and so we did not separately allocate costs between TRV734 and TRV130 until the start of 2011 when we selected TRV130 as a product candidate. We have incurred a total of \$76.8 million in research and development expenses from January 1, 2011 through September 30, 2014, with \$43.6 million being spent on external costs for TRV027, TRV130 and TRV734 and the remainder being spent on internal costs, predominantly personnel related costs, and

external costs related to the development of our ABLE product platform, grant funded activities and our early stage programs, including the δ -opioid receptor program.

Table of Contents

Research and development costs are expensed as incurred. We record costs for some development activities, such as clinical trials, based on an evaluation of the progress to completion of specific tasks using data such as patient enrollment, clinical site activations or information provided to us by our vendors.

Research and development activities are central to our business model. Product candidates in later stages of clinical development generally have higher development costs than those in earlier stages of clinical development, primarily due to the increased size and duration of later-stage clinical trials. As we advance our product candidates, we expect the amount of research and development spending allocated to external spending relative to internal spending will continue to grow for the foreseeable future, while our internal spending should grow at a slower and more controlled pace.

It is difficult to determine with certainty the duration and completion costs of our current or future preclinical programs and clinical trials of our product candidates, or if, when or to what extent we will generate revenue from the commercialization and sale of any of our product candidates that obtain regulatory approval. We may never succeed in achieving regulatory approval for any of our product candidates. The duration, costs and timing of clinical trials and development of our product candidates will depend on a variety of factors, including the uncertainties of future clinical and preclinical studies, uncertainties in clinical trial enrollment rate and significant and changing government regulation. In addition, the probability of success for each product candidate will depend on numerous factors, including competition, manufacturing capability and commercial viability. We will determine which programs to pursue and how much to fund each program in response to the scientific and clinical success of each product candidate, as well as an assessment of each product candidate's commercial potential.

Change in Fair Value of Warrant Liability

Prior to our initial public offering, or IPO, we issued warrants for the purchase of our convertible preferred stock that we concluded were financial instruments that might require a transfer of assets because of the redemption features of the underlying preferred stock. Therefore, we classified these warrants as liabilities that we re-measured to fair value at each balance sheet date and we recorded the changes in the fair value of the warrant liability in our statement of operations and comprehensive loss as a change in fair value of warrant liability. At the time of the IPO, these warrants were net exercised into common stock and the remaining fair value of \$145 thousand associated with these warrants was reclassified to additional paid-in capital.

We also have an outstanding warrant to purchase 20,161 shares of common stock. This warrant had a fair value recorded as a liability of \$96 thousand at September 30, 2014 as it contains a cash settlement feature upon certain strategic transactions. We will continue to adjust the liability related to this warrant for changes in fair value until the earlier of the exercise or expiration of the warrants.

Other Income / Expense

Other income consists principally of interest income earned on cash and cash equivalent balances and miscellaneous income attributable to the sale of research and development tax credits.

Interest expense consists of cash paid and noncash interest expense related to the \$2.0 million tranche of the senior secured term loan credit facility with Oxford Finance LLC and Square 1 Bank, which we drew on inception of the facility, cash paid and noncash interest expense related to our prior bank facility, which we repaid in November 2011, our prior equipment loan facility with the Commonwealth of Pennsylvania, which we repaid in December 2012, and our loan facility with Comerica Bank, or the Comerica loan facility, which we repaid in May 2013.

Table of Contents

Accretion of Preferred Stock

We account for the redemption of issuance costs on our preferred stock using the effective interest method, accreting such amounts to preferred stock from the date of issuance to the earliest date the holder can demand redemption.

Critical Accounting Policies and Significant Judgments and Estimates

This discussion and analysis of our financial condition and results of operations is based on our financial statements, which have been prepared in accordance with generally accepted accounting principles in the United States of America, or GAAP. The preparation of these financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities, disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reported period. In accordance with GAAP, we base our estimates on historical experience and on various other assumptions that we believe are reasonable under the circumstances. Actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are more fully described in Note 2 to our audited financial statements appearing elsewhere in this prospectus, we believe the following accounting policies are critical to the process of making significant judgments and estimates in the preparation of our financial statements.

Grant Revenue Recognition

We recognize grant revenue when persuasive evidence of an arrangement exists, delivery has occurred or services have been rendered, the price is fixed and determinable and collectability is reasonably assured. In August 2011, we received a second research grant from the NIH to assist in the funding of our δ -opioid program. The award contemplated funding up to \$496 thousand during the period from August 15, 2011 through July 31, 2016, subject to availability of funds and successful progression of the program. Through June 6, 2013, we had received \$338 thousand, and on June 6, 2013, we were informed that no additional funds would be made available. We recognized revenue under this grant in the period in which the related expenditures are incurred.

Collaboration Revenue Recognition

We recognize collaboration revenue when persuasive evidence of an arrangement exists, delivery has occurred or services have been rendered, the price is fixed and determinable, and collectability is reasonably assured.

Research and Development Expenses

Research and development costs are charged to expense as incurred. These costs include, but are not limited to, employee-related expenses, including salaries, benefits and travel; expenses incurred under agreements with contract research organizations and clinical research organizations and investigative sites that conduct clinical trials and preclinical studies; the cost of acquiring, developing and manufacturing clinical trial materials; facilities, depreciation and other expenses, which include direct and allocated expenses for rent and utilities; insurance and other supplies; and costs associated with preclinical activities and regulatory operations.

Costs for certain development activities, such as clinical trials, are recognized based on an evaluation of the progress to completion of specific tasks using data such as patient enrollment, clinical site activations or information provided to us by our vendors with respect to their actual costs incurred. Payments for these activities are based on the terms of the individual arrangements, which may differ from the pattern of costs incurred, and are reflected in the financial statements as prepaid or accrued research and development expense, as the case may be.

Table of Contents

Income Taxes

Income taxes are recorded in accordance with ASC Topic 740, *Income Taxes*, or ASC 740, which provides for deferred taxes using an asset and liability approach. We recognize deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements or tax returns. Deferred tax assets and liabilities are determined based on the difference between the financial statement and tax bases of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. Valuation allowances are provided if, based upon the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized.

We account for uncertain tax positions in accordance with the provisions of ASC 740. When uncertain tax positions exist, we recognize the tax benefit of tax positions to the extent that the benefit will more likely than not be realized. The determination as to whether the tax benefit will more likely than not be realized is based upon the technical merits of the tax position as well as consideration of the available facts and circumstances. As of December 31, 2012 and 2013, and September 30, 2014, we did not have any significant uncertain tax positions.

Stock-Based Compensation

We account for all share-based compensation payments issued to employees, directors and non-employees using an option pricing model for estimating fair value. Accordingly, share-based compensation expense is measured based on the estimated fair value of the awards on the date of grant, net of forfeitures. We recognize compensation expense for the portion of the award that is ultimately expected to vest over the period during which the recipient renders the required services to us using the straight-line single option method. In accordance with authoritative accounting guidance, we re-measure the fair value of non-employee share-based awards as the awards vest, and recognize the resulting value, if any, as expense during the period the related services are rendered.

Significant Factors, Assumptions and Methodologies Used in Determining Fair Value

We apply the fair value recognition provisions of Financial Accounting Standards Board Accounting Standards Codification Topic 718, *Compensation - Stock Compensation*, or ASC 718. Determining the amount of share-based compensation to be recorded requires us to develop estimates of the fair value of stock options as of their grant date. We recognize share-based compensation expense ratably over the requisite service period, which in most cases is the vesting period of the award. Calculating the fair value of share-based awards requires that we make highly subjective assumptions.

We use the Black-Scholes option pricing model to value our stock option awards. Use of this valuation methodology requires that we make assumptions as to the volatility of our common stock, the expected term of our stock options, the risk free interest rate for a period that approximates the expected term of our stock options and our expected dividend yield. Because we are a privately held company with a limited operating history, we utilize data from a representative group of companies to estimate expected stock price volatility. We selected companies from the biopharmaceutical industry with similar characteristics to us, including those in the early stage of product development and with a therapeutic focus.

We use the simplified method as prescribed by the Securities and Exchange Commission Staff Accounting Bulletin No. 107, *Share-Based Payment*, to calculate the expected term of stock option grants to employees as we do not have sufficient historical exercise data to provide a reasonable basis upon which to estimate the expected term of stock options granted to employees. We utilize a dividend yield of zero based on the fact that we have never paid cash dividends and have no current intention to pay cash dividends. The risk-free interest rate used for each grant is based on the U.S. Treasury yield

Table of Contents

curve in effect at the time of grant for instruments with a similar expected life. The weighted-average assumptions used to estimate the fair value of stock options using the Black-Scholes option pricing model were as follows for the year ended December 31, 2013 and for the nine months ended September 30, 2014:

	Year Ended December 31, 2013	Nine Months Ended September 30, 2014
Risk-free interest rate	1.52%	1.82%
Expected term of options (in years)	6.1	5.9
Expected volatility	80.5%	75.9%
Dividend yield	0.0%	0.0%

We also are required to estimate forfeitures at the time of grant, and revise those estimates in subsequent periods if actual forfeitures differ from our estimates. We use historical data to estimate pre-vesting option forfeitures and record share-based compensation expense only for those awards that are expected to vest. To the extent that actual forfeitures differ from our estimates, the difference is recorded as a cumulative adjustment in the period the estimates were revised. Through September 30, 2014, actual forfeitures have not been material.

Stock-based compensation expense totaled \$928 thousand and \$1.89 million for the year ended December 31, 2013 and for the nine months ended September 30, 2014, respectively. We record stock-based compensation expense as a component of research and development expenses or general and administrative expenses, depending on the function performed by the optionee. For the year ended December 31, 2013 and the nine months ended September 30, 2014, we allocated stock-based compensation as follows:

	Year Ended December 31, 2013	Nine Months Ended September 30, 2014
	(in thousands)	
Research and development	\$ 609	\$ 921
General and administrative	319	969
Total	\$ 928	\$ 1,890

As of September 30, 2014, there was \$6.7 million of total unrecognized compensation expense, related to unvested options granted under our 2013 Equity Incentive Plan that will be recognized over the weighted average remaining period of 3.09 years. Although our share-based compensation for stock options granted to employees and non-employees to date has not been material to our financial results, in future periods, our share-based compensation expense is expected to increase as a result of recognizing our existing unrecognized share-based compensation for awards that will vest and as we issue additional share-based awards to attract and retain our employees.

Fair Market Value Estimates for Pre-IPO Option Grants

Stock options granted after January 31, 2014, the date of our IPO, were granted with an exercise price equal to the closing price of our stock on the date of grant. Prior to our IPO, we were required to estimate the fair market value of the common stock underlying our share-based awards when performing the fair value calculations with the Black-Scholes option pricing model. The fair market value of the common stock underlying our share-based awards was determined on each grant date by our board of directors, with input from management. All options to purchase shares of our common stock were intended to be granted with an exercise price per share no less than the fair market value per share of our common stock underlying those options on the date of grant, based on the information known to us on the date of grant. In the absence of a public trading market for our

Table of Contents

common stock, on each grant date, we developed an estimate of the fair market value of our common stock in order to determine an exercise price for the option grants. We determined the fair market value of our common stock using methodologies, approaches and assumptions consistent with the American Institute of Certified Public Accountants, or AICPA, Audit and Accounting Practice Aid Series: Valuation of Privately Held Company Equity Securities Issued as Compensation, or the AICPA Practice Guide. In addition, we considered various objective and subjective factors, along with input from management and contemporaneous valuations, to determine the fair market value of our common stock, including:

external market conditions affecting the biotechnology industry;

trends within the biotechnology industry;

the prices at which we sold shares of preferred stock;

the superior rights and preferences of the preferred stock relative to our common stock at the time of each grant;

our results of operations and financial position;

the status of our research and development efforts;

our stage of development and business strategy;

the lack of an active public market for our capital stock; and

the likelihood of achieving a liquidity event, such as an IPO or sale of our company in light of prevailing market conditions.

The per share estimated fair market value of our common stock in the table below represents the determination by our board of directors of the fair market value of our common stock as of the date of grant, taking into consideration the various objective and subjective factors described above, including the conclusions, if applicable, of contemporaneous independent third-party valuations of our common stock as discussed below. We computed the per share weighted average estimated fair value for stock option grants based on the Black-Scholes option pricing model. The following table sets forth information about our stock option grants from January 1, 2013 through the date of our IPO:

Date of Issuance	Number of Shares Underlying Options Granted	Exercise Price per Share	Estimated Fair Market Value per Common Share	Estimated Fair Value of Options per Share
June 17, 2013	1,057,247	\$ 2.23	\$ 2.23	\$ 1.55
June 19, 2013	26,655	2.23	2.23	1.55
August 6, 2013	39,490	2.23	2.23	1.55
August 12, 2013	98,724	2.23	2.23	1.55
August 27, 2013	69,286	7.44	7.44	5.19
September 3, 2013	197,449	7.44	7.44	5.25
September 26, 2013	122,579	7.44	7.44	5.17
December 6, 2013	118,725	7.00	7.00	4.88
January 24, 2014	80,116	7.00	7.00	4.66

In determining the exercise prices of the options set forth in the table above granted since January 1, 2013 and before our IPO, our board of directors considered the most recent available independent third-party valuations of our common stock, which were prepared as of July 8, 2010, April 30, 2013 and August 15, 2013, and based its determination in part on such valuations, with the analyses summarized below.

Table of Contents

Stock options granted on June 17, 2013 and July 29, 2013

Our board of directors granted stock options on June 17, 2013 and July 29, 2013, with each having an exercise price of \$2.23 per share. Three of these grants became effective upon later dates (June 19, 2013, August 6, 2013 and August 12, 2013) when the respective recipient initially became an employee of our company. The exercise price per share was supported by the most recent independent third-party valuation of \$2.23 per common share as of April 30, 2013 which our board determined was still appropriate as of the dates of these grants in the absence of any new clinical trial data and the absence of any agreement within the board to authorize us to begin preparing for an IPO. In conducting this April 30, 2013 valuation, we utilized the option pricing model backsolve method to calculate our enterprise value utilizing as a starting point the May 2013 Series C financing at \$1.632 per share of preferred stock, which is effectively \$10.12 per share of common stock on an as-converted basis. The price per share of preferred stock in the Series C financing was deemed to be fair value because the price was set by willing and informed unrelated parties (Forest and our company), neither of whom was forced to transact. The Series C financing was concluded after extensive negotiations in which each party sought to obtain the best price. Although we also transferred an option to Forest concurrent with the stock purchase, the value of the option was negligible, so the inclusion of the option in the transaction did not alter the fair value assigned to our equity.

We estimated the value of our common stock versus the other share classes using the option pricing method, consistent with the methodology noted above in the July 8, 2010 valuation. Changes in assumptions since the July 8, 2010 valuation included adjusting the enterprise value based upon the Series C financing raise at \$1.632 per share, changing the expected term to 2.5 years based on updated management estimates, utilizing volatility of 80.5% based on the median of comparable companies and reducing the discount for lack of marketability to 30%. The comparable companies we used were publicly traded companies selected primarily on the basis of the lead indications they have under development. These companies consisted of Pain Therapeutics, Acura Pharmaceuticals, Horizon Pharma, Zogenix and Neurocrine Biosciences, each of which have lead indications focused on pain/neurological disorders, and Aastrom Biosciences, Pozen and Cytokinetics, each of which specializes in cardiovascular indications. All of the selected companies have market capitalizations of less than a billion dollars and low or no product revenue, which we believe makes them representative of our size and stage of development.

Stock options granted on August 27, 2013 and September 26, 2013

Our board of directors granted stock options on August 27, 2013 and September 26, 2013 with an exercise price of \$7.44 per share. One of these grants became effective upon a later date (September 3, 2013) when the recipient initially became an employee of our company. The exercise price per share was supported by the most recent third-party valuation of \$7.44 per common share as of August 15, 2013. In conducting this valuation, we used the probability weighted expected return method, or PWERM, with two main categories of discrete scenarios a non-IPO scenario and multiple IPO scenarios to take into account the decision by our board of directors in August 2013 to proceed with preparations for a potential IPO. We applied a weighting of 50% to the non-IPO scenario, which was valued using the market adjusted option pricing method, which captures the distribution of exits appropriate for a private company where there are numerous potential future pathways as yet poorly defined, and a weighting of 50% to the IPO scenarios included under the PWERM approach, which assumed that we would achieve an IPO exit in the near-term. This 50% probability of an IPO exit in the near term was deemed appropriate because a successful IPO could only be achieved if the ongoing Phase 1b clinical trial for TRV130 yielded positive data, and the results of this trial were unknown as of the August and September option grant dates. In addition, we had not yet obtained investor feedback that might have increased our assessment of the likelihood of a successful IPO and we were concerned

Table of Contents

about subsequent changes in the market's receptivity for biotech IPOs based on the early stage of our IPO preparations.

To calculate our enterprise value under the market adjusted option pricing method for the non-IPO scenario, we started with the enterprise value calculated in the April 30, 2013 valuation described above. We first adjusted that value, increasing it by 9.7%, to reflect changes in the market conditions for the biotechnology industry generally between April 30, 2013 and August 15, 2013, as evidenced by the growth in enterprise value of three relevant market indices (the NASDAQ Biotechnology Index, iShares NASDAQ Biotechnology Index and SPDR S&P Biotech). We chose not to use the mean change in the enterprise values of our comparable companies because such values did not indicate a trend in biotech company valuations, but rather were significantly influenced by company-specific events. We then further adjusted the enterprise value, increasing it by 13.3% to reflect operational progress made between April 30, 2013 and August 15, 2013 including the receipt of positive interim data from our then-ongoing Phase 1b clinical trial of TRV130. From this enterprise value we then estimated the value of our common stock using the option pricing method, consistent with the methodology noted above in the July 8, 2010 and April 30, 2013 valuations. We used a discount for lack of marketability of 30% in line with the April 30, 2013 valuation to reflect the absence of a near-term exit in the non-IPO scenario. The implied value per share of common stock in the option pricing method as of August 15, 2013 was \$2.48 per share.

Our PWERM approach employed three IPO scenarios and weighted those as described below. We estimated our enterprise value under these IPO scenarios using the guideline public company method under the market approach. Under the guideline public company method, we considered an average of pre-money values for IPOs completed by biotechnology companies from the beginning of 2012 through the middle of 2013. We considered the value of cardiovascular therapeutic companies, which were typically at the low end of the comparable company range, and the value of platform-focused companies, which were typically at the high end of the comparable company range. The valuation range that we selected was between the valuation ranges for the two sets of companies because we work in multiple therapeutic areas, and employ a proprietary biased ligand research platform. In addition, we considered a medium multiple of invested capital as indicated by the IPOs. For the complete set of biotechnology companies that went public between the beginning of 2012 through the middle of 2013, the median step-up factor was 1.1x. However, for biotechnology companies with lead programs, partnerships with pharmaceutical companies and robust pipelines, the range of this multiple has been 1.2x to 1.4x. Given the general positive investor sentiment in the public markets for biotech IPOs, we used a factor of 1.3x as the upper end of the enterprise value range for our company, which is at a slight premium to the historical median.

For each of the various IPO scenarios, an equity value was estimated and the rights and preferences for each shareholder class were considered to determine what portion of the enterprise value to allocate to common shares. The common share value was then multiplied by a discount factor reflecting the calculated discount rate and the timing of the event. Lastly, the common share value in each scenario was multiplied by an estimated probability for that scenario. The probability and timing of each scenario were based on discussions between our board of directors and our management team.

We used the following three possible IPO scenarios under the PWERM, weighing them as indicated:

an IPO at an assumed high valuation in the fourth quarter of 2013, weighted at 30%;

an IPO at a lower assumed valuation in the fourth quarter of 2013, weighted at 12.5%; and

an IPO at the higher assumed valuation in the first quarter of 2014, weighted at 7.5%.

A discount for lack of marketability of 10% was then applied to the resulting value for each IPO scenario. This discount was significantly less than the 30% applied to the April 30, 2013 option pricing

Edgar Filing: TREVENA INC - Form S-1/A

Table of Contents

model to reflect that the IPO scenarios assumed that we had moved closer to marketability of shares of common stock in anticipation of a successful IPO. The average implied value per share of common stock in the IPO scenarios was \$12.40 per share.

The table below summarizes the significant assumptions utilized for each of the PWERM scenarios used in valuing the common stock and based upon which the fair value was determined to be \$7.44:

	No IPO (Option Pricing Method)	PWERM Scenarios		
		Early IPO (High)	Early IPO (Low)	Late IPO (High)
Liquidity date	2/15/2016	4Q13	4Q13	1Q14
Probability weighting	50%	30%	12.5%	7.5%
Discount for lack of marketability, or DLOM	30%	10%	10%	10%
Estimated per share value of common stock in each PWERM scenario after DLOM	\$ 2.48	\$ 13.10	\$ 10.91	\$ 12.09
Probability weighted estimated per share value of common stock across all three IPO scenarios after DLOM			\$ 12.40	
Probability weighted estimated per share value of common stock across all four PWERM scenarios after DLOM			\$7.44	

The primary drivers for the increased value per share of common stock between April 30, 2013 and August 15, 2013 were:

The likelihood of a successful IPO increased. We believed a successful IPO would require good data from the then-ongoing Phase 1b clinical trial for TRV130. In the beginning of August we received positive preliminary data from the first ten subjects in the trial. Based on these data, our assessment of the likelihood that the final data from the trial would be positive increased and so we initiated preparations for an IPO. The increased probability of a successful IPO was also linked to the advancement of TRV734, increased market receptivity to biotech IPOs, the decision by our board of directors in August 2013 to initiate the process for an IPO and the selection of co-lead underwriters.

The increased valuations associated with early-stage biotech IPOs. The valuations associated with early-stage biotech IPOs were not incorporated into the April 30, 2013 valuation but these valuations were incorporated into the August 15, 2013 valuation methodology and increased the value of common stock as of that date thereby contributing to the change in value between April 30, 2013 and August 15, 2013.

Stock options granted on December 6, 2013 and January 24, 2014

Our board of directors granted stock options on December 6, 2013 and January 24, 2014 with an exercise price of \$7.00, based on the price at which we sold shares in our subsequent IPO.

Recent Accounting Pronouncements

In June 2011, FASB issued ASU No. 2011-05, Comprehensive Income (ASC Topic 220): Presentation of Comprehensive Income, or ASU 2011-05. This accounting update eliminates the option to present the components of other comprehensive income as part of the statement of stockholders' equity. Instead, comprehensive income must be presented in either a single continuous statement of comprehensive income, which contains two sections, net income and other comprehensive income, or in two separate but consecutive statements. ASU 2011-05 was effective for fiscal periods beginning after December 15, 2011 with early adoption permitted. Our retrospective adoption of ASU 2011-05 did not have a significant impact on our financial position, results of operations or cash flows.

Table of Contents

In February 2013, FASB issued ASU No. 2013-02, Comprehensive Income (Topic 220): Reporting of Amounts Reclassified Out of Accumulated Other Comprehensive Income, or ASU 2013-02. ASU 2013-02 requires companies to present either in a single note or parenthetically on the face of the financial statements; the effect of significant amounts reclassified from each component of accumulated other comprehensive income based on its source and the income statement line items affected by the reclassification. This guidance is effective for annual reporting periods beginning after December 15, 2012. The adoption of this standard did not have a significant impact on our financial position, results of operations or cash flows.

On June 10, 2014, FASB issued ASU No. 2014-10, Development Stage Entities (Topic 915): Elimination of Certain Financial Reporting Requirements, Including an Amendment to Variable Interest Entities Guidance in Topic 810, Consolidation, or ASU 2014-10. ASU 2014-10 eliminates the accounting and reporting differences in U.S. GAAP between development stage entities and other operating entities, including the presentation of inception-to-date financial statement information and the development stage entity financial statement label. FASB guidance related to risks and uncertainties and FASB guidance utilized to determine if an entity is a variable interest entity now apply to entities that have not commenced planned principal operations. These changes will provide more consistent consolidation analysis and decisions among reporting entities. While these amendments are retrospectively effective for annual reporting periods beginning after December 15, 2014, early adoption is permitted for any annual reporting period or interim period for which the entity's financial statements have not yet been issued. We have elected early adoption in 2014. The adoption of this standard did not have a significant impact on our financial position, results of operations or cash flows.

In August 2014, the FASB issued ASU No. 2014-15, Presentation of Financial Statements-Going Concern (Subtopic 205-40): Disclosure of Uncertainties about an Entity's Ability to Continue as a Going Concern, which defines management's responsibility to assess an entity's ability to continue as a going concern, and to provide related footnote disclosures if there is substantial doubt about its ability to continue as a going concern. The pronouncement is effective for annual reporting periods ending after December 15, 2016 with early adoption permitted. The adoption of this guidance is not expected to have a material impact on our financial statements.

JOBS Act

The JOBS Act contains provisions that, among other things, reduce reporting requirements for an "emerging growth company." As an emerging growth company, we have elected to not take advantage of the extended transition period afforded by the JOBS Act for the implementation of new or revised accounting standards and, as a result, will comply with new or revised accounting standards on the relevant dates on which adoption of such standards is required for non-emerging growth companies.

Table of Contents**Results of Operations***Comparison of the Nine Months Ended September 30, 2013 and 2014*

	Nine Months Ended September 30,		
	2013	2014	Change
	(in thousands)		
Revenue:			
Grant revenue	\$ 85	\$	\$ (85)
Collaboration revenue	50		(50)
Total revenue	135		(135)
Operating expenses:			
General and administrative	2,843	7,034	4,191
Research and development	12,240	29,671	17,431
Total operating expenses	15,083	36,705	21,622
Loss from operations	(14,948)	(36,705)	(21,757)
Other income (expense):			
Change in fair value of warrant liability	(1,250)	109	1,359
Miscellaneous income	1	184	183
Interest income		12	12
Interest expense	(149)	(4)	145
Total other income (expense)	(1,398)	301	1,699
Net loss and comprehensive loss	(16,346)	(36,404)	(20,058)
Accretion of preferred stock	(248)	(28)	220
Net loss attributable to common stockholders	\$ (16,594)	\$ (36,432)	\$ (19,838)

Revenue

We had no grant revenue in 2014 due to the discontinuation of funding in June 2013 for a research grant from the National Institutes of Health.

General and administrative expenses

Edgar Filing: TREVENA INC - Form S-1/A

For the nine months ended September 30, 2014 compared to the same period in 2013, general and administrative expenses increased by \$4.2 million, or 147%, primarily as a result of increased headcount and associated salary costs, increased compensation expense associated with stock options granted and increased insurance, professional fees and other operating costs as a result of becoming a public company.

Research and development expenses

Research and development expenses increased by \$17.4 million, or 142%, from \$12.2 million for the nine months ended September 30, 2013 to \$29.7 million for the nine months ended September 30, 2014. The increase was primarily driven by an increase of \$13.0 million in clinical research expenses associated with our advancement into a Phase 2b clinical trial with TRV027 and the initiation of a Phase 2a/b clinical trial of TRV130 to assess the effects of TRV130 in patients following bunionectomy surgery. The remaining increase was primarily driven by other clinical activity for TRV130.

Table of Contents

The following table summarizes our research and development expenses for the nine months ended September 30, 2014 and 2013:

	Nine Months Ended September 30,	
	2013	2014
	(in thousands)	
TRV027	\$ 2,242	\$ 8,421
TRV130	2,477	10,582
TRV734	1,559	2,601
Stock-based compensation	355	921
Other personnel related costs	3,676	4,143
Other research and development	1,931	3,003
	\$ 12,240	\$ 29,671

Change in fair value of warrant liability

We recognized gains of \$110 thousand and losses of \$1.2 million for the nine months ended September 30, 2014 and 2013, respectively, for the change in fair value on revaluation of our warrant liability associated with our warrants outstanding.

Miscellaneous income

For the nine months ended September 30, 2014, we recorded miscellaneous income of \$184 thousand due to the sale of research and development tax credits awarded by the Commonwealth of Pennsylvania and the sale of laboratory equipment no longer in use.

Interest income

We recorded interest income of \$12 thousand during and nine months ended September 30, 2014 due to income associated with the investment of funds in U.S. Treasury Bills.

Interest expense

Interest expense decreased \$144 thousand in the nine months ended September 30, 2014 due primarily to the repayment of our loan facility with Comerica Bank in May 2013.

Accretion of preferred stock

Accretion of preferred stock of \$28 thousand was recorded during the nine months ended September 30, 2014, due to the conversion of our preferred stock into common stock in connection with the IPO.

Table of Contents*Comparison of Years Ended December 31, 2012 and 2013*

	Year Ended December 31,		
	2012	2013	Change
	(in thousands)		
Revenue:			
Grant revenue	\$ 408	\$ 85	\$ (323)
Collaboration revenue	400	50	(350)
Total revenue	808	135	(673)
Operating expenses:			
General and administrative	3,123	4,718	1,595
Research and development	13,295	18,762	5,467
Total operating expenses	16,418	23,480	7,062
Loss from operations	(15,610)	(23,345)	(7,735)
Other income (expense):			
Change in fair value of warrant liability	45	242	197
Miscellaneous income	123	1	(122)
Interest income	0	1	1
Interest expense	(194)	(150)	44
Total other income (expense)	(26)	94	120
Net loss and comprehensive loss	(15,636)	(23,251)	(7,615)
Accretion of preferred stock	(316)	(334)	(18)
Net loss attributable to common stockholders	\$ (15,952)	\$ (23,585)	\$ (7,633)

Revenue

Revenue decreased by \$673 thousand, or 83%, from \$808 thousand for the year ended December 31, 2012 to \$135 thousand for the year ended December 31, 2013. The change was attributable to a decrease of \$196 thousand in grant revenue due to the conclusion of the Michael J. Fox Foundation research grant in November 2012, a decrease of \$127 thousand in grant revenue due to the discontinuation of funding in June 2013 for a research grant from the National Institutes of Health and a decrease of \$350 thousand in collaboration revenue related to the completion of the research activities under a research collaboration agreement with Merck Sharp & Dohme Corporation.

General and administrative expenses

Edgar Filing: TREVENA INC - Form S-1/A

General and administrative expenses increased by \$1.6 million, or 51%, for the year ended December 31, 2013 compared to the same period in 2012 primarily as a result of an increase in professional fees for legal services, for financial consulting services in connection with business development activities and certain expenses incurred in connection with planning for our IPO.

Research and development expenses

Research and development expenses increased by \$5.5 million, or 41%, from \$13.3 million for the year ended December 31, 2012 to \$18.8 million for the year ended December 31, 2013. The increase was primarily driven by \$2.2 million of clinical research expenses and manufacturing/formulation expenses for TRV130 associated with its continued development, \$1.8 million in clinical research expenses for TRV027 associated with its advancement into a Phase 2b clinical trial and \$1.3 million of expenses associated with the progression of TRV734 from lead optimization work in 2012 into

Table of Contents

IND-enabling studies in 2013. The following table summarizes our research and development expenses for the years ended December 31, 2012 and 2013:

	Year Ended December 31,	
	2012	2013
	(in thousands)	
TRV027	\$ 3,114	\$ 4,425
TRV130	1,849	4,277
TRV734	494	1,988
Stock-based compensation	125	609
Other personnel related costs	4,744	4,768
Other research and development	2,969	2,695
	\$ 13,295	\$ 18,762

Change in fair value of warrant liability

We recognized gains of \$242 thousand and \$45 thousand for the years ended December 31, 2013 and 2012, respectively, for the change in fair value on revaluation of our warrant liability associated with our preferred stock warrants outstanding.

Miscellaneous income

Miscellaneous income decreased by \$122 thousand during 2013 due to income recorded during 2012 associated with the sale of research and development tax credits awarded by the Commonwealth of Pennsylvania.

Interest expense

Interest expense decreased by \$44 thousand during 2013 compared to 2012 due primarily to the full repayment of a loan facility in May 2013.

Accretion of preferred stock

Accretion of preferred stock increased by \$17 thousand during 2013 due to offering costs associated with the issuance of our Series C Preferred Stock in May 2013.

Liquidity and Capital Resources

Since our inception, we have incurred net losses and negative cash flows from our operations. We incurred net losses of \$15.6 million and \$23.3 million for the years ended December 31, 2012 and 2013, respectively, and \$16.3 million and \$36.4 million for the nine months ended September 30, 2013 and 2014, respectively. Net cash used in operating activities was \$13.7 million and \$26.7 million during the nine months ended September 30, 2013 and 2014, respectively. At September 30, 2014, we had an accumulated deficit of \$118.7 million, working capital of \$65.6 million and cash and cash equivalents of \$72.2 million. Historically, we have financed our operations principally through private placements of preferred stock. In January 2014, we completed our IPO. Through September 30, 2014, we have received net proceeds of \$180.0 million from the issuance of preferred and common stock, including pursuant to the exercise of options and warrants.

Table of Contents**Cash Flows**

The following table summarizes our cash flows for the years ended December 31, 2012 and 2013 and the nine months ended September 30, 2013 and 2014:

	Year Ended December 31,	
	2012	2013
	(in thousands)	
Net cash (used in) provided by:		
Operating activities	\$ (14,805)	\$ (24,239)
Investing activities	(21)	(140)
Financing activities	4,505	55,606
Net (decrease) increase in cash and cash equivalents	\$ (10,321)	\$ 31,227

	Nine Months Ended September 30,	
	2013	2014
	(in thousands)	
Net cash (used in) provided by:		
Operating activities	\$ (13,687)	\$ (26,730)
Investing activities	(78)	(422)
Financing activities	55,010	61,411
Net increase in cash and cash equivalents	\$ 41,245	\$ 34,259

Net cash used in operating activities

Net cash used in operating activities was \$24.2 million for the year ended December 31, 2013 and consisted primarily of a net loss of \$23.3 million partially offset by noncash increases of \$1.5 million and a \$2.5 million decrease related to the change in operating assets and liabilities. The noncash increases were primarily attributable to depreciation and amortization related to leasehold improvements and capital equipment, the increase in the fair value of stock options and the revaluation of warrant liability. The significant factors that contributed to the change in operating assets and liabilities included an increase in prepaid expenses and other assets of \$3.8 million, partially offset by increases in accounts payable and accrued expenses of \$1.2 million. The increase in prepaid expenses and other assets was primarily due to expenses incurred in connection with planning for our IPO and costs that were prepaid in association with the initiation of the Phase 2b clinical trial for TRV027. The increase in accounts payable and accrued expenses was primarily due to the timing of our payment of costs related to ongoing development of our product candidates.

Net cash used in operating activities was \$14.8 million for the year ended December 31, 2012 and consisted primarily of a net loss of \$15.6 million, partially offset by noncash increases of \$1.0 million. The noncash increases were primarily attributable to depreciation and amortization expenses on leasehold improvements and laboratory equipment.

Net cash used in operating activities was \$26.7 million for the nine months ended September 30, 2014, consisting primarily of a net loss of \$36.4 million partially offset by noncash adjustments of \$2.0 million and changes in operating assets and liabilities of \$7.7 million. The noncash

adjustments were primarily attributable to increased expense associated with stock options granted and depreciation and amortization related to leasehold improvements and capital equipment partially offset by a gain recognized on the revaluation of the warrant liability. Changes in operating assets and liabilities were driven by a decrease in prepaid expenses and other assets of \$3.0 million and an increase in accounts

Table of Contents

payable and accrued expenses of \$4.7 million. The decrease in prepaid expenses and other assets was primarily due to prepaid IPO costs incurred in 2013 partially offset by prepaid expenses in 2014 related to the initiation of the Phase 2b clinical trial for TRV027 and the Phase 2a/b clinical trial for TRV130. The increase in accounts payable and accrued expenses was primarily due to the timing and volume of our payment of costs related to ongoing development of our product candidates.

Net cash used in operating activities was \$13.7 million for the nine months ended September 30, 2013 and consisted primarily of a net loss of \$16.3 million, partially offset by noncash adjustments of \$2.4 million primarily attributable to depreciation and amortization expenses on leasehold improvements and laboratory equipment, expense associated with stock options and the revaluation of the warrant liability.

Net cash used in investing activities

Net cash used in investing activities for the years ended December 31, 2013 and 2012 was \$140 thousand and \$21 thousand, respectively, and consisted primarily of expenditures related to leasehold improvements and the purchase of capital equipment.

Net cash used in investing activities for the nine months ended September 30, 2014 and 2013 was \$422 thousand and \$78 thousand, respectively, and consisted primarily of expenditures related to leasehold improvements and the purchase of capital equipment.

Net cash provided by financing activities

Net cash provided by financing activities was \$55.6 million for the year ended December 31, 2013, which was primarily due to \$59.9 million in net proceeds from the issuance of preferred stock and \$550 thousand in proceeds from the exercise of preferred stock warrants partially offset by \$4.9 million in repayments of a bank loan facility.

Net cash provided by financing activities was \$4.5 million for the year ended December 31, 2012, which was primarily due to net borrowings under the Comerica loan facility.

Net cash provided by financing activities was \$61.4 million for the nine months ended September 30, 2014, which was primarily due to net proceeds from the issuance of common stock in our IPO and net proceeds from our initial borrowing under our term loan agreement on September 19, 2014 with Oxford Finance LLC and Square 1 Bank.

Net cash provided by financing activities was \$55.0 million for the nine months ended September 30, 2013, resulting primarily from proceeds from the issuance of the Series C Convertible Preferred Stock.

Operating and Capital Expenditure Requirements

We have not achieved profitability since our inception and we expect to continue to incur net losses for the foreseeable future. We expect our cash expenditures to increase in the near term as we fund our Phase 2 clinical trials of TRV027 and TRV130, our Phase 3 clinical trials of TRV130 and our clinical development of TRV734, as well as for our continuing preclinical activities. As a result of our IPO, we are a publicly traded company and incur significant legal, accounting and other expenses that we were not required to incur as a private company. In addition, the Sarbanes-Oxley Act, as well as rules adopted by the SEC and the NASDAQ Stock Market, require public companies to implement specified corporate governance practices that were inapplicable to us as a private company. These rules and regulations have increased our legal and financial compliance costs and make some activities more time-consuming and costly.

Table of Contents

We believe that the net proceeds from this offering, our existing cash and cash equivalents and the \$16.5 million we believe we have met the conditions to draw under the second tranche of our credit facility, together with interest thereon, will be sufficient to fund our operations through the fourth quarter of 2016. However, we anticipate that we will need to raise substantial additional financing in the future to fund our operations. To meet these additional cash requirements, we may seek to sell additional equity or convertible securities that may result in dilution to our stockholders. If we raise additional funds through the issuance of convertible securities, these securities could have rights senior to those of our common stock and could contain covenants that restrict our operations. There can be no assurance that we will be able to obtain additional equity or debt financing on terms acceptable to us, if at all. Our future capital requirements will depend on many factors, including:

- the progress and results of the Phase 2 clinical program for TRV130;
- whether Actavis exercises its option to license TRV027;
- our ability to enter into collaborative agreements for the development and commercialization of our product candidates, for example TRV734;
- the number and development requirements of any other product candidates that we pursue;
- the scope, progress, results and costs of researching and developing our product candidates or any future product candidates, both in the United States and in territories outside the United States;
- the costs, timing and outcome of regulatory review of our product candidates or any future product candidates, both in the United States and in territories outside the United States;
- the costs and timing of future commercialization activities, including product manufacturing, marketing, sales and distribution, for any of our product candidates for which we receive marketing approval;
- any product liability or other lawsuits related to our products;
- the expenses needed to attract and retain skilled personnel;
- the revenue, if any, received from commercial sales of our product candidates for which we receive marketing approval; and
- the costs involved in preparing, filing and prosecuting patent applications, maintaining and enforcing our intellectual property rights and defending our intellectual property-related claims, both in the United States and in territories outside the United States.

Please see "Risk Factors" for additional risks associated with our substantial capital requirements.

Contractual Obligations and Commitments

The following is a summary of our long-term contractual cash obligations as of December 31, 2013:

Total	Less than 1 Year	1 - 3 Years	3 - 5 Years	More than 5 Years
(in thousands)				

Edgar Filing: TREVENA INC - Form S-1/A

Operating lease obligations(1)	\$	1,055	\$	226	\$	829	\$	\$
Total contractual obligations	\$	1,055	\$	226	\$	829	\$	\$

(1) Operating lease obligations reflect our obligation to make payments in connection with the lease for our office space.

Table of Contents

Purchase Commitments

We have no material non-cancelable purchase commitments with contract manufacturers or service providers as we have generally contracted on a cancelable basis.

Option and License Agreements and Other Commitments

For a description of our agreement with Actavis, see " Option and License Agreement with Actavis plc" above.

In addition, in the course of normal business operations, we have agreements with contract service providers to assist in the performance of our research and development and manufacturing activities. We can elect to discontinue the work under these agreements at any time. We could also enter into additional collaborative research, contract research, manufacturing and supplier agreements in the future, which may require upfront payments and even long-term commitments of cash.

Off-Balance Sheet Arrangements

We do not have any off-balance sheet arrangements, as defined by applicable SEC regulations.

Quantitative and Qualitative Disclosures about Market Risk

We are exposed to market risks in the ordinary course of our business. These market risks are principally limited to interest rate fluctuations. We had cash and cash equivalents of \$38.0 million as of December 31, 2013 and \$72.2 million as of September 30, 2014, consisting of cash and money market mutual funds that invest substantially all of their assets in U.S. government securities. The primary objective of our investment activities is to preserve principal and liquidity while maximizing income without significantly increasing risk. We do not enter into investments for trading or speculative purposes. Due to the short-term nature of our investment portfolio, we do not believe an immediate 10% increase in interest rates would have a material effect on the fair market value of our portfolio, and accordingly we do not expect our operating results or cash flows to be materially affected by a sudden change in market interest rates.

We contract with contract research organizations, clinical research organizations and contract manufacturers globally. We may be subject to fluctuations in foreign currency rates in connection with some of these agreements. To date, we have not incurred material effects from foreign currency changes on these contracts. Transactions denominated in currencies other than the U.S. dollar are recorded based on exchange rates at the time such transactions arise.

Table of Contents

BUSINESS

Overview

We are a clinical stage biopharmaceutical company that discovers, develops and intends to commercialize therapeutics that use a novel approach to target G protein coupled receptors, or GPCRs. Using our proprietary product platform, we have identified and advanced three differentiated product candidates into the clinic as follows:

TRV130: We recently announced top-line data from our Phase 2a/b clinical trial of TRV130 in postoperative pain. At doses of 2 mg and 3 mg of TRV130 administered every three hours, the trial achieved its primary endpoint of statistically greater pain reduction than placebo for 48 hours, which we believe demonstrates proof of concept for TRV130. The 3 mg dose of TRV130 also showed statistically superior analgesic efficacy over the 48-hour trial period compared to 4 mg of morphine administered every four hours. Additionally, in the first three hours of dosing, when pain was most severe, the 1 mg, 2 mg and 3 mg doses of TRV130 demonstrated superior analgesic efficacy in the trial compared to placebo, and the 2 mg and 3 mg doses of TRV130 demonstrated superior analgesic efficacy compared to 4 mg of morphine. There were no serious adverse events reported in the trial, which we believe suggests that these levels of pain relief can be achieved safely. Over the 48-hour trial period, the tolerability of TRV130 at doses of 2 mg and 3 mg administered every three hours was similar to that of 4 mg of morphine administered every four hours. Based on these data, we plan to move into Phase 3 preparations, which we expect to occur in parallel with a second Phase 2 trial for TRV130 that we plan to commence in December 2014. We also anticipate that we will initiate a Phase 3 clinical trial for TRV130 in the first quarter of 2016. These data complement the data generated in our Phase 1b trial, in which TRV130 showed superior efficacy with an improved tolerability profile following a single dose of TRV130 relative to a 10 mg dose of morphine in a human evoked-pain model. We hold a U.S. patent covering the composition of matter and methods of use for TRV130. We have retained all worldwide development and commercialization rights to TRV130, and plan to commercialize it in acute care markets such as hospitals and ambulatory surgery centers if it receives regulatory approval.

TRV734: We have completed a first Phase 1 single ascending dose clinical trial for TRV734, an oral follow-on to TRV130 for the treatment of moderate to severe acute and chronic pain. We have completed enrollment in a second Phase 1 multiple ascending dose clinical trial and expect to report data from this trial early in the first quarter of 2015. We have retained all worldwide development and commercialization rights to TRV734.

TRV027: We have completed a Phase 2a clinical trial and in early 2014 we initiated a Phase 2b clinical trial of TRV027 for acute heart failure, or AHF. Enrollment in this trial is ongoing, with over 250 patients recruited out of planned enrollment of approximately 500 patients. More than 65 sites in 12 countries are now open and recruiting, and we expect patient enrollment will conclude in the third quarter of 2015. We expect to report top-line data from this trial in the fourth quarter of 2015. Actavis plc, or Actavis, has the exclusive option to license TRV027 from us. We plan for TRV027 to be commercialized in the acute care hospital market if it receives regulatory approval.

We also have identified a new product candidate, TRV250, from our preclinical δ -opioid receptor program focused on central nervous system, or CNS, indications and plan to advance TRV250 to preclinical studies in 2015 that would support our submission of an investigational new drug application, or IND, to the U.S. Food and Drug Administration, or FDA.

Table of Contents

Our Pipeline

Our Platform

GPCRs are a large family of cell surface receptors that trigger two signaling pathways, G protein and β -arrestin, and are implicated in cellular function and disease processes. More than 30% of all currently marketed therapeutics target GPCRs. Currently available therapeutics that target GPCRs, or GPCR ligands, are typically not signal specific, and therefore either inhibit both the G protein and β -arrestin pathways (an antagonist ligand) or activate both pathways (an agonist ligand). This lack of signal specificity often results in a suboptimal therapeutic profile for these drugs because in many cases one of the pathways is associated with a beneficial therapeutic effect and the other is associated with limiting that benefit or with an undesirable side effect (see Figure 1). We use our proprietary Advanced Biased Ligand Explorer, or ABLE, product platform to identify "biased" ligands, which are compounds that activate one of the two signaling pathways of the GPCR while inhibiting the other (see Figure 2). This signaling specificity is the basis for our drug discovery and development approach, which is to identify selective GPCR biased ligands and develop them into differentiated clinical products. While some GPCRs trigger other signaling pathways in addition to G protein and β -arrestin, most GPCRs trigger those two pathways.

Our ABLE product platform is a collection of proprietary biological information, *in vitro* assays, know-how and expertise that we use to identify unique GPCR-targeted biased ligands with attractive pharmaceutical properties. *In vitro* assays are laboratory tests performed outside of a living organism. Our *in vitro* assays use cells that have the receptor of interest on the cell surface, where G protein and β -arrestin signaling from that receptor can be measured to determine if a particular ligand is biased, and if so whether it is a G protein or β -arrestin biased ligand. Our assays can also measure different cellular responses resulting from signaling through β -arrestin and can thereby help us to associate pharmacological responses with molecular signaling. Most components of our ABLE product platform are maintained as trade secrets, but the output of the product platform is reflected in the product candidates that we have advanced into clinical testing and the research we have published in numerous peer-reviewed journals. We believe that our ABLE product platform provides us with an important competitive advantage in identifying further opportunities for efficient and high-impact biased ligand drug discovery, development and commercialization.

We were founded in late 2007 to discover and develop product candidates based on biased ligands, a concept discovered by our scientific founder, Dr. Robert Lefkowitz, who was awarded the 2012 Nobel Prize in Chemistry in part for his elucidation of the multiple pathways that a GPCR engages. We believe that we are the first company to progress a GPCR biased ligand into clinical trials. The

Table of Contents

members of our executive management team have held senior positions at leading pharmaceutical and biotechnology companies and possess substantial experience across the spectrum of drug discovery, development and commercialization.

Figure 1: Mechanism of current GPCR-targeted drugs

Figure 2: Mechanism of our biased ligands the next generation of GPCR-targeted drugs

Our Strategy

Our goal is to build a leading biopharmaceutical company leveraging our expertise in biased ligands to develop and commercialize innovative, best-in-class drugs targeting established GPCRs. Key elements of our business strategy to achieve this goal are to:

Rapidly advance clinical development of our three lead product candidates to commercialization.

We plan to develop and commercialize TRV130 for the treatment of moderate to severe acute postoperative pain and other indications where intravenous, or IV, therapy is preferred. Specific uses could include the treatment of pain related to surgery as well as nonsurgical settings like severe burn or end-of-life care facilities. The efficacy of drugs targeting the μ -opioid receptor is well-established. We have announced top-line data from our Phase 2a/b trial of TRV130 in postoperative pain in which we observed statistically significant analgesic efficacy

compared to placebo and evidence for beneficial

Table of Contents

differentiation from a benchmark dose of morphine. We also plan to initiate a second Phase 2 clinical trial for TRV130 in December 2014 in a soft tissue surgery model to further inform Phase 3 development and to further evaluate the potential for an improved therapeutic profile compared to morphine.

We plan to develop TRV734 for oral use in moderate to severe acute and chronic pain. We intend to seek a collaborator with experience in developing and commercializing controlled-substance therapeutics in acute and chronic care pain markets while retaining rights to commercialize TRV734 in hospital surgical settings in the United States. We completed our first Phase 1 clinical trial, in which we observed bioavailability and CNS activity of TRV734 after oral dosing, and we have completed enrollment in a second Phase 1 trial to support Phase 2 development. We expect to report data for the second trial early in the first quarter of 2015.

We plan to complete our Phase 2b clinical trial for TRV027 for the treatment of AHF by the end of 2015. If this trial is successful and Actavis exercises its option, Actavis will be responsible for all costs associated with further development and commercialization of TRV027. If the option is exercised, we will be entitled to an upfront option exercise fee and certain contingent milestone payments and royalties, which we intend to use to further develop and potentially commercialize our proprietary portfolio.

Establish commercialization and marketing capabilities in the United States, initially in acute care markets, for any of our product candidates that are approved or that we anticipate may be approved.

If any of our products beyond TRV027 receive or are anticipated to receive regulatory approval, we intend to build a focused sales force and establish marketing capabilities to commercialize those products to specialists in the United States, initially in acute care settings such as hospitals and ambulatory surgery centers.

We intend to retain full commercialization rights in the United States for TRV130. After the availability of Phase 2 clinical data for TRV130, we may seek collaborators for commercializing TRV130 outside the United States to offset risk and preserve capital.

For TRV734, we intend to seek a collaborator with experience in developing and commercializing controlled-substance therapeutics in acute and chronic care pain markets, thereby leveraging their expertise while retaining rights to commercialize TRV734 in hospital surgical settings and other settings where we may commercialize TRV130 in the United States.

If Actavis exercises its option to license TRV027, Actavis will be responsible for commercialization of TRV027 worldwide. We have the option to negotiate with Actavis for co-promotion rights in the United States, although Actavis has no obligation to grant us any co-promotion rights. We expect that TRV027, if approved, would be used primarily in the acute care setting, thereby providing an opportunity to leverage the commercial infrastructure we plan to implement to market our other product candidates, if any of them are approved.

Expand our CNS product portfolio by advancing TRV250, our δ -opioid receptor product candidate.

We aim to develop TRV250, which we believe will be the first selective δ -opioid receptor-targeted therapeutic for the treatment of CNS disorders. Based on the initial profile of TRV250, we anticipate focusing our initial development efforts on treatment-refractory migraine headaches. According to Decision Resources, a healthcare consulting company, the acute episodic migraine market encompassed approximately 12 million drug-treated patients in 2013 in the United States, representing approximately \$2.2 billion of sales. We estimate that approximately 20% to 30% of these patients either do not respond to or cannot tolerate the market-leading triptan drug class and an additional 30% would benefit from improved efficacy compared to these drugs.

Table of Contents

We believe TRV250 also may have utility in other CNS areas such as depression, Parkinson's disease or neuropathic pain. We intend to conduct preclinical work beginning in 2015 designed to support the filing of an IND for TRV250. We also intend to seek a collaborator for TRV250 with CNS development and worldwide commercialization expertise, while potentially retaining commercialization rights in the United States.

Leverage our ABLE product platform to continue to discover and develop a pipeline of innovative biased ligand therapeutics and expand our product platform's impact through external collaborations.

We have used our ABLE product platform to identify four potential therapeutics targeting GPCRs and have also identified additional high-value GPCR targets. As part of our longer term strategy, we plan to initiate internal drug discovery efforts in indications characterized by significant unmet medical need. We also intend to selectively collaborate on discovery and development programs to leverage the potential of our ABLE product platform.

CNS Portfolio

TRV130

TRV130 is a small molecule G protein biased ligand at the μ -opioid receptor, which we are developing as a first-line treatment for patients experiencing moderate to severe acute pain where IV administration is preferred. TRV130 activates the μ -opioid receptor G protein pathway, which in preclinical studies was associated with analgesia, and inhibits the β -arrestin pathway at the same receptor, which in preclinical studies was associated with limiting opioid analgesia and with promoting opioid-induced respiratory depression and constipation. Given its pharmacokinetic, tolerability and efficacy profile in our Phase 1 and Phase 2a/b trials, we believe that both the inpatient and outpatient settings could be appropriate for TRV130 use. The current focus of our clinical trials is on surgical patients. We believe offering superior analgesia or reducing the adverse side effects typically associated with the activation of the μ -opioid receptor will position TRV130, if approved, to more effectively treat moderate to severe acute pain than currently available μ -opioid therapies. We have an issued U.S. patent that covers TRV130, compositions comprising TRV130 and methods of using TRV130 and this patent is expected to expire no earlier than 2032.

Disease

According to data from IMS Health, in 2013 there were approximately 47 million hospital inpatient stays and outpatient visits during which reimbursement claims for injectable opioids were made, 20 million of which involved a surgical procedure. In terms of the total potential market opportunity, the World Health Organization estimates that over 230 million major surgical procedures are performed each year worldwide. According to Life Science Intelligence, a market research firm, over 30 million inpatient surgical procedures and 42 million outpatient or ambulatory surgical procedures were performed in the United States in 2013. According to the European Commission, about 30 million hospital inpatient surgeries are performed collectively in France, Germany, the United Kingdom, Italy and Spain each year. Accordingly, we believe that there is a large potential commercial opportunity for TRV130 in the treatment of surgical pain, if approved.

Treatment options for moderate to severe, acute postoperative pain

The typical treatment paradigm in developed markets for management of moderate to severe, acute postoperative pain is to initiate injectable or IV pain medication in the preoperative or immediate postoperative period to provide rapid and effective pain relief. As soon as it is safe and practical, a transition is typically made to oral pain medication, allowing patients to take medication home with them.

Table of Contents

Opioid analgesics like morphine, fentanyl and hydromorphone are mainstays of pain treatment in the immediate postoperative period. Despite the development and adoption of guidelines for the management of postoperative pain and the extensive use of current treatments, significant unmet need remains. In a 2012 survey of 300 surgical patients in the United States, over 80% of patients reported postoperative pain after the first analgesic medication had been administered, and 40% of this pain was reported to be moderate or severe. The effectiveness of currently available μ -opioid agonists is limited in part because their doses are limited by severe side effects such as respiratory depression, nausea and vomiting, constipation and postoperative ileus, or POI, which is a condition that most commonly occurs after surgery involving interruption of movement of the intestines in which the bowel enters spasm and stops passing food and waste.

A recent survey we conducted in a sample of 72 U.S. surgeons and anesthesiologists suggests that the most important attribute driving physicians' choice of an IV opioid is analgesic efficacy. In the same survey, respondents stated that injectable non-opioid analgesics are currently used to supplement IV opioids for post-surgical pain management in about 60% of hospital inpatient cases. These drugs, such as IV non-steroidal anti-inflammatory drugs, or NSAIDs, IV acetaminophen or local anesthetics such as bupivacaine, have their own potential side effects in the cardiovascular and gastrointestinal, or GI, systems as well as the liver. We estimate that recently introduced branded versions of these drugs can add \$50 to \$300 per patient per day to the cost of managing patients with moderate to severe postoperative pain in the United States.

None of these non-opioid analgesic approaches has displaced the use of opioid analgesics as the cornerstone of IV therapy for acute moderate to severe pain. However, the level of analgesic efficacy achievable with opioid medicines is limited as a result of dose-limiting side effects. Opioid-related side effects, including respiratory depression, nausea and vomiting, and constipation, can limit opioid dosing and may contribute to inadequate pain relief reported by patients and physicians with currently prescribed opioids:

Morphine, fentanyl and hydromorphone are all associated with reduced respiratory rate and reduced tidal volume, which is the amount of air inhaled or exhaled in a single breath. Although serious complications or deaths from opioid-induced respiratory depression are rare, with our estimate being about 80,000 cases per year in U.S. hospitals, fear of respiratory depression represents a major barrier to the effective use of opioids in the management of postoperative pain because physicians are cautious about increasing dose. We believe this contributes to the limited effectiveness of pain relief with current IV opioids.

In several published surveys, patients faced with surgery list the avoidance of postoperative nausea and vomiting, or PONV, as a leading concern. PONV occurs in approximately one third of surgical patients following treatment with IV opioids. We believe that there are over 5 million cases of opioid-induced PONV annually in U.S. hospitals for inpatients alone. The constipating effects of opioid drugs are also problematic and costly for surgical patients, who are typically not considered ready for discharge until they have had a meal or a bowel movement. POI is a condition in which the bowel enters spasm and stops passing food and waste, which most commonly occurs after surgery involving interruption of movement of the intestines. POI is exacerbated by anesthetics and opioid analgesics, and occurs in at least 10% of patients following invasive abdominal procedures. We believe that opioid-induced PONV, opioid-induced constipation, and POI together add approximately \$5 billion to the cost of hospital inpatient post-surgical recovery in the United States annually.

Key differentiating attributes of TRV130

We believe that TRV130 may offer several potential advantages over existing opioid treatments for postoperative pain, any of which may contribute to higher levels of pain relief for TRV130 compared to these drugs. These potential advantages are as follows:

Table of Contents**Efficacy**

Highly effective. Based on top-line data from our Phase 2a/b clinical trial of TRV130 for treatment of postoperative pain following bunionectomy, a 3mg dose of TRV130 administered every three hours showed statistically superior analgesic efficacy over the 48-hour trial period compared to 4 mg of morphine administered every four hours. Additionally, 2mg and 3mg doses of TRV130 demonstrated statistically superior analgesic efficacy compared to 4 mg of morphine in the first three hours of dosing, when pain was most severe. There were no serious adverse events reported in the trial, which we believe suggests that these levels of pain relief can be achieved safely. Over the 48-hour trial period, the tolerability of TRV130 at doses of 2 mg and 3 mg administered every three hours was similar to that of 4 mg of morphine administered every four hours. At the highest dose tested, TRV130 was associated with a mean change from baseline pain score of approximately seven (severe pain) to approximately one (mild pain) by the first data collection point five minutes after dosing. By contrast, a standard dose of morphine was associated with a change from the same baseline to a score of approximately five (moderate pain). These data are complementary to data from our Phase 1b trial in healthy subjects using an evoked-pain model, in which 3 mg of TRV130 showed superior analgesia compared to a 10 mg dose of morphine and produced less respiratory depression, less severe nausea and less frequent vomiting compared to morphine. If future pivotal trials of TRV130 continue to provide evidence of an improved therapeutic profile with respect to key safety and tolerability concerns, we believe that TRV130, if approved, may represent an improvement over unbiased μ -opioid agonists, which are the current standard of care.

Fast acting. In preclinical studies, TRV130 delivered maximal efficacy at only five minutes after dosing. In our Phase 1 clinical trial, we also observed full pharmacodynamic response in the form of pupil constriction in humans at ten minutes after dosing. Pupil constriction is a well-established biomarker for the analgesic efficacy of opioid drugs. We also observed full analgesic effect in the Phase 1b evoked-pain model at the first practical data collection point of 10 minutes after dosing, and in our Phase 2a/b postoperative pain trial we observed maximum analgesia five to 15 minutes after dosing. If our pivotal clinical trials confirm this rapid time to peak effect, we believe the market potential of TRV130, if approved, could be broadened into the peri-operative pain market where fentanyl is commonly used today.

Drug safety and tolerability

Reduced respiratory depression risk. In a Phase 1b clinical trial in healthy subjects using an evoked-pain model, TRV130 showed less respiratory depression compared to a 10 mg dose of morphine and delivered superior analgesia. In a preclinical proof of concept study, TRV130 showed less respiratory depression at equivalent analgesic doses compared to morphine.

Reduced PONV. In our Phase 1b clinical trial in healthy subjects using an evoked-pain model, subjects treated with TRV130 showed less severe nausea and less frequent vomiting at a dose eliciting greater analgesia compared to a high dose of morphine. This was consistent with our Phase 1 data in which TRV130 showed no nausea or vomiting at doses eliciting equivalent or greater pupil constriction compared to high doses of morphine or fentanyl that would be expected to result in a 20% to 30% incidence of nausea and vomiting. A reduction in PONV, if supported by future clinical trials, would be a meaningful advantage for physicians, patients and payors.

Reduced POI and constipation. If we are able to demonstrate its safety and efficacy in clinical trials, in the absence of negative GI side effects, we believe TRV130, if approved, would be an attractive treatment option for patients. In preclinical studies, TRV130 caused

Table of Contents

significantly less constipation compared to morphine at doses delivering equivalent analgesia. If these potential benefits translate to the clinical setting, and TRV130 is approved, we believe it could offer the possibility of meaningful cost savings to hospitals.

Clinical experience

We have had an active IND for TRV130 for moderate to severe acute pain with the FDA since January 2012. Since then, we have completed our Phase 2 a/b clinical trial of TRV130 in postoperative pain in 333 patients, four other clinical trials in 121 healthy subjects and one part of a two-part multiple-ascending dose trial in healthy volunteers, the second part of which is ongoing. These trials include:

Phase 2a/b trial of TRV130 in acute postoperative pain following bunionectomy.

The aim of our Phase 2a/b clinical trial was to evaluate TRV130's efficacy and tolerability in the management of postoperative pain using morphine as a benchmark. The trial was a multicenter, randomized, double-blind, placebo- and active-controlled, multiple dose, adaptive trial in 333 women and men undergoing a primary unilateral first-metatarsal bunionectomy surgery at four sites in the United States. Patients were randomized after surgery to receive TRV130, morphine or placebo to manage their pain. Pain intensity was measured using validated numeric rating scales ranging from ten (most severe pain) to zero (no pain) at multiple time points up to 48 hours. Based on these scales, analgesic efficacy was assessed with a time-weighted average change in pain score over 48 hours – a well established measure of changes in the intensity of pain over time and an FDA-recommended endpoint for pain studies. The trial was conducted in two parts, with the goal of providing information on efficacy and dose- and interval-ranging and furthering the differentiation of TRV130 compared to morphine. In the first part, a pilot phase, patients were randomized to receive one of four doses of TRV130 (1 mg, 2 mg, 3 mg or 4 mg), morphine or placebo, all given at four hour intervals. In the second part of the trial, an adaptive phase, eight cohorts of approximately 25 patients each were randomized successively to one of two adaptive doses of TRV130 given every three hours, morphine given every four hours, and placebo given every three or four hours in a double-blind, double-dummy fashion. In this adaptive phase, doses of 0.5 mg, 1 mg, 2 mg and 3 mg of TRV130 were evaluated. Rescue medication consisting of acetaminophen or ketorolac was used in all groups. In total, 141 patients were treated in the pilot phase and 192 patients were treated in the adaptive phase. The second part of the trial was originally planned to include ten cohorts of 25 patients each, but after progressing through the pilot phase and eight of the ten planned cohorts in the second phase, we elected to close enrollment in the trial following a pre-specified interim analysis because the trial had met its objectives.

We recently announced top-line data from this trial. At doses of 2 mg and 3 mg of TRV130 administered every three hours, the trial achieved its primary endpoint of statistically greater pain reduction than placebo for 48 hours, which we believe demonstrates proof of concept for TRV130. Over the 48-hour trial period, the 3mg dose of TRV130 administered every three hours also showed statistically superior analgesic efficacy compared to the 4mg dose of morphine administered every four hours. Additionally, in the first three hours of dosing, when pain was most severe, the 1 mg, 2 mg and 3 mg doses of TRV130 demonstrated superior analgesic efficacy in the trial compared to placebo, and the 2 mg and 3 mg doses of TRV130 demonstrated superior analgesic efficacy compared to the 4 mg dose of morphine.

There were no serious adverse events reported in the trial. Both the 2mg and 3 mg doses of TRV130 showed overall tolerability over the 48-hour trial period similar to the 4 mg dose of morphine administered every four hours. Adverse events attributable to TRV130 were largely opioid-related, with the most frequently reported events being dizziness, headache, somnolence, nausea, vomiting, flushing and itching. Adverse effects were generally dose-related.

Table of Contents

These top-line results of the adaptive phase of the trial are summarized in more detail below:

Primary endpoint TRV130 compared to placebo over 48 hours. Over 48 hours, doses of 2 mg and 3 mg of TRV130 administered at three hour intervals achieved statistically more reduction in pain intensity compared to placebo administered at three or four hour intervals. The 2 mg dose of TRV130 reduced the time-weighted average pain score by 1.4 points more than placebo and the 3 mg dose of TRV130 reduced the time-weighted average pain score by 2.4 points more than placebo. These results were statistically significant, with one-sided p-values of 0.0024 and less than 0.0001, respectively, for the 2 mg and 3 mg doses of TRV130. P-value is a conventional statistical method for measuring the statistical significance of clinical results. A p-value of 0.05 or less represents statistical significance, meaning that there is a 1-in-20 or less likelihood that the observed results occurred by chance. The mean baseline pain rating was approximately seven out of ten, a pain level considered severe.

TRV130 compared to morphine over 48 hours. Over 48 hours, 3 mg of TRV130 administered at three hour intervals achieved statistically more reduction in pain intensity compared to 4 mg of morphine administered at four hour intervals, reducing the time-weighted average pain score compared to placebo by 1.0 point more than morphine. This result was statistically significant, with a one-sided p-value of 0.014.

Figure 3 summarizes these results from the adaptive phase of the trial, comparing the least squares mean time-weighted average pain intensity difference over the 48-hour trial period for the four doses of TRV130 and morphine, each compared to placebo.

Figure 3: Pain relief from TRV130 and morphine compared to placebo over 48 hours

TRV130 compared to placebo and morphine over three hours. When study pain was most severe, during the first three hours after the initial dose, TRV130 at 1 mg, 2 mg and 3 mg showed statistically more reduction in pain intensity compared to placebo, reducing the time-weighted average pain score by 1.0 point, 2.4 points and 3.0 points, respectively, more than placebo and with one-sided p-values of 0.021, less than 0.0001 and less than 0.0001, respectively. Likewise, TRV130 at 2 mg and 3 mg showed statistically more reduction in pain intensity compared to 4 mg of morphine, reducing the time-weighted average pain score by 1.2 points and 1.8 points, respectively, more than morphine, with one-sided p-values of 0.0029 and less than 0.0001, respectively. The 3 mg dose of TRV130 achieved a reduction in least squares mean pain intensity of approximately six points, with notable efficacy at five minutes, the first pain intensity assessment after dosing.

Table of Contents

Figure 4 summarizes these results from the adaptive phase of the trial, comparing the mean pain score from one to ten at various measurement points over the first three hours after the initial dose of placebo, 4 mg of morphine or one of the four doses of TRV130.

Figure 4: Pain intensity for TRV130, morphine and placebo over first three study hours

Patient-reported peak pain relief after first dose. Consistent with these findings, more patients reported statistically greater peak pain relief during the first three-hour dosing period for 2 mg and 3 mg doses TRV130 compared to 4 mg of morphine, with p-values of 0.005 and less than 0.0001, respectively. Of patients receiving 1 mg, 2 mg or 3 mg of TRV130, 13%, 31% and 52%, respectively, reported complete peak pain relief during this period compared to 0% and 8% of patients receiving placebo and 4 mg morphine, respectively.

Figure 5 summarizes these results from the adaptive phase of the trial, indicating the percentage of responding patients taking placebo, morphine or one of the four doses of TRV130 reporting various levels of peak pain relief, from no or little relief to complete relief, during the first three-hour dosing period.

Table of Contents

Figure 5: Level of peak pain relief from TRV130, morphine and placebo over first three study hours

The efficacy demonstrated by TRV130 in the first three hours was reproduced upon repeat dosing, leading to sustained differences from placebo at both the 2 mg and 3 mg doses (Figure 6). During the final 24 hours of the trial, pain intensity decreased in patients receiving placebo, which we believe reduced the amount of efficacy that could be measured for TRV130.

Figure 6: Pain intensity for TRV130, morphine and placebo over 48 hours

As noted above, there were no serious adverse events reported in the trial. Adverse events were generally dose-related. Adverse events attributable to TRV130 were largely opioid-related, with the

Table of Contents

most frequently reported events, representing a greater than 10% incidence in any group, being dizziness, headache, somnolence, nausea, vomiting, flushing and itching, as reflected below in Figure 7.

Figure 7: Spontaneously reported opioid-related adverse events

In addition, all four doses of TRV130 showed trends of less respiratory depression than morphine, as measured by oxygen saturation, after three hours following the first dose (hours 0-3) and after 24 hours following the first dose, the last time of oxygen saturation measurement (hours 0-24), as shown in Figure 8.

Figure 8: Change from baseline in oxygen desaturation levels from 0-3 and 0-24 hours

hours 0-3

hours 0-24

Table of Contents

Phase 1b proof of concept exploratory trial in healthy subjects using an evoked-pain model

The aims of this trial were to characterize the analgesic efficacy and safety and tolerability of a single dose of TRV130 as compared to a single 10 mg dose of morphine. We employed a double-blind, five-period crossover design with 30 healthy male subjects each randomized to receive a 2-minute infusion of three dose levels of TRV130 (1.5 mg, 3.0 mg and 4.5 mg), 10 mg of morphine, and placebo in random order. We used an evoked-pain model, the cold pain test, to evaluate the analgesic effects of TRV130. The cold pain test is an established model to evaluate opioid effectiveness. We measured time to hand removal, or latency, from a temperature-controlled cold water bath. We used visual analog scale measurements of nausea and measured respiratory depression through ventilatory response to hypercapnia, another well-known experimental model.

At both the 3.0 mg and 4.5 mg doses, TRV130 showed superior efficacy as compared to a 10 mg morphine dose that was statistically significant with a p-value of less than 0.05 at the ten and 30 minute time points after dosing. The durability of the analgesic effect was similar to morphine as shown in Figure 9. In addition, the time to peak effect was more rapid than morphine.

Overall, TRV130 was well tolerated in the trial. Subjects receiving TRV130 showed less severe nausea and less frequent vomiting at the 1.5 mg and 3.0 mg doses as compared to a 10 mg dose of morphine. TRV130 also showed less respiratory depression compared to morphine, measured as minute volume, or MV, area under the curve over 4 hours as shown in Figure 10. MV is a product of respiratory rate and tidal volume, or the amount of air exhaled in a single breath, and thereby captures the body's ability to expel carbon dioxide. The reduction in respiratory depression was statistically significant as compared to a 10 mg morphine dose with a p-value of less than 0.05 at all TRV130 doses. The 3.0 mg dose of TRV130 therefore demonstrated superior efficacy, less severe nausea, less vomiting and less respiratory depression in this trial as compared to 10 mg morphine, suggesting that TRV130, if approved, may have a better analgesic profile compared to existing unbiased μ -opioid agonists.

Figure 9: Analgesic effect of TRV130 as compared to morphine in an evoked-pain model

Table of Contents

Figure 10: Less respiratory depression with TRV130 as compared to morphine

Three part phase 1 clinical trial in healthy subjects

The primary objectives of this trial were to evaluate the pharmacokinetics and tolerability of TRV130. We also obtained pharmacodynamic data by measuring pupil constriction. At historically efficacious doses, morphine and fentanyl cause approximately 1 to 2 mm of pupil constriction.

Based on the pharmacokinetics data from these trials, we expect TRV130, if approved, could be administered by IV bolus, or continuous infusion, including by way of patient-controlled analgesic device, making it potentially convenient and easy to use for postoperative pain. Specific pharmacokinetic data obtained from these trials is highlighted below:

TRV130 showed a dose-dependent increase in exposure.

In vitro data suggest that TRV130 is metabolized by at least two liver enzymes: CYP2D6 and CYP3A4. Approximately 2% to 21% of the population has low levels of CYP2D6 activity. In Part B of the trial, we evaluated TRV130 in a group of these poor metabolizers in order to understand whether dose adjustments will be required in this group. The maximum TRV130 plasma concentration in this group was in the upper range of that observed in non-poor metabolizers, suggesting that the poor metabolizers should exhibit similar tolerability to non-poor metabolizers. There was a reduction in clearance by approximately 50% in the poor metabolizers suggesting that a lower frequency of dosing may be required to offer effective pain relief.

Reducing infusion time when administering TRV130 as a bolus in Part C of the trial did not significantly alter the exposure, suggesting that TRV130 could be administered as an intermittent bolus infusion without compromising drug exposure.

Table of Contents

Overall, TRV130 was well tolerated. In Part A of the Phase 1 clinical trial, when TRV130 was administered as a one-hour infusion, there was no nausea or vomiting reported at doses up to 4 mg/hr that produced a reduction in pupil diameter of approximately 2.5 mm. When the dose was increased to 7 mg/hr, four subjects receiving TRV130 experienced nausea and four experienced vomiting, thus establishing the non-tolerated dose.

In Part A of this Phase 1 clinical trial in healthy subjects, one subject who received 0.25 mg/hr TRV130 experienced a severe episode of vasovagal syncope during which he fainted and his pulse stopped, which were classified as serious adverse events. He recovered without medical intervention and experienced no known adverse consequences from this event. Certain potential triggers of vasovagal syncope were removed from the trial protocol, and dose escalation proceeded up to 7 mg/hr (28-fold higher than the 0.25 mg/hr dose at which the syncope occurred). No additional vasovagal syncope events were reported in the trial or in any other TRV130 trial.

In Part C of the trial, TRV130 was administered to six subjects with each subject receiving on successive days a 1.5 mg dose with an infusion time of 30 minutes, 15 minutes, five minutes and one minute. TRV130 was well tolerated with pupil constriction of approximately 1 mm. We used these data to design a further intravenous bolus trial as described below to evaluate higher bolus doses.

Phase 1 IV bolus trial

In a follow-up trial with bolus doses of 2.0, 3.0 or 3.5 mg administered over two minutes, TRV130 was well tolerated up to 3.5 mg (the highest dose in the trial). One subject experienced mild nausea when 3.5 mg TRV130 was given. No nausea was reported at the lower doses. When 3.5 mg of TRV130 was administered, pupil diameter decreased by approximately 2 mm from baseline, in line with high-dose morphine or fentanyl.

Phase 1 drug-drug interaction trial

To further explore TRV130's metabolic profile in the clinic, a single dose of TRV130 was administered to healthy subjects in conjunction with ketoconazole, a CYP3A4 inhibitor. TRV130 was safe and generally well-tolerated in the presence of ketoconazole and there was no clinically meaningful change in TRV130 exposure.

Phase 1 two-part multiple ascending dose trial

The first part of this trial evaluated the maximum tolerated dose and pharmacokinetics of TRV130 when multiple doses were given, and also measured pharmacodynamic effects of TRV130, including pupil constriction and cold pain test analgesia. The results of this part of the trial were consistent with earlier trials, showing reproducible pharmacokinetics and pharmacodynamic effects of TRV130. Safety and tolerability of TRV130 were also consistent with earlier trials, and no unexpected adverse effects were observed. The second part of the trial, which is testing the effects of subjects' metabolic capacity on potential duration of action of TRV130, is in progress and we expect to release data from this part of the trial by the end of 2014.

Preclinical studies

In preclinical models, TRV130 showed analgesic efficacy comparable to morphine but reached peak effect more quickly than morphine. Time to peak effect occurred within five minutes for TRV130 compared to 30 minutes for morphine. TRV130 had a significantly improved therapeutic index, compared to morphine, of analgesia to respiratory depression, measured as blood carbon dioxide, or pCO₂, and analgesia to constipation, measured using two GI motility assays. This was consistent with basic research studies in which morphine given to β -arrestin2 knockout mice showed increased analgesia, less respiratory depression and less constipation than morphine given to wild-type mice.

Table of Contents

Clinical development strategy

We believe that the early clinical and preclinical data generated suggest that TRV130 may have superior analgesia with fewer dose-limiting safety and tolerability disadvantages compared to existing opioid analgesics. If confirmed in further trials, we believe that this profile will justify TRV130, if approved, as a preferred opioid analgesic for the intravenous treatment of moderate to severe acute pain.

We are also conducting a Phase 1 clinical trial to explore the safety, tolerability, pharmacokinetics and pharmacodynamics of multiple ascending doses of TRV130 in healthy volunteers. This trial consists of two parts. We have completed the first part of this trial, in which we observed safety, tolerability, pharmacokinetics and pharmacodynamics after repeat-dosing consistent with our expectations from earlier single-dose trials. The second part of the trial, which is testing the effects of subjects' CYP2D6 metabolic capacity on TRV130 potential duration of action, is ongoing.

Separately, we are conducting an additional Phase 1 trial to evaluate the absorption, metabolism and excretion of TRV130 in healthy subjects. This additional Phase 1 trial is ongoing and we expect it to conclude in the first half of 2015.

We expect to initiate a second Phase 2 clinical trial of TRV130 in December 2014 with the goal of evaluating analgesic efficacy following a soft tissue surgery and exploring TRV130's safety and tolerability profile compared to morphine. We expect to report top-line data from this trial in mid-2015. This trial will employ as-needed dosing to broaden dosing information beyond the fixed-interval dosing used in the bunionectomy trial. In this trial, TRV130, morphine or placebo will be administered as an initial loading dose followed by delivery of on-demand doses via a patient-controlled analgesia device. Approximately 200 patients who have undergone uncomplicated, elective abdominoplasty surgery will be enrolled in the trial, with approximately 40 receiving placebo, 80 receiving TRV130 and 80 receiving morphine. The primary endpoint of the trial will be the efficacy of TRV130 compared to placebo over 24 hours, which may serve as a registration endpoint in Phase 3 development. In parallel with the Phase 2 abdominoplasty clinical trial, we intend to commence Phase 3 preparations for TRV130, with the goal of initiating our first of two Phase 3 clinical trials in the first quarter of 2016. We expect that the Phase 2 abdominoplasty trial, if the data are promising, along with data from the Phase 2a/b clinical trial of treatment of postoperative pain following bunionectomy, would support Phase 3 development in soft and hard tissue pain, which we believe would be required by the FDA for approval of TRV130 for broad use in moderate to severe pain. In addition, we plan to complete other clinical trials that would support Phase 3 clinical development. Core pivotal studies in the Phase 3 program could closely resemble the Phase 2 trials, with additional trials exploring the therapeutic potential more broadly. This approach may enable an NDA for a broad acute moderate to severe pain label and may also guide commercial positioning.

We plan to initially target TRV130 for the treatment of moderate to severe, acute postoperative pain where IV administration is preferred. If our trials for this indication are successful, we believe there may be additional opportunities to expand the target indications in subsequent trials. Other potential patient populations for the eventual use of TRV130 include perioperative use (including sustained dosing for the most painful surgery types); non-surgical hospitalized patients such as burn victims (including debridement); end-of-life palliative care; emergency service trauma care; renal stones; sickle cell crises and military applications. We may also explore other dosage forms, such as transmucosal or transdermal administration for breakthrough or chronic pain, respectively, in additional separate trials.

Commercialization

We plan to develop and commercialize TRV130 for IV administration ourselves, if approved. We intend to build acute care commercial capabilities, initially in the United States, and to retain full U.S. rights. In the United States, sales of injectable analgesics have increased by more than 70% between

Table of Contents

2011 and 2013 to approximately \$660 million, according to IMS health. We may seek collaborators for commercializing TRV130 outside the United States after the availability of full Phase 2 data to offset risk and preserve capital.

Manufacturing

We have carried out TRV130 drug substance synthesis, performed by a third party, at a scale up to 2 kg per batch. Phase 3 synthetic process development and regulatory compliance studies are in progress. Currently we manufacture drug substance and drug product, both with third parties, at single sites, but we plan to qualify additional sites in connection with any Phase 3 trials.

Competition

If TRV130 is approved for IV treatment of moderate to severe acute pain, it will compete with widely used, currently marketed opioid analgesics, such as morphine, hydromorphone and fentanyl. The effectiveness of these agents is limited by well-known adverse side effects, such as respiratory depression, nausea and vomiting, constipation and POI. TRV130 may also compete against Ofirmev, marketed by Mallinckrodt plc, and Exparel, marketed by Pacira Pharmaceuticals, Inc., which are reformulations of existing products and are typically used in combination with opioids.

We are aware of a number of products in development that are aimed at improving the treatment of moderate to severe, acute postoperative pain while reducing undesirable side effects. The most advanced product candidates are reformulations of existing opioids, such as a fentanyl ionophoresis patch, in development by The Medicines Company, and sufentanil nanotab, in development by AcclRx. In addition, Cara Therapeutics Inc. is developing an IV and oral peripherally restricted κ -opioid receptor agonist, which will likely be used in combination with opioids.

Intellectual property

Our TRV130 patent portfolio is wholly owned by us. The portfolio includes one issued U.S. Patent, which claims among other things, TRV130, compositions comprising TRV130 and methods of using TRV130. The portfolio also includes one pending U.S. patent application claiming TRV130, other compounds and/or methods of making or using the same. If issued, the pending U.S. application is predicted to expire no earlier than 2032, subject to any disclaimers or extensions. A related Patent Cooperation Treaty, or PCT, application was filed and national patent applications have been filed in South Korea, the European Patent Office, the Eurasian Patent Office, Australia, Brazil, Canada, Israel, India, Japan, China, and New Zealand. Any patents resulting from these national patent applications, if issued, are expected to expire no earlier than 2032, subject to any disclaimers or extensions.

TRV734

TRV734 is a small molecule G protein biased ligand at the μ -opioid receptor, which we are developing as a first-line, orally administered compound for the treatment of moderate to severe acute and chronic pain. Like TRV130, TRV734 takes advantage of a well-established mechanism of pain relief by targeting the μ -opioid receptor, but does so with enhanced selectivity for the G protein signaling pathway, which in preclinical studies was linked to analgesia, as opposed to the β -arrestin signaling pathway, which in preclinical studies was associated with side effects. Subject to successful preclinical and clinical development and regulatory approval, we believe TRV734 may have an improved efficacy and side effect profile as compared to current commonly prescribed oral analgesics, such as oxycodone. We have filed patent applications covering TRV734 and methods of using TRV734.

Data from IMS Health show that opioid drug sales across the United States, Europe and Japan were approximately \$11 billion in 2013. Despite widespread use, there are significant limitations to existing therapies with respect to efficacy, constipation, nausea and vomiting and respiratory depression. Dose-limiting side-effects may translate into inadequate pain control. The constipating effects of chronic opioids are particularly problematic because they do not lessen over time, while efficacy does

Table of Contents

tend to reduce over time for a particular dose level. Numerous approaches have been attempted to mitigate constipation. Laxatives, peripherally restricted opioid antagonists, such as naloxegol, methylnaltrexone and alvimopan, and multimodal analgesia, such as the opioid/SNRI tapentadol, are only partially effective and can raise problematic new side effects in an attempt to mitigate the adverse effects of opioid analgesics. Based on the very large market and substantial limitations confronting current analgesics, we believe a new opioid with a more precisely targeted mechanism of action and an improved therapeutic profile could provide a significant product opportunity in the acute and chronic pain markets.

Clinical experience

We have had an active IND for TRV734 since January 2014. In 2014, we completed our first Phase 1 trial of TRV734, which tested single ascending doses and the relative bioavailability of oral TRV734 in healthy subjects. In this trial, we observed that TRV734 was pharmacologically active at a range of safe and well-tolerated doses. We believe that the data from this trial suggest that TRV734 provides dose-related exposure, speed of onset, and duration of action suitable for treating moderate to severe acute pain. TRV734 elicited dose-related increases in plasma concentrations, with peak plasma concentrations reached approximately one hour after dosing and a terminal half-life consistent with use for treating acute pain. Pupil constriction indicative of analgesia was observed at doses of 80 mg and higher, and mild-to-moderate adverse effects were reported at the maximum explored dose of 250 mg. We believe this suggests that the analgesic efficacy of TRV734 may be separable from opioid-related adverse effects. No clinically significant changes in vital signs, laboratory values or ECG parameters, and no severe or serious adverse events, were reported.

Preclinical data

TRV734 has shown a similar profile to TRV130 in *in vitro* and *in vivo* studies. It is highly selective for the μ -opioid receptor, where, like the most powerful opioid analgesics, it is a strong agonist of G protein coupling. TRV734 is distinct from those analgesics in its very weak recruitment of β -arrestins to the μ -opioid receptor. In our preclinical studies, TRV734 showed analgesic effects in preclinical pain models similar to oxycodone and morphine. In the same studies, TRV734 caused less constipation compared to equivalently analgesic doses of oxycodone and morphine. TRV734 is active after oral administration in mice and rats, has high oral bioavailability and has been well tolerated in non-human primates.

Based on these data and data for TRV130, we believe that TRV734 may offer an improved efficacy profile as compared to current opioid therapies or equivalent efficacy with an improved GI tolerability and respiratory safety profile.

Clinical development strategy

We intend to seek a collaborator with experience in developing and commercializing controlled-substance therapeutics in chronic care pain markets thereby leveraging their expertise while still retaining rights to commercialize TRV734 in acute care settings, including hospitals, in the United States.

We have completed enrollment in a second Phase 1 clinical trial, which is a multiple ascending dose trial evaluating the safety, tolerability, pharmacodynamics and pharmacokinetics of TRV734 given as a single dose and as multiple ascending doses in healthy volunteers. The trial is designed to enable Phase 2 development, and is being conducted in two parts with approximately 70 healthy volunteers randomized to participate in the trial. The first part will assess the safety, tolerability, pharmacodynamics and pharmacokinetics of single 125 mg doses of TRV734 in an open-label, randomized, three-period crossover trial in which subjects are fasted, fed a standard meal or fed a high-fat meal. This portion of the trial is designed to explore how changes in absorption may modify the performance of TRV734 and to identify the best administration paradigm for the second part of the

Table of Contents

trial. The second part of the trial will assess the safety, tolerability, pharmacodynamics and pharmacokinetics of multiple ascending doses of TRV734 in a double-blind, double-dummy, randomized, active- and placebo-controlled adaptive trial. Oxycodone immediate release 10 mg is used as a benchmark for a variety of pharmacodynamic measures intended to evaluate the analgesic and adverse effect profile of TRV734. We expect to release top line data for both parts of the trial early in the first quarter of 2015. We plan to continue development of TRV734 by conducting activities to support Phase 2 clinical trials. We also plan to seek a collaboration with a third party to support later-stage development and commercialization efforts.

Manufacturing

We have carried out TRV734 drug substance synthesis, performed by a third party, at a scale up to 2 kg per batch. A formulated tablet is being developed for Phase 2 clinical trials.

Intellectual property

Our TRV734 patent portfolio, which is wholly owned by us, includes one pending U.S. patent application claiming TRV734, other compounds and/or methods of making or using the same. If issued, we expect the pending U.S. application will expire no earlier than 2032, subject to any disclaimers or extensions. A related PCT application was filed and national patent applications have been filed in South Korea, the European Patent Office, the Eurasian Patent Office, Australia, Brazil, Canada, Israel, India, Japan, China, and New Zealand. Any patents resulting from these national patent applications, if issued, are predicted to expire no earlier than 2032, subject to any disclaimers or extensions.

TRV250

In November 2014, we identified a new product candidate, TRV250, a small molecule G protein biased ligand of the δ -opioid receptor. Based on the initial profile of TRV250, we anticipate focusing our initial development efforts on the treatment of treatment-refractory migraine headaches. According to Decision Resources, a healthcare consulting company, the acute episodic migraine market encompassed approximately 12 million drug-treated patients in 2013 in the United States, representing approximately \$2.2 billion of sales. We estimate that approximately 20% to 30% of these patients either do not respond to or cannot tolerate the market-leading triptan drug class, and an additional 30% would benefit from improved efficacy compared to these drugs.

We believe our preclinical data support targeting the δ -opioid receptor for the treatment of CNS disorders. Prior approaches to modulate this receptor have been limited by a significant risk of seizure associated with this target. By contrast, TRV250 is a potent δ -opioid receptor ligand that displayed strong efficacy in animal models of migraine and other CNS disorders with reduced seizure liability through selectively activating G protein coupling without engaging β -arrestin. These *in vivo* data are further supported by data for δ -agonists in β -arrestin knockout mice suggesting that β -arrestin plays a role in seizures. We intend to advance TRV250 into preclinical studies in 2015 designed to support our submission of an IND to the FDA. We also intend to seek a collaborator for TRV250 with CNS development and worldwide commercialization expertise, while potentially retaining commercialization rights in the United States. Phase 1 clinical trials could include electroencephalogram studies to specifically assess seizure liability.

We have two provisional patent applications directed to compounds that modulate the δ -opioid receptor. One of the applications is solely owned by us and the other is co-owned by us and Ligand Pharmaceuticals Incorporated. We have an exclusive worldwide, paid up, royalty-free license to any compound or method of use in the field of pharmaceuticals disclosed in the Ligand co-owned application. We expect that any compound that modulates the δ -opioid receptor we choose to pursue under our development program would be covered by the application solely owned by us. These applications are eligible for worldwide filing and may be used to establish non-provisional applications that, if issued, are predicted to expire no earlier than 2035.

Table of Contents

Cardiovascular Program

TRV027

TRV027 is a peptide β -arrestin biased ligand that targets the AT1R, inhibiting G protein signaling and activating β -arrestin signaling. We are developing TRV027 for the treatment of AHF in combination with standard diuretic therapy. In our Phase 2a clinical trial, TRV027 rapidly reduced blood pressure and preserved renal, or kidney, function, while preserving cardiac performance. We currently are enrolling patients in a Phase 2b clinical trial to evaluate the safety and efficacy of TRV027 in AHF. If our clinical development of TRV027 is successful and the product ultimately is approved by regulatory authorities, we believe TRV027 would be used as a first-line in-hospital AHF treatment. We also believe TRV027 could improve AHF symptoms, shorten length of hospital stay and potentially lower readmission rates and mortality rates after hospital discharge. U.S. patents covering the composition of matter and method of use of TRV027 have issued and are expected to expire no earlier than 2031 and 2029, respectively.

Disease

Heart failure is the inability of the heart to supply adequate blood flow, and therefore oxygen, to peripheral tissues and organs. When the heart is failing, mechanisms are triggered by the body to maintain blood pressure and tissue perfusion. One such mechanism is the activation of the renin-angiotensin system, or RAS, of which angiotensin II is a key mediator. Through angiotensin II, RAS increases blood pressure and stimulates the kidneys to retain both sodium and water. These mechanisms maintain cardiac performance in the short term, but in the longer term, the heart must pump against higher pressure, referred to as afterload, and is overstretched when filled, referred to as preload. These effects make the failing heart pump less efficiently and lead to progressive damage to the muscular tissue of the heart.

There are over 20 million people living with heart failure in the United States and Europe, according to the American Heart Association and the European Society of Cardiology. AHF, also sometimes referred to as acute decompensated heart failure, is heart failure requiring hospitalization. AHF patients present with fluid overload and severe dyspnea, a serious shortness of breath sometimes described as "air hunger," leading to an inability to perform simple functions such as standing and walking short distances. AHF can also lead to organ dysfunction, including in the kidneys and heart. Most patients experiencing an AHF event have a worsening of existing chronic heart failure, although an estimated 25% of AHF hospitalizations represent new diagnoses of heart failure.

According to National Hospital Discharge Survey data, in the United States there were over 5 million hospital discharges in 2010 where heart failure was listed as a component of the diagnosis, over 1 million of which listed heart failure as the primary diagnosis. Based on national hospital discharge statistics from 25 countries in Europe, we estimate that there were a total of 1.6 million hospitalizations with a primary heart failure diagnosis in 2010 in those countries. Despite long hospital stays, up to approximately 50% of AHF patients remain symptomatic on discharge according to data from ADHERE, a national U.S. registry of over 100,000 patients admitted to the hospital with AHF between 2000 and 2005. In addition, the risk of readmission is 25% after 30 days and the one-year mortality rate is approximately 30%. Combined, these poor outcomes result in a substantial burden to the healthcare system. In 2012, the American Heart Association estimated the annual direct medical cost of treating heart failure in the United States to be almost \$21 billion.

Current treatment options for AHF

We believe there is a significant unmet medical need for improved treatments for AHF. The current approach to treating patients with AHF involves facilitating the excretion of accumulated fluid with loop diuretics like furosemide; improving hemodynamics by reducing preload and afterload blood

Table of Contents

pressure with vasodilators like nitroglycerin; and directly stimulating the heart to contract more forcefully with inotropes like dobutamine. None of these approaches has been robustly shown to improve patient outcomes in AHF, and each therapy has specific adverse effects that limit its clinical utility.

The mainstay of therapy for AHF is loop diuretics, such as furosemide. In AHF patients, fluid removal is important to relieve symptoms and to improve tissue oxygenation. Furosemide facilitates excretion of excess fluid, but aggressive diuresis can lead to renal dysfunction. Worsening renal function in AHF patients is associated with higher mortality and increased risk of hospital readmission. Diuretic therapy has also been shown to precipitate activation of RAS, further exacerbating the vicious cycle of heart failure.

After diuretics, IV vasodilators, such as nitroglycerin, nitroprusside and nesiritide, are the most common medications used for the treatment of AHF. These vasodilators effectively reduce blood pressure, but each is associated with undesirable side effects and other limitations. Hypotension, or low blood pressure, is the most common serious side effect of vasodilating agents. Nitroglycerin raises RAS, and its use is also hampered by rapid development of tolerance, such that the medication becomes less effective the longer that it is used. Nitroprusside is associated with possible cyanide toxicity and cannot be used without intensive monitoring, so its use is limited. Nesiritide is infrequently used, which we believe is due to uncertainties about its efficacy and safety.

In severe cases, and those characterized by very low cardiac output, physicians sometimes resort to the use of inotropes, which work by increasing cardiac contractility by mobilizing calcium but at the expense of increased oxygen consumption and risk of arrhythmia. These agents can improve symptoms in the short term but have been shown to increase mortality. In addition, these drugs are only used in patients who have AHF associated with low ejection fraction. This sub-group of AHF patients represents approximately half of all patients who present for urgent AHF treatment.

There remains an unmet need for better therapeutic approaches to treat AHF that can improve blood circulation through vasodilation, facilitate fluid excretion by the kidneys and enhance cardiac function through a novel mechanism not requiring calcium mobilization. Based on our preclinical studies and our clinical trials conducted to date, we believe TRV027 has the potential to meet this unmet need, and may prove to be more effective than currently available treatment options, reducing hospital readmission rates, mortality rates and length of hospital stay, while improving symptoms more rapidly and more completely.

Key differentiating attributes of TRV027

We believe that TRV027, when used with current standard of care, particularly loop diuretics like furosemide, will have the following potential advantages:

Efficacy

Targets RAS, a mechanism that is central to the disease. RAS blockade has been shown to have morbidity and mortality benefits in chronic heart failure. We believe that TRV027, if approved, could be the first therapy to bring modulation of RAS to the acute hospital setting, allowing the physician to improve blood circulation while protecting the heart and kidneys.

Benefits the three key organ systems affected by AHF. In our preclinical studies and Phase 1b and 2a clinical trials, TRV027 has shown beneficial effects on the blood vessels, heart and kidneys. TRV027 could improve patient symptoms and outcomes by rapidly lowering afterload and preload blood pressure, sustaining cardiac output, and preserving kidney performance as a result of the lower blood pressure.

Table of Contents

Enhances furosemide's effects on pulmonary capillary wedge pressure. Pulmonary capillary wedge pressure is a pharmacodynamic marker of dyspnea, a main symptom of AHF. Loop diuretics, like furosemide, facilitate excretion of excess fluid and are frequently used to manage AHF patients. Loop diuretics also activate RAS, which may compromise their ability to fully resolve symptoms, and may contribute to the estimated 50% of AHF patients who are still symptomatic at the time of discharge from the hospital. We believe that administering TRV027 in combination with furosemide may improve dyspnea directly by decreasing pressure on the heart and in the lungs and indirectly by allowing furosemide to work more effectively without the negative consequences of RAS activation.

Drug safety and tolerability

Favorable drug safety profile. TRV027 is a small peptide that is highly specific for the angiotensin receptor, so we believe that off-target adverse effects would not be expected. In clinical trials to date, TRV027 has been well-tolerated in healthy subjects and in patients with advanced chronic congestive heart failure, in each case at doses up to 20-fold higher than the expected efficacious dose. In preclinical toxicology studies, TRV027 had a favorable profile at doses up to 500 times the expected therapeutic dose.

Self-limiting blood pressure effect. In our Phase 2a clinical trial, there was a dose-dependent decrease in blood pressure up to doses of 1 µg/kg/min. No further reduction in blood pressure was seen at doses up to 3 µg/kg/min. We believe that this characteristic would offer a safety advantage over current vasodilators, which can cause dangerous hypotension.

Rapidly reversible effects on blood pressure. In our three completed clinical trials, TRV027 had a very short half-life and its effects were rapidly reversible. In the acute care setting, we believe this should allow the physician to alter the dose and avoid prolonged hypotension.

Action specific to target pathophysiology. In our three completed clinical trials, TRV027 lowered blood pressure only in subjects with elevated measures of RAS activity, the target pathophysiology. This is important for any drug that is used in emergency rooms when the initial diagnosis may be uncertain.

Clinical experience

We have had an active IND, for TRV027 for AHF with the FDA since February 2010. Since then, we have completed three clinical trials of TRV027:

A Phase 2a clinical trial in medically fragile subjects with advanced stable heart failure, low ejection fraction and a clinical indication for right-heart catheterization. Ejection fraction is a measure of the volume of blood pumped by the heart. Right-heart catheterization is a procedure that allows measurement of intracardiac and intravascular pressures on the side of the heart leading to the lungs. This procedure is not commonly used for the treatment of AHF patients, so this trial enabled us to profile the hemodynamic effects of TRV027 in a comparatively stable chronic heart failure population that could be considered an AHF forerunner population.

A Phase 1b clinical trial in subjects with moderate heart failure and concomitant renal dysfunction. Selecting a stable population allowed us to directly measure renal plasma flow, or RPF, and glomerular filtration rate, or GFR, two common measures used to evaluate renal safety.

A Phase 1 clinical trial in healthy subjects to evaluate pharmacokinetics and tolerability prior to moving into chronic stable heart failure subjects.

Table of Contents

Phase 2a hemodynamics trial in advanced stable heart failure subjects

The primary objectives of this trial were to characterize the safety and tolerability of TRV027 in subjects with advanced stable heart failure and to measure its effects on blood circulation, also known as hemodynamics. Due to the wide dose-range available following the Phase 1 clinical trial, we elected to employ a step-wise dose titration over five hours with the dose increased to a target dose 10-fold higher than the starting dose. This highest dose was continued for nine hours as a steady state infusion, for a total infusion time of 14 hours, to evaluate the stability of TRV027's hemodynamic effects. Reversibility of TRV027's effects was then studied for four hours after the infusion was discontinued. Three dosing regimens were evaluated in 24 subjects: 0.1 µg/kg/min titrated up to 1 µg/kg/min; 0.3 µg/kg/min titrated up to 3 µg/kg/min; and 1 µg/kg/min titrated up to 10 µg/kg/min. In total, 14 different doses were studied across the three different dosing regimens. Nine additional subjects received placebo in a double blind manner. Based on the preclinical and Phase 1 data, we were expecting the hemodynamic effects of TRV027 to depend on elevation of RAS activity. The data were therefore analyzed based on plasma renin activity, or PRA, elevation, with high PRA subjects defined as those with PRA levels greater than 5.82 ng/ml/hr, which is the upper limit of lab normal range. PRA is an enzyme in the RAS cascade and measures RAS activity. Eleven of the 24 treated subjects had high PRA. We believe that these high PRA subjects represent a sicker population more relevant to AHF, and we anticipate that most AHF patients will have high PRA.

In this trial TRV027 produced a dose-related decrease in mean arterial pressure, or MAP, in subjects with elevated PRA, as shown in Figure 11. The reduction in MAP was sustained during the steady state infusion period and reversed during the washout period following the end of the infusion. This reversal of effect was statistically significant compared to both placebo and normal PRA subjects with p-values of less than 0.01 and 0.001, respectively. The decrease in MAP in the high PRA subjects compared to subjects receiving placebo in the maintenance phase was also statistically significant, with a p-value of less than 0.05.

Figure 11: Effect of TRV027 on mean arterial pressure in advanced stable heart failure subjects with elevated PRA

We also observed evidence of pharmacologic effects on PCWP in the subjects with elevated PRA. PCWP dropped in subjects with high PRA during the titration phase and this was sustained during the

Table of Contents

maintenance phase and reversed during the wash-out phase. The interpretation of the results in the titration and maintenance phases was complicated by a baseline drift in PCWP in the placebo group, however, the increase in PCWP when the TRV027 infusion was stopped was clear and statistically significant in high PRA compared to normal PRA subjects, with a p-value of less than 0.01, as shown in Figure 12.

**Figure 12: Reversal of effect of TRV027 on pulmonary capillary wedge pressure
in advanced stable heart failure subjects**

In this trial, there was no apparent change in cardiac index or heart rate observed in subjects with normal or high PRA following administration of TRV027. Cardiac index is a well accepted measurement of how well the heart is functioning as a pump by directly correlating the volume of blood pumped by the heart with an individual's body surface area. This contrasts with the response of heart failure subjects to acute administration of the angiotensin receptor blocker, or ARB, losartan, which has been shown to decrease cardiac index in some studies.

TRV027 was well tolerated in this medically fragile population. Despite the substantial reduction in MAP in TRV027-treated high-PRA subjects, there was no apparent increase in heart rate or in levels of cystatin-C or creatinine, which are biomarkers of renal function. This suggests that the blood pressure reduction was accompanied by preservation of kidney function. This result was consistent with our observations in preclinical studies. One subject in the lowest-dose cohort in this trial experienced hypotension necessitating dose reduction and then discontinuation of the TRV027 infusion. No other TRV027-related clinically significant adverse events were reported.

Phase 1b renal safety trial in stable chronic heart failure subjects

The primary objective of this trial was to explore the pharmacokinetics and renal safety of TRV027, co-administered with furosemide, in 17 subjects with a history of heart failure and concomitant renal dysfunction. Two cohorts of six subjects and one cohort of five subjects were enrolled in this two-period crossover trial. All of the subjects had moderate heart failure and concomitant renal dysfunction.

TRV027 was administered using a standard dosing paradigm, with doses of 1.25 mg/hr, 6.25 mg/hr and 31.25 mg/hr (equivalent to 0.35 µg/kg/min, 1.74 µg/kg/min and 8.68 µg/kg/min, respectively, for a 60 kg person), without weight correction. The plasma concentrations obtained were similar to those

Table of Contents

obtained when TRV027 was administered on a per-kg basis to subjects with normal kidney function, suggesting that a standard dosing approach with no adjustment for weight or renal impairment is appropriate, which would facilitate use in the emergency room where patients are not routinely weighed.

TRV027 was well tolerated in these renally impaired subjects. There were no TRV027-related clinically significant or serious adverse events reported. Previously published research has shown that oral furosemide administration produces a reduction in GFR that can be inhibited by blocking the effects of elevated angiotensin II. In our trial, however, there was no effect of the single dose of furosemide on GFR or RPF; therefore, it was not possible to show a renal protective effect of TRV027. The trial did, however, show that TRV027 itself preserved GFR and RPF, before and after furosemide administration. In this trial, co-administration of TRV027 did not impair furosemide's effect on diuresis or urinary sodium excretion.

Taken together, we believe the Phase 2a and Phase 1b clinical trials in stable chronic heart failure subjects provide evidence suggesting that TRV027 may have a beneficial effect on the heart, the blood vessels and kidney function in patients suffering from AHF, consistent with the data we had obtained in preclinical studies.

Phase 1 clinical trial

The Phase 1 clinical trial was a single center, crossover trial evaluating four-hour infusions of TRV027 in 20 healthy subjects at doses ranging from 0.01 to 20 $\mu\text{g}/\text{kg}/\text{min}$. The primary objective of the trial was to evaluate the tolerability and pharmacokinetics of TRV027. TRV027 was well tolerated with no serious adverse events or clinically significant adverse events reported even at doses up to 20 times higher than the expected therapeutic dose. There was a linear increase in exposure with dose and TRV027 was rapidly cleared when the infusion was stopped, suggesting that it will potentially be easy to reverse any unexpected hypotensive effects. There was no urinary excretion of TRV027 so we do not expect any dose adjustments to be required for renal insufficiency. We believe this characteristic may make TRV027 easy to use in the emergency room.

Preclinical studies

In a paced dog animal model of heart failure, TRV027 decreased MAP and PCWP. TRV027 also increased renal blood flow and moderately increased cardiac output. In another paced dog model study, TRV027 was studied in combination with furosemide and showed additive effects on reducing PCWP, which would be consistent with beneficial effects on dyspnea in the clinic. In addition, combining the data in normal dogs, paced dogs and paced dogs treated with furosemide, we observed meaningful blood pressure decreases only in animals with elevated RAS, which is consistent with the data seen in the clinical trials and we believe provides further evidence supporting the premise that TRV027 only works in patients with the target pathophysiology. Furthermore, the dose response observed in paced dogs was consistent with that observed in subjects in the Phase 2a clinical trial.

To examine the direct effects of TRV027 on cardiac contractility, we studied the hemodynamic effects of TRV027 compared to the unbiased ARB telmisartan in normal rats using a micromanometer conductance catheter. TRV027 treatment increased cardiac contractility independent of its effects on blood pressure, as measured by end systolic pressure volume relationship, or ESPVR, a common measure of cardiac output independent of blood pressure, and it also decreased MAP. This compared to telmisartan, which similarly decreased MAP but also decreased ESPVR (see Figure 13). Telmisartan is an unbiased ARB that inhibits both the G protein and β -arrestin AT1R pathways. In addition, in *in vitro* studies, TRV027 stimulated cardiomyocyte contractility through a β -arrestin dependent mechanism and selectively activated a subset of downstream signaling pathways seen with the full agonist, angiotensin II.

Table of Contents

Figure 13: Effect of TRV027 on MAP and cardiac contractility in normal rats

The mechanism by which TRV027 increased cardiac contractility in *in vivo* studies does not appear to involve calcium mobilization seen in currently marketed inotropes. Calcium mobilization is linked to pro-arrhythmic effects. In a study we conducted in rats, a β -arrestin biased AT1R ligand closely related to TRV027 increased contractility through a myofilament calcium sensitization mechanism, a novel mechanism of cardiac contractility that does not involve calcium mobilization. In *in vivo* studies, this related ligand prevented hypertrophy and prevented cardiac apoptosis, suggesting a potential cardioprotective effect. Furthermore, cardiac stress in mice induces AT1R, β -arrestin-dependent cardioprotective signaling, suggesting that AT1R β -arrestin biased ligands could be potentially cardioprotective.

Clinical development strategy

We are enrolling patients in a Phase 2b clinical trial to evaluate the safety and efficacy of TRV027 in AHF. This is a randomized double-blind, placebo controlled trial comparing TRV027 plus standard of care to standard of care alone. The primary objective of this trial is to evaluate the effects of three doses of TRV027, 1.0 mg/hr, 5.0 mg/hr and 25 mg/hr, on a composite of clinically important outcomes: mortality, worsening heart failure, hospital readmission rate, dyspnea and length of hospital stay. Our trial design contemplates that approximately 500 patients will be enrolled and randomized. We are targeting early administration of TRV027, ideally within six hours of arrival at the hospital. TRV027 will then continue to be administered for a minimum of 48 hours and up to 96 hours. We believe administration of TRV027 soon after hospital admission will improve in-hospital mortality rates and shorten length of hospital stay. We are enrolling patients with both low ejection fraction and preserved ejection fraction since RAS elevation is a key component of both conditions. This trial has enrolled over 250 patients towards the objective of 500 patients. More than 65 sites in 12 countries are now open and recruiting, and patient enrollment is expected to conclude in the third quarter of 2015. We plan to conduct an interim analysis and, depending on the outcome of that analysis, enrollment into one or more of the active dose groups may be discontinued. Since the initiation of this trial, the data safety monitoring board for the trial has reviewed safety data from the trial on two separate occasions and has recommended each time that the trial continue administering all three doses under investigation. We expect to release top-line data from this trial in the fourth quarter of 2015.

We believe that an endpoint measuring dyspnea or worsening of heart failure during hospitalization in Phase 3 clinical trials could form the basis for FDA approval of TRV027. However, we believe the FDA may be open to other well-defined benefit parameters, such as a hospitalization benefit or a patient and caregiver quality of life benefit. The composite endpoint tested in Phase 2b will facilitate our evaluation of potential alternative proposals to be discussed with the FDA at an end-of-Phase 2 meeting.

Table of Contents

Option and License Agreements with Actavis

On May 3, 2013, we entered into an option agreement and a license agreement with Actavis plc (formerly Forest Laboratories Holdings Limited), under which we granted to Actavis an exclusive option to license TRV027. If Actavis exercises this option, the license agreement will become effective and Actavis will have an exclusive worldwide license to develop and commercialize TRV027 and specified related compounds. At our request, Actavis will consider in good faith whether to grant us the right to co-promote the licensed products in the United States under terms to be agreed upon by the parties, but it has no obligation to provide co-promotion rights to us. Actavis will be responsible for subsequent development, regulatory approval and commercialization of TRV027 at Actavis' expense.

Under the option agreement, we will conduct, at our expense, a Phase 2b clinical trial of TRV027 in acute heart failure. The Phase 2b clinical trial will be conducted pursuant to a mutually agreed upon development plan and under the oversight of a joint development committee, which has an equal number of representatives from us and from Actavis, with operational authority during the option period retained by us, subject to Actavis' right to assume control in certain circumstances if we fail to conduct the development activities adequately.

Actavis may exercise its option during the pendency of the Phase 2b clinical trial or during a specified time period after we deliver the data from the Phase 2b clinical trial to Actavis. During the option period, we are not permitted to negotiate for or enter into any agreement with a third party for the development and commercialization of TRV027 and its related compounds. Under specified circumstances linked to adverse changes in the market or related to the results from the Phase 2b trial of TRV027, Actavis has the right to renegotiate the terms of the license agreement. If Actavis exercises such right, we will be obligated to negotiate in good faith with Actavis for a period of time the terms of any new arrangement. If we and Actavis are unable to agree on the terms of any new arrangement, then the option agreement will terminate and for a specified period of time thereafter we may not offer a license to any third party on terms better than those last proposed either by us or by Actavis during the negotiations. If Actavis does not exercise the option during the specified period, its option will expire and the license agreement will not become effective. In that case, we would be free to enter into a collaboration arrangement with another party for the development and commercialization of TRV027 or to pursue development and commercialization on our own.

We received no consideration upon the grant of the option to Actavis. If Actavis exercises the option, we would receive a \$65 million option exercise fee and could potentially receive up to \$365 million in additional payments depending upon the achievement of future development and commercial milestones. We also could receive tiered royalties between 10% and 20% on net sales of licensed products worldwide, with the royalty rates on net sales of licensed products in the United States being somewhat higher than the royalty rates on net sales of licensed products outside the United States. The term of the royalty on sales of TRV027 for a given country would extend until the latest to occur of (i) ten years from first commercial sale of TRV027 in that country, (ii) the expiration of the last to expire patent claiming TRV027 that is sufficient to block the entrance of a generic version of the product, or (iii) the expiration of any period of exclusivity granted by applicable law or any regulatory authority in such country that confers exclusive marketing rights on the product.

If the license agreement becomes effective, Actavis has the right to grant sublicenses under the license agreement to affiliates and third parties. Any sublicensing does not act to relieve Actavis of any of its obligations under the license agreement, including Actavis' obligation to make milestone payments to us with respect to TRV027 or pay royalties to us on sales of TRV027 by such sublicensee. Under the license, both Actavis and we have the right to terminate the agreement in the event of an uncured material breach or insolvency of the other party. In addition, Actavis is permitted to terminate the license agreement without cause at any time upon prior written notice or immediately for product safety reasons. Following a termination of the license agreement, all licenses granted to Actavis would

Table of Contents

terminate, and Actavis would grant to us an exclusive royalty bearing license under specified patents and know-how to develop and commercialize reverted licensed products. If not terminated, the license agreement would remain in effect until the expiration of the last royalty term for the last licensed product.

Manufacturing

TRV027 drug substance has been made by a third party at a scale up to 2 kg per batch. We are exploring potential process improvements, which we will implement as appropriate as development progresses. Currently drug substance and drug product are each manufactured at single sites, but additional sites are planned for qualification in connection with any Phase 3 clinical trials.

Commercialization

If Actavis exercises its option to license TRV027, Actavis will have the exclusive rights to commercialize TRV027 and will be responsible for all commercialization activities at Actavis's expense. At our request, Actavis will consider in good faith whether to grant us the right to co-promote TRV027 in the United States under terms to be agreed upon by the parties, but it has no obligation to provide co-promotion rights to us. If Actavis does not exercise its option to license TRV027 and we are successful in obtaining necessary regulatory approval, we might pursue commercialization on our own or seek to collaborate with a third party for commercialization, particularly outside the United States.

Competition

If TRV027 is approved for the indication of AHF, it will be used with standard loop diuretic therapy and may result in reduced need for vasodilators and/or inotropes. We also are aware of three product candidates in mid- to late-stage clinical development for AHF, specifically serelaxin, which is being developed by Novartis and currently is in Phase 3 clinical trials in patients with AHF; omecamtiv mecarbil, which is being developed by Amgen in collaboration with Cytokinetics Incorporated and currently is in Phase 2b clinical trials in patients with AHF and chronic heart failure; and ularitide, which is being developed by Cardiorentis and currently is in Phase 3 clinical trials for AHF. In addition, several product candidates are in mid- to late-stage clinical development for treating chronic heart failure which may, if approved, reduce the incidence of acute heart failure. These product candidates include LCZ-696 from Novartis, and Mydicar from Celladon.

Intellectual Property

&