



Pfenex Inc.

Fiscal 2017 Annual Report

About PFE^{nex}

We are a clinical-stage development and licensing biotechnology company focused on leveraging our Pfenex Expression Technology[®] to improve protein therapies for unmet patient needs. Using the patented Pfenex Expression Technology platform, we have created an advanced pipeline of therapeutic equivalents, vaccines, biologics and biosimilars. Our lead product candidates are PF708, a therapeutic equivalent candidate to Forteo[®] (teriparatide) for the treatment of osteoporosis, and our novel anthrax vaccine candidates, Px563L and RPA563, funded through an advanced development contract with the U.S. government. In addition, we are developing hematology/oncology products in collaboration with Jazz Pharmaceuticals. Furthermore, our pipeline includes biosimilar candidates to Lucentis[®] and Neulasta[®].



Evert B. Schimmelpennink
Chief Executive Officer

Dear Shareholders,

I joined Pfenex last August as the company's chief executive officer because I saw a company with a unique and validated protein expression platform, a broad differentiated portfolio and a very talented team, as well as one that has significant opportunities for future growth.

I realized the company was in need of change to unlock its true potential, and from day-one my team and I focused on defining our priorities and setting a new course. We ended the year with a clear and concise strategic focus that we believe leverages the strength of the Pfenex Expression Technology® platform through the development of our own key assets in our pipeline, while selectively working with strong collaboration partners. Combined with lean and targeted spending, as well as laser focus on execution, we are committed to continue to drive our success.

Throughout 2017 we made considerable progress in advancing our lead product candidates as well as achieving substantial development milestones on our partnered programs.

- **Pfenex's lead product candidate is PF708 that is being developed as a therapeutic equivalent to Forteo® (teriparatide),** marketed by Eli Lilly for the treatment of osteoporosis patients at high risk of fracture. Following the successful completion of a bioequivalence study in healthy subjects in 2016, Pfenex began its pivotal study in osteoporosis patients late that same year. In 2017 we completed the enrollment of the pivotal study according to plan, and we subsequently released the pharmacokinetic data which demonstrated comparability to Forteo and complemented the data from the bioequivalence study. In mid-February of 2018, we completed last patient visit and we anticipate receiving top-line immunogenicity data from the ongoing pivotal study in the second quarter of 2018. We believe that results from our PF708-301 trial, if positive, along with the bioequivalence findings from our PF708-101 trial in healthy subjects we announced previously, should satisfy the clinical filing requirements for PF708. We expect to submit the new drug application (NDA) to the FDA in the third quarter of 2018 with a potential commercial launch of PF708 in the US possible as early as the third quarter of 2019 upon expiration of relevant patents and subject to receipt of US FDA marketing authorization.

- **Our Collaboration with Jazz Pharmaceuticals continues to demonstrate how our platform is uniquely enabling.** In the fourth quarter of 2017, we announced that under the amended agreement with Jazz Pharmaceuticals Ireland Limited (Jazz), we will be eligible to receive an additional \$43.5 million in amendment fee and development milestone payments as compared to the 2016 agreement, increasing the total value of upfront, option and amendment fee payments and potential payments for the achievement of development, regulatory and sales-related milestones associated with the collaboration to an aggregate total of \$224.5 million. We will also continue to be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement. Pursuant to the amended agreement, we received \$18.5 million in connection with the collaboration of which \$13.5 million related to development achievement and \$5 million following signing of the amended agreement. Finally, in the third quarter of 2017, we completed a milestone associated with our collaboration with Jazz.

- **Our US government funded Anthrax vaccine development programs are another illustration of the versatility of the Pfenex capabilities.** Px563L and RPA563 are novel anthrax vaccine candidates being developed by Pfenex in response to the United States government's unmet demand for increased quantity, stability and dose sparing regimens of anthrax vaccine. These programs are funded by the US Government under a \$143.5MM advanced developed contract with the Biomedical Advanced Research and Development Authority (BARDA). In January of 2017, BARDA exercised additional phases of the development contract, allowing for the continuing development of both RPA563 and Px563L. Over the course of 2017 we continued to collect favorable stability data for both products. In the second quarter of 2017 we completed our long-term follow-up of the Phase 1 study subjects, and the results showed no change to the interim safety or immunogenicity results. In October 2017, we had a meeting with the FDA, in which the Agency provided guidance for the proposed clinical development and licensure plans for post-exposure prophylaxis indication. Potential next milestones in 2018 are the triggering of analytical and non-clinical animal study options leading to a potential Phase 2 study in 2019 subject to continued funding by BARDA.

- **In line with our strategy that dictates laser focus on our near-term opportunities to create stockholder value, we completed our strategic review in the third quarter of 2017.** We have clearly defined our key assets and subsequently aligned our resources with them, that we believe will help ensure success going forward. While we believe that there remains considerable value in our PF582 Lucentis® and PF529 Neulasta® biosimilar programs, we believe that the most prudent path for their development is in collaboration with a strategic development partner. We continue to seek partners with whom we would advance those programs and that business development process continues.

I regard our deeply talented scientific team, in combination with the Pfenex Expression Technology®, as a platform and team that has truly revolutionized protein production, as the core of Pfenex. The institutional knowledge possessed by this team which has been accumulated over the past 17 years and over 60 partnerships, including with 12 of the 15 top pharmaceutical

companies in the world, is of significant value. That knowledge combined with new internal and partnering opportunities provides for a very exciting outlook going forward. The Pfenex Expression Technology platform is extremely versatile and has routinely demonstrated its ability to successfully produce a broad range of therapeutic and vaccine candidates, from peptides to large, complex proteins. This versatility leads to the ability to rapidly develop a pipeline of commercially attractive product opportunities which is demonstrated by the portfolio of product candidates in our pipeline.

We will aim to drive additional growth by growing our Pfenex Expression Technology-based partnered portfolio. We believe that the Pfenex Expression Technology represents a sustainable competitive advantage in the biopharmaceutical industry and will seek to further exploit the platform through additional collaborations where the platform is uniquely enabling. To that end we are continuing our business and corporate development efforts seeking new collaborations.

As part of our cultural evolution that began in 2017, I believe that we have a team committed to a culture that is focused on effective and mindful use of resources, as well as targeted and lean execution. Our priorities are clear, our key milestones for success are defined, and our entire team is extremely motivated and focused.

2018 will be an exciting year for Pfenex. Based on feedback from FDA, we believe the final results of our pivotal PF708 study, if positive, will in combination with bioequivalence data from our previous healthy subject trial, provide a critical data set for our first NDA submission in the third quarter. We will work closely with BARDA regarding the advanced development of our anthrax vaccines. We look forward to continuing our strong collaboration with Jazz Pharmaceuticals through the achievement of key development milestones. Finally, we will be leveraging the Pfenex Expression Technology platform to seek new partnerships on our existing portfolio as well as new programs.

Pfenex is at a transformational point in our development, and I look forward to leading the team and continuing to build Pfenex into an industry success. I am grateful for the efforts put forth by the team at Pfenex as we work diligently every day to build value for our stockholders.

A handwritten signature in black ink, appearing to read 'E. Schimmelpennink', with a long horizontal flourish extending to the right.

Evert B. Schimmelpennink
Chief Executive Officer

March 15, 2018

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**

Washington, D.C. 20549

FORM 10-K

(Mark One)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended December 31, 2017

or

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the transition period from _____ to _____
Commission file number: 001-36540

Pfenex Inc.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation or organization)

27-1356759
(I.R.S. Employer
Identification Number)

10790 Roselle Street
San Diego, California 92121
(Address of principal executive offices, including zip code)

858.352.4400
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Common Stock, par value \$0.001 per share
(Title of each class)

NYSE American LLC
(Name of each exchange on which registered)

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act: Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act: Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

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

Large accelerated filer Accelerated filer
Non-accelerated filer (Do not check if a smaller reporting company) Smaller reporting company
Emerging Growth Company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes No

The aggregate market value of the voting and non-voting common stock held by non-affiliates of the registrant, based on the closing sale price of the Registrant's common stock on the last business day of its most recently completed second fiscal quarter, as reported on NYSE American, was approximately \$93.9 million. Shares of common stock held by each executive officer and director and by each other person who may be deemed to be an affiliate of the Registrant, have been excluded from this computation. The determination of affiliate status for this purpose is not necessarily a conclusive determination for other purposes.

As of March 6, 2018, there were 23,583,585 shares of the registrant's common stock, \$0.001 par value, outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Proxy Statement for its Annual Meeting of Stockholders are incorporated by reference in Part III of this Annual Report on Form 10-K where indicated. Such Proxy Statement will be filed with the Securities and Exchange Commission within 120 days of the registrant's fiscal year ended December 31, 2017.

Pfenex Inc.

Annual Report on Form 10-K

For the Fiscal Year Ended December 31, 2017

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As used in this Annual Report on Form 10-K, the terms “the Company,” “we,” “us” and “our” refer to Pfenex Inc. and its subsidiaries, unless the context indicates otherwise.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended, which are subject to the “safe harbor” created thereunder and which involve substantial risks and uncertainties. Forward-looking statements generally relate to future events or our future financial or operating performance. In some cases, you can identify forward-looking statements because they contain words such as “may,” “will,” “should,” “expects,” “plans,” “anticipates,” “could,” “intends,” “target,” “projects,” “contemplates,” “believes,” “estimates,” “predicts,” “potential” or “continue” or the negative of these words or other similar terms or expressions that concern our expectations, strategy, plans or intentions. Forward-looking statements contained in this Annual Report on Form 10-K include, but are not limited to, statements about:

- the sufficiency of our cash and cash equivalents and cash generated from operations to meet our working capital and capital expenditure needs for the next 12 months, including our belief that we have sufficient cash resources to fund all necessary activities leading up to and including the submission of a new drug application (NDA) to the U.S. Food and Drug Administration (FDA) for PF708;
- our and any potential future collaboration partner’s ability to enroll patients in our clinical studies at the pace that we project;
- our expectations regarding the initiation, timing, progress and the success of the design of the clinical trials and planned clinical trials of PF708, Px563L/RPA563 and our other product candidates, and reporting results from same;
- whether the results of our and our potential collaboration partners’ trials will be sufficient to support domestic or global regulatory approvals for PF708, including our expectations regarding the timing of our submission of the NDA for PF708;
- our ability to obtain and maintain regulatory approval of PF708 or our other product candidates, and the timing of such regulatory approvals;
- our expectations regarding the earliest potential commercial launch of PF708 in the United States;
- our reliance on third parties to conduct clinical studies;
- our reliance on third-party contract manufacturers to manufacture and supply our product candidates for us;
- the benefits of the use of PF708, Px563L/RPA563 or any of our other product candidates;
- the rate and degree of market acceptance of PF708, Px563L/RPA563 or any of our other product candidates, if approved for sale;
- regulatory developments in the United States and foreign countries;
- our expectations regarding government and third-party payor coverage and reimbursement;
- our ability to manufacture PF708, Px563L/RPA563 and our other product candidates in conformity with regulatory requirements and to scale up manufacturing of PF708, Px563L/RPA563 and our other product candidates to commercial scale;
- our ability to successfully build a specialty sales force, or collaborate with third-party distributors, to commercialize PF708 and our other product candidates;
- our ability to compete with companies currently producing the reference products, including Forte;

- our reliance on Jazz and any future collaboration partner’s performance over which we do not have control;
- our ability to retain and recruit key personnel, including development of a sales and marketing function;
- our ability to obtain and maintain intellectual property protection for PF708, Px563L/RPA563 or any other product candidates;
- our estimates of our expenses, ongoing losses, future revenue, capital requirements and our needs for or ability to obtain additional financing;
- our expectations regarding the market size, size of patient populations, and growth potential for our product candidates, if approved for commercial use;
- our estimates of the expected patent expiration timelines for Forteo and other branded reference biologics;
- our expectations regarding the time during which we will be an emerging growth company under the Jumpstart Our Business Startups Act;
- our ability to develop new products and product candidates;
- our ability to successfully establish and successfully maintain appropriate collaborations and derive significant revenue from those collaborations, including receipt of milestone payments under our collaboration with Jazz;
- our financial performance; and
- developments and projections relating to our competitors and our industry.

We caution you that the foregoing list may not contain all of the forward-looking statements made in this Annual Report on Form 10-K.

You should not rely upon forward-looking statements as predictions of future events. We have based the forward-looking statements contained in this Annual Report on Form 10-K primarily on our current expectations and projections about future events and trends that we believe may affect our business, financial condition, results of operations, and prospects. The outcome of the events described in these forward-looking statements is subject to risks, uncertainties, and other factors described in the section titled “Risk Factors” and elsewhere in this Annual Report on Form 10-K. Moreover, we operate in a very competitive and rapidly changing environment. New risks and uncertainties emerge from time to time, and it is not possible for us to predict all risks and uncertainties that could have an impact on the forward-looking statements contained in this Annual Report on Form 10-K. We cannot assure you that the results, events, and circumstances reflected in the forward-looking statements will be achieved or occur, and actual results, events, or circumstances could differ materially from those described in the forward-looking statements.

The forward-looking statements made in this Annual Report on Form 10-K are based on information available to us on the date of this Annual Report on Form 10-K. We undertake no obligation to update any forward-looking statements made in this Annual Report on Form 10-K to reflect events or circumstances after the date of this Annual Report on Form 10-K or to reflect new information or the occurrence of unanticipated events, except as required by law. We may not actually achieve the plans, intentions, or expectations disclosed in our forward-looking statements and you should not place undue reliance on our forward-looking statements. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures, or investments we may make.

This Annual Report on Form 10-K also contains estimates, projections and other information concerning our industry, our business, and the markets for certain diseases, including data regarding the estimated size of those

markets, and the incidence and prevalence of certain medical conditions. Information that is based on estimates, forecasts, projections, market research or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances reflected in this information. Unless otherwise expressly stated, we obtained this industry, business, market, and other data from reports, research surveys, studies, and similar data prepared by market research firms and other third parties, industry, medical and general publications, government data, and similar sources.

Pfēnex™ and Pfēnex Expression Technology® are our primary trademarks. This Annual Report on Form 10-K contains these trademarks and some of our other trademarks, trade names and service marks. Each trademark, trade name or service mark of any other company appearing in this Annual Report on Form 10-K belongs to its respective holder.

PART I

Item 1. *Business*

Overview

We are a clinical-stage development and licensing biotechnology company focused on leveraging our Pfenex Expression Technology® to improve protein therapies for unmet patient needs. Using the patented Pfenex Expression Technology platform, we have created an advanced pipeline of therapeutic equivalents, vaccines, biologics and biosimilars. Our lead product candidates are PF708, a therapeutic equivalent candidate to Forteo® (teriparatide) for the treatment of osteoporosis, and our novel anthrax vaccine candidates, Px563L and RPA563, funded through an advanced development contract with the U.S. government. In addition, we are developing hematology/oncology products in collaboration with Jazz Pharmaceuticals. Furthermore, our pipeline includes biosimilar candidates to Lucentis® and Neulasta®.

Product Candidates and Collaborations

The following table summarizes certain information about our lead product candidates:

<u>Product Candidate</u>	<u>Branded Reference Drug</u>	<u>Program</u>	<u>Indication</u>
<i>Therapeutic Equivalent</i>			
PF708 – Teriparatide	Forteo	Wholly-Owned	Osteoporosis
<i>Novel Vaccines</i>			
Px563L/RPA563 – rPA based anthrax vaccines	N/A	U.S. Government Funded	Anthrax post-exposure prophylaxis

The following table summarizes certain information about our lead collaboration:

<u>Collaboration Partner</u>	<u>Products</u>	<u>Indication</u>
Jazz Pharmaceuticals Ireland Limited	Multiple Hematology/Oncology Products	Various

- PF708 – our teriparatide (Forteo) therapeutic equivalent candidate.** PF708 is our therapeutic equivalent candidate to Forteo, which is marketed by Eli Lilly and Company for the treatment of osteoporosis. Forteo achieved \$1.7 billion in global product sales in 2017. In November 2017, we announced the interim pharmacokinetic (PK) results from ongoing Study PF708-301, which compares the effects of PF708 and Forteo in osteoporosis patients. PF708 is being developed pursuant to the 505(b)(2) regulatory pathway in the U.S. and references Forteo®, which is marketed for the treatment of osteoporosis patients at a high risk of fracture, as the Reference Listed Drug. Study PF708-301 completed enrollment in the third quarter of 2017 with a total of 181 patients – 90 randomized to PF708 and 91 to Forteo. We completed the last patient visit in mid-February 2018. The primary study endpoint is anti-drug antibody formation after 24 weeks of drug treatment. The secondary study endpoints are changes in bone mineral density and bone turnover markers after 24 weeks of drug treatment, as well as PK parameters for up to 4 hours after the first dose. The PF708 and Forteo PK profiles are comparable, and there are no statistically significant differences in key PK parameters. Top-line immunogenicity data readout is expected in the second quarter of 2018. We believe that results from Study PF708-301, if positive, along with the previously announced bioequivalence findings from Study PF708-101 in healthy subjects, should satisfy the clinical filing requirements for PF708 in the United States and we expect to submit an NDA to the FDA in the third quarter of 2018, with a potential commercial launch possible in the US as early as the third quarter of 2019 upon expiration of the relevant patents and subject to receipt of US FDA marketing authorization. We believe we have sufficient cash resources to fund all necessary activities leading up to and including

the submission of the NDA to the FDA. We believe that the clinical program in the U.S. may be leveraged for regulatory filings in other geographies, such as the European Union (EU).

- **Px563L and RPA563 – our two novel anthrax vaccine candidates funded by the Biomedical Advanced Research and Development Authority (BARDA).** Our *Pfēnex* Expression Technology[®] is also well suited for vaccine development. We are developing Px563L/RPA563, novel anthrax vaccine candidates, in response to the United States government’s unmet demand for increased quantity, stability and dose sparing regimens of anthrax vaccine. The vaccine candidates are funded by the Biomedical Advanced Research and Development Authority (BARDA). Both vaccine candidates are prepared using the identical antigen. However, while Px563L contains an adjuvant and RPA563 does not contain an adjuvant, both candidates are being evaluated in parallel. In August 2016, we announced positive immunogenicity and safety data from Day 70 analysis of the Px563L/RPA563 anthrax vaccine study. The Px563L results indicated that the vaccine was well-tolerated and afforded immunogenicity protection with fewer doses than the currently licensed product. On Day 70, 100% of Px563L subjects at the 10 mcg and 80 mcg dose levels achieved a TNA NF₅₀ ≥ 0.56, and 87.5% at the 50 mcg dose level achieved the target threshold. An additional success criterion for assessing anthrax vaccine immunogenicity is for the lower confidence limit (LCL), or the lower bound of 95% confidence interval, of the percentage of subjects who met or exceeded the TNA NF₅₀ threshold of 0.56, to be greater than or equal to 40%. On Day 70, all doses of Px563L exceeded this threshold, which was established by the currently licensed anthrax vaccine for the indication of post-exposure prophylaxis. In addition, we have developed an optimized production process for the large-scale manufacturing of bulk mrPA. We announced positive interim results from a Phase 1a study in healthy subjects in the second half of 2016, and the study was completed in the first half of 2017. In January 2017, BARDA exercised two options under its existing contract, allowing for the continued development of Px563L and RPA563. To date, we have generated stability data on the 2016 manufactured lot for up to 9 months, demonstrating the maintenance of high purity at 5°C, the expected storage temperature, and accelerated stability data at 25°C. We have also generated long-term stability data from our toxicology lot, showing the maintenance of high purity at 5°C at 40 months. Subject to continued funding from BARDA, we expect to continue to advance the program with the potential to initiate a Phase 2 trial in 2019.
- **Jazz Collaboration – multiple early stage hematology/oncology product candidates with Jazz.** In July 2016, we entered into a license and option agreement with Jazz Pharmaceuticals Ireland Limited (Jazz), pursuant to which we and Jazz are collaboratively developing hematology/oncology products, including PF743, a recombinant crisantaspase, and PF745, a recombinant crisantaspase with half-life extension technology, and Jazz will have the exclusive right to manufacture and commercialize such products throughout the world. In addition, pursuant to the agreement, we have granted Jazz certain other rights to negotiate the exclusive right to develop, manufacture and commercialize throughout the world other hematology/oncology products that are currently or in the future may be developed by us. In the third quarter of 2017, we completed a process development milestone associated with this collaboration. In December 2017, we amended the agreement, bringing the total value of payments and potential payments associated with the collaboration to \$224.5 million. Upon signing the amended and restated agreement, we received a payment totaling \$18.5 million, of which \$13.5 million was for development achievement and \$5 million was an upfront payment. We may also be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement.

Our Strategy

Our strategy is to utilize our *Pfēnex* Expression Technology[®] and our expertise in bioanalytical characterization and product development to become a leading protein therapeutics company focused on developing a portfolio of wholly-owned and partnered assets.

Our product candidate selection strategy focuses on products with large addressable markets, which are expected to be free of intellectual property barriers in major markets over our projected approval timelines, and

for which our Pfenex Expression Technology® enables efficient and large-scale manufacture of high-value and difficult-to-manufacture proteins. Our pipeline of product candidates and preclinical products under development includes wholly-owned programs and certain other products that are being developed in collaboration with Jazz Pharmaceuticals.

The key elements to implement our strategy include the following:

- ***Develop and obtain regulatory approval of PF708 and maximize its commercial potential.*** We are actively completing the necessary items that we believe will satisfy the filing requirements for the 505(b)(2) regulatory pathway in the United States to enable timely regulatory approval as intellectual property protection and regulatory exclusivity for Forteo expire. We completed enrollment in our Study PF708-301 in the third quarter of 2017 and completed the last patient visit in mid-February 2018 from our on-going PF708-301 trial, which compares the effects of PF708 and Forteo in osteoporosis patients. We expect top-line immunogenicity data results in the second quarter of 2018. We believe that results from our PF708-301 trial, along with the bioequivalence findings from our PF708-101 trial in healthy subjects announced previously, should satisfy the clinical filing requirements for PF708. We expect to submit an NDA to the FDA in the third quarter of 2018, with a potential commercial launch possible in the US as early as the third quarter of 2019 upon expiration of the relevant patents and subject to receipt of US FDA marketing authorization.
- ***Develop vaccine programs primarily with non-dilutive government funding and other third-party grants.*** Using our Pfenex Expression Technology®, we are developing Px563L/RPA563 as a next generation anthrax vaccine candidate that we believe will address the limitations of the existing approved product including compliance, cost and potential fulfillment of the Strategic National Stockpile. Over the course of 2017, we continued to collect favorable stability data for both products. Potential next milestones in 2018 are the triggering of analytical and non-clinical animal study options, leading to potential Phase 2 study in 2019, subject in each case to continued funding by BARDA. The development of Px563L/RPA563 is funded through BARDA under a cost plus fixed fee advanced development contract valued at up to approximately \$143.5 million. The National Institute of Allergy and Infectious Diseases (NIAID) continues to evaluate our vaccine candidate, Px533, against malaria infection. Clinical development of Px533 is controlled and funded by NIAID.
- ***Advance the Jazz partnered programs and establish additional development and commercialization collaborations.*** In July 2016, we entered into an agreement with Jazz, which we amended in December 2017, to collaboratively develop hematology/oncology products, including PF743, a recombinant crisantaspase, and PF745, a recombinant crisantaspase with half-life extension technology. Under the agreement with Jazz, Jazz will have the exclusive right to manufacture and commercialize such hematology/oncology products throughout the world. In addition, pursuant to the agreement, we have granted Jazz certain other rights to negotiate the exclusive right to develop, manufacture and commercialize throughout the world other hematology/oncology products that are currently or in the future may be developed by us. We have received payments for achievement of development milestones in 2016 and 2017. We may receive additional payments of up to \$189.3 million for achievement of certain research and development, regulatory and sales-related milestones, bringing the total value of payments and potential payments associated with the collaboration to \$224.5 million. In addition, we may be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement. We also aim to drive additional growth by growing our Pfenex Expression Technology-based partnered portfolio. We believe that the Pfenex Expression Technology represents a sustainable competitive advantage in the biopharmaceutical industry and will seek to further exploit the platform through additional collaborations where the platform is uniquely enabling. To that end we are continuing our business and corporate development efforts seeking new collaborations. We continue to evaluate new product candidates to add to our pipeline.

- ***Continue to develop our pipeline of product candidates.*** In addition to our lead product candidates, our pipeline includes various other biosimilar candidates, including PF582, our biosimilar candidate to Lucentis®, and PF529, our biosimilar candidate to Neulasta®, as well as vaccines and next generation biologic candidates. Following our strategic review in November 2017, we decided to pause our development activities for PF582 and PF529 and focus our efforts and resources elsewhere in our product portfolio. While we are seeking a new collaboration partner for the development and commercialization of PF582 and PF529, there are no assurances that we will find a new collaboration partner or that the terms and timing of any such arrangements would be acceptable to us.

Our Approach

Our patented protein production platform, *Pfēnex* Expression Technology®, allows us to address hurdles to development and enable our product candidates and those being developed under collaborations. We believe our technology confers several important competitive advantages compared to traditional techniques for protein production, including the ability to produce complex proteins with higher accuracy and greater degree of protein purity, as well as speed and cost advantages. Our platform utilizes a proprietary high throughput robotically-enabled parallel approach, which allows the construction and testing of thousands of unique protein production variables in parallel, thereby allowing us to produce and characterize complex proteins while reducing the time and cost of development and long-term production.

We have replaced the traditional, trial and error approach to protein production with a simultaneous, parallel processing model that allows the construction and testing of thousands of unique protein production variables in parallel. This technology, which became our *Pfēnex* Expression Technology® was originated at Mycogen Corporation and further developed at The Dow Chemical Company, collectively, over a period of 20 years, and was assigned to us in the 2009 spinout to form the technology basis of our company. We have continued to improve the technology for the specific use in biopharmaceuticals development and manufacturing. We believe our platform delivers a significant competitive advantage for protein production, including higher accuracy, greater degree of protein purity, speed and lower costs.

***Pfēnex* Expression Technology®**

Protein Production Overview

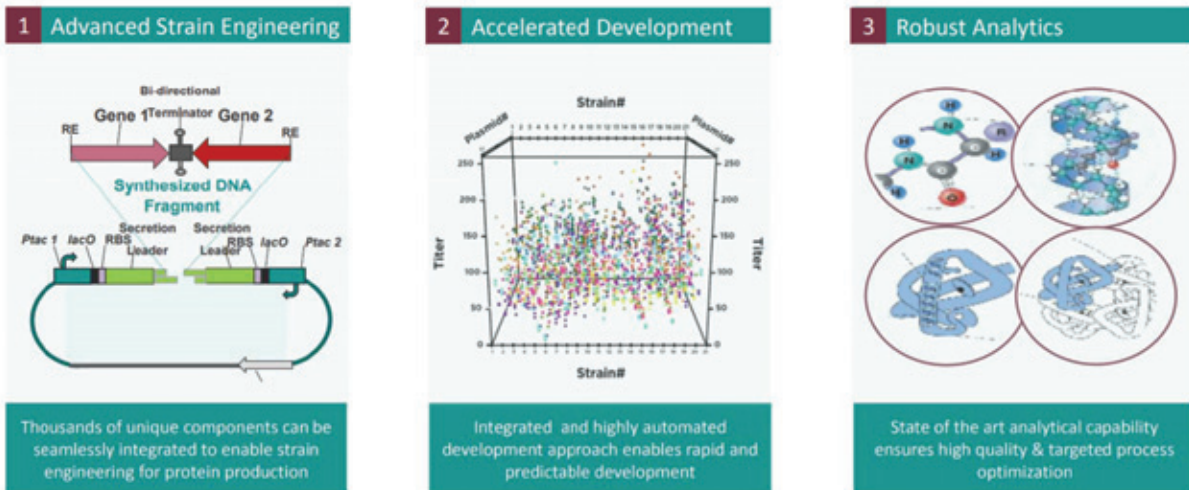
Protein production is a fundamental activity necessary for biological drug development and manufacturing. The most common method of manufacturing therapeutic proteins involves the use of engineered microorganisms. Proteins produced using these organisms are referred to as recombinant proteins. Recombinant proteins are produced by inserting DNA, or a gene, that codes for the protein, into a cell which then acts as a protein production factory. Typically, this is accomplished by inserting DNA into an expression vector, which contains genetic control elements that can be used to turn the gene on and off.

Our platform is based on automated high-throughput screening of large libraries of novel, genetically engineered *P. fluorescens* bacterial expression strains. The libraries contain thousands of expression strains which are constructed from a large inventory of expression vectors, or genetic elements, incorporated into engineered *P. fluorescens* host strains. We then employ automated, robotically enabled parallel high-throughput screening, incorporating extensive bioanalytical testing, in order to select strains from the library which express the protein of interest at optimal yields, purity and potency. Extensive fermentation scouting experiments on the selected strains allows for the identification of a final production strain with further improvements in the yield of the active therapeutic protein.

Our patented *Pfēnex* Expression Technology® illustrated in the diagram below utilizes a parallel, high throughput method for microbial strain development compared to the more traditional linear approach of trial and error.

Proprietary Platform Pfenex Expression Technology®

Discards traditional, linear and iterative approach, adopts parallel, high throughput method for microbial strain development



Our Pfenex Expression Technology® platform consists of three primary elements that, when combined, deliver a significant competitive advantage for protein production that differentiates us in the biopharmaceutical industry.

The three elements include:

- Robust Protein Production Organism
- Creation of Extensive Library of Protein Expression Variants
- Robotically Enabled High Throughput Screening

Robust Protein Production Organism

P. fluorescens has been used industrially where it has efficiently produced complex proteins. We exploit certain attributes of the *P. fluorescens* bacterium that enables us to rapidly identify the optimal strain for a specific protein of interest. The favorable attributes of the *P. fluorescens* bacterium include:

- Secretion of soluble protein into the bacterial periplasm, or the space between the inner and outer membrane in gram negative bacteria, resulting in increased recovery yields of properly folded protein
- *P. fluorescens* genome allows for modifications, including deleting protease genes, or nucleotides that provide instructions for synthesis of RNA into a specific protease, and inserting chaperone and/or disulfide bond isomerase genes, or nucleotides that provide instructions for synthesis of RNA into a specific chaperone or disulfide isomerase, which overall increase the quality and production of properly folded active full length proteins
- Selection of expression strains without the use of antibiotics
- High cell density fermentation due to its obligate aerobic growth nature, or bacterium that can only grow in the presence of oxygen, which improves the protein production for characterization, enables consistent scale-up and long-term low cost of goods

Creation of Extensive Library of Protein Expression Variants

We have developed an extensive toolbox of protein production variants that can be readily accessed for finding the best choice for manufacturing of a specific protein. This toolbox is continuously growing due to our ongoing research and development efforts. We construct libraries of thousands of unique expression strain variants by combining engineered *P. fluorescens* host strains with proprietary expression vectors. The engineered *P. fluorescens* strains have reduced expression of protein degrading enzymes and/or increased levels of folding elements while the expression vectors consist of plasmids with engineered genetic elements including promoters, ribosome binding sites and secretion leaders. Determining which of these variants will improve production of any particular protein cannot be determined from the amino acid sequence of the protein of interest. As a result, we employ the automated high throughput screening of a large library of the strain variants in order to select the strain that produces the protein of interest at optimal purity, yield and potency.

Robotically Enabled High Throughput Screening

Our high-throughput automation supports simultaneous, parallel evaluation of thousands of unique protein production alternatives, enabling rapid identification of the optimal production strain for the protein of interest. Our protein production technology employs rapid construction of protein production strains and testing thousands of unique variants evaluated through automated sample analysis to determine the titer, or quantity of the product per unit volume, of high quality protein each expression strain produces, which can then be analyzed through our high throughput analytical capacity. Our proprietary, robotically enabled automated high throughput screening process, along with our optimized production organism and toolbox of variants, as well as our expertise in analytical characterization, expedites the development of an optimal protein production engine from approximately one year in a typical case for traditional approaches, if at all possible, to approximately nine weeks with our Pfēnex Expression Technology®.

CRM197

Utilizing our Pfēnex Expression Technology®, we supply preclinical and cGMP-grade CRM197 to the biopharmaceutical and vaccine development community. We currently have supply agreements for the supply of cGMP CRM197.

Our Product Candidates and Collaboration

The development of our own portfolio of product candidates and the candidates we have licensed to a collaboration partner has been enabled by our successful history of meeting analytically rigorous client specifications of protein quality, yield and potency using our Pfēnex Expression Technology®. Our pipeline includes product candidates and preclinical products under development in various stages of development. Details of our pipeline and collaboration are included below.

PF708 – Teriparatide

One of our lead product candidates, PF708, is a peptide product candidate that is being developed as a therapeutic equivalent to the reference listed drug Forteo, an injectable prescription medicine marketed by Eli Lilly for the treatment of osteoporosis patients at high risk of fractures. Teriparatide is a shortened version of the naturally occurring parathyroid hormone (amino acids 1-34) that promotes bone growth. To date, we have demonstrated production of teriparatide in quantities that we believe predict a competitive cost of goods. Despite Forteo's status as a biologic peptide currently manufactured in *E. coli*, due to its size (less than or equal to 40 amino acids), it is considered a small molecule. As a result, we are developing PF708 pursuant to the Section 505(b)(2) regulatory pathway in the United States.

Market Overview

The global osteoporosis market represents a significant opportunity, with product sales that are estimated to grow to approximately \$6.7 billion in the United States, Japan and the five major European Markets in 2025.

Treatment with teriparatide is the only treatment approach that promotes bone growth currently available for the treatment of osteoporosis. According to the National Institutes of Health (NIH), it is estimated that approximately 53 million Americans either have osteoporosis or are at increased risk due to low bone mass (osteopenia). Forteo (marketed as Forsteo in Europe) is the only product currently approved that builds bone primarily by increasing the activity of osteoblasts (cells that deposit bone). Worldwide sales of Forteo were approximately \$1.7 billion in 2017, according to Eli Lilly.

Development

We have performed an extensive bioanalytical comparative analysis of PF708 and Forteo. Based on what we believe to be equivalent results to date, we have not conducted preclinical in vivo studies for safety or efficacy purposes prior to initiating clinical investigation. We have also completed an initial assessment of the PF708 and Forteo injection pens, and we believe that the two injection devices are functionally equivalent. We completed a pharmacokinetic bioequivalence study in healthy subjects in the first half of 2016, and we initiated a comparative immunogenicity/pharmacokinetics study in osteoporosis patients in the fourth quarter of 2016. In November 2017, we announced interim pharmacokinetic (PK) data from the study: the PF708 and Forteo PK profiles are comparable, and there are no statistically significant differences in key PK parameters. In the second quarter of 2018 we expect top-line immunogenicity study results. We expect to submit an NDA to the FDA in the third quarter of 2018, with a potential commercial launch possible in the US as early as the third quarter of 2019 upon expiration of the relevant patents and subject to receipt of US FDA marketing authorization.

Commercialization

Subject to receipt of marketing authorization we anticipate the first commercial sales of PF708 to take place at the end of 2019. We are in the process of contemplating the commercialization of PF708 in the United States ourselves or in collaboration with a partner. Outside of the United States we intend to commercialize PF708 via commercialization partners. We have worked closely with marketing and commercialization experts to define the commercial organizational requirements to support launch and commercial supply of PF708. If approved, PF708 would be distributed in the United States through a network of distributors and specialty pharmacies. Under this distribution model, both the distributors and specialty pharmacies would take physical delivery of product and the specialty pharmacies would dispense the product directly to patients.

We would establish market access and sales teams that will engage and support external customers. The market access organization would engage the large third-party payers and trade accounts that represent a substantial majority of all potential target patients. Depending upon receipt of an A/B rating or a BX rating, we may or may not require a sales force. If we receive a BX rating, we believe a nominal sales force would be required given the concentrated prescriber base.

Px563L/RPA563

Px563L/RPA563 are novel anthrax vaccine candidates based on a recombinant modified form (mutant) of the protective antigen from *Bacillus anthracis* (anthrax). We are developing Px563L/RPA563 in response to the United States government's unmet demand for increased quantity, stability and dose sparing regimens of anthrax vaccine. We believe that Px563L/RPA563 can address each of these demands. We initiated a randomized, placebo-controlled Phase 1a trial in healthy subjects in the second half of 2015 to investigate the safety and immunogenicity of Px563L/RPA563, and we announced the interim analysis results in the second half of 2016. Findings indicated that the vaccine was well-tolerated, with the potential to afford immunogenicity protection against anthrax infection after only two injections (vs. three for the currently licensed anthrax vaccine product). The development of Px563L/RPA563 is funded by the U.S. Department of Health and Human Services (HHS) through BARDA under a contract providing up to \$143.5 million in funding. Subject to continued funding from BARDA, we expect to continue to advance the program with the potential to initiate a Phase 2 trial in 2019.

Market Overview

In October 2001, letters contaminated with anthrax spores were delivered to government officials and members of the media in the United States. As a result of these attacks, 22 people became infected with anthrax and five people died. In response to this and other terrorist attacks around the world, the biodefense market has grown dramatically. In December 2016, the Centers for Disease Control (CDC) signed a procurement contract for BioThrax valued at up to \$911 million to supply to the Strategic National Stockpile that represents approximately 29.4 million doses through September 2021. The federal government spends billions of dollars in biodefense through HHS, CDC, NIAID and Office of Public Health Preparedness and Response. In 2013, the Pandemic and All-Hazards Preparedness Reauthorization Act (PAHPRA), which was originally passed in 2006 to improve the United States' public health and medical preparedness and response capabilities for emergencies, authorized \$2.8 billion for the procurement of countermeasures for biological, chemical, radiological and nuclear attacks. If successful with clinical development, we believe we may be able to enter into a procurement relationship with the US federal government to supply a next generation recombinant protective antigen (rPA) based anthrax vaccine to the Strategic National Stockpile.

Development

In preclinical animal studies, Px563L has resulted in a greater immune response than the only available anthrax vaccine, BioThrax, and has the potential to provide longer protective immunity with fewer vaccinations. Through the application of our Pfēnex Expression Technology[®] we have developed a robust production strain for manufacturing that has demonstrated an ability to produce large amounts of mutant recombinant protective antigen (mrPA).

In August 2016, we announced positive immunogenicity and safety data from Day 70 analysis of the Px563L anthrax vaccine study. The randomized, double-blind, placebo-controlled Phase 1a study enrolled three cohorts in a dose-escalating manner (10 mcg, 50 mcg and 80 mcg of antigen). Within each cohort, subjects received Px563L, RPA563 or placebo in an 8:8:2 ratio. Subjects were administered two doses of vaccine or placebo 28 days apart. Interim results indicated that the vaccine was well-tolerated, with the potential to afford immunogenicity protection against anthrax infection after only two injections (vs. three for the currently licensed anthrax vaccine product). Immunogenicity was assessed by toxin-neutralizing antibody (TNA) expressed as 50% neutralizing factor (NF₅₀), with a threshold value ≥ 0.56 correlating with significant survival in animal models of anthrax infection. On Day 70, 100% of Px563L subjects at the 10 mcg and 80 mcg dose levels achieved a TNA NF₅₀ ≥ 0.56 , and 87.5% at the 50 mcg dose level achieved the target threshold. An additional success criterion for assessing anthrax vaccine immunogenicity is for the lower confidence limit (LCL), or the lower bound of 95% confidence interval, of the percentage of subjects who met or exceeded the TNA NF₅₀ threshold of 0.56, to be greater than or equal to 40%. On Day 70, all doses of Px563L exceeded this threshold, which was established by the currently licensed anthrax vaccine for the indication of post-exposure prophylaxis.

We announced positive interim results from a Phase 1a study in healthy subjects in the second half of 2016, and in January 2017, BARDA exercised two options under its existing contract, allowing for the continued development of Px563L and RPA563. Over the course of 2017, we continued to collect favorable stability data for both products. In October 2017, we completed a meeting with the FDA in which the Agency provided guidance for the proposed clinical development and licensure plans for post-exposure prophylaxis indication. Potential next milestones in 2018 are the triggering of analytical and non-clinical animal study options, leading to potential Phase 2 study in 2019, subject in each case to continued funding by BARDA.

Multiple early stage hematology/oncology product candidates in collaboration with Jazz Pharmaceuticals

We are collaboratively developing certain hematology/oncology products with Jazz. The programs are advancing according to mutually agreed development plans. In the third quarter of 2017, we completed a process development milestone associated with this collaboration. In December 2017, we signed an amended and restated

agreement under which we will be eligible to receive an additional \$43.5 million in amendment fee and development milestone payments as compared to the 2016 agreement, increasing the total value of upfront, option and amendment fee payments and potential payments for the achievement of development, regulatory and sales-related milestones associated with the collaboration to an aggregate of \$224.5 million. We will also continue to be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement.

Biosimilar Pipeline Products

Biosimilars Background

Our pipeline includes biosimilar candidates to certain reference products, including biosimilar candidates to Lucentis[®] and Neulasta[®]. Following our strategic review in November 2017, we decided to pause development activities on PF582, our biosimilar candidate to Lucentis[®] and PF529, our biosimilar to Neulasta[®] and focus development efforts elsewhere within the product portfolio while we continue to engage potential strategic partners to advance the program and maximize value. Following the consummation of the Jazz collaboration in July 2016, we decided to advance the hematology/oncology assets that are part of the Jazz collaboration and pause development activities on PF530, our biosimilar to Betaseron.

PF582 – Ranibizumab

PF582 is a biosimilar product candidate to Lucentis (ranibizumab), indicated for the treatment of visual impairment due to neovascular, or wet, age-related macular degeneration (AMD), macular edema following retinal vein occlusion, choroidal neovascularization secondary to pathologic myopia, diabetic macular edema and diabetic retinopathy in patients with diabetic macular edema. Following our strategic review in November 2017, we decided to pause development activities on PF582 and focus development efforts elsewhere within the product portfolio while we continue to engage potential strategic partners to advance the program and maximize value.

Market Overview

Lucentis achieved approximately \$3.3 billion in global product sales in 2017. By the second quarter of 2018, markets with 2016 Lucentis sales of approximately \$400 million are expected to lose patent protection, and become available to biosimilars. By the second quarter of 2020, markets with an additional \$1.6 billion in 2016 Lucentis sales are expected to lose patent protection and become available for biosimilars, and after January 2022 markets with an additional \$1.1 billion in 2016 sales are expected to also lose patent protection.

Development

We have completed extensive bioanalytical similarity studies comparing PF582 to multiple lots of United States and European Union sourced Lucentis, as well as comparability studies between multiple lots of PF582 at the pilot scale and current Good Manufacturing Practice (cGMP) commercial scale. We have also completed a preclinical study using an animal model that demonstrated, when injected into animal eyes, PF582 and Lucentis yielded similar tolerability and pharmacological profiles. Based on our analytical and preclinical data package, the FDA granted us a Biosimilar Initial Advisory Meeting which was held in January 2014 to discuss the data we had generated to date, our comparative clinical trial design and our strategy for the comparison of European Union and United States licensed reference products. In the subsequent meeting minutes, the FDA indicated that our analytical data appear acceptable to support the development of PF582 as a biosimilar candidate to Lucentis.

In the third quarter of 2016, we announced the results of a randomized Phase 1/2 trial in patients with wet AMD. Following our strategic review in November 2017, we decided to pause development activities on PF582 and focus development efforts elsewhere within the product portfolio while we continue to engage potential strategic partners to advance the program and maximize value.

PF529

We are currently in process development for PF529, a peg-filgrastim biosimilar candidate to Neulasta. Regulatory feedback for PF529 was received from the FDA in 2016 which supported the feasibility of development under the 351(k) biosimilar pathway. Following our strategic review in November 2017, we have decided to pause development activities on PF529 and focus development efforts elsewhere within the product portfolio while we continue to engage potential strategic partners to advance the program and maximize value.

PF530

Following the consummation of the Jazz collaboration in July 2016, we decided to advance the hematology/oncology assets that are part of the Jazz collaboration ahead of the PF530 biosimilar Betaseron opportunity, effectively pausing development activities on PF530. We completed a Phase 1 trial of PF530, a biosimilar candidate to Betaseron, in 2015 which enrolled 12 healthy subjects. Based on the analysis of the trial PK and PD parameters, no meaningful differences between PF530 compared to the reference compound were observed. Potential strategic opportunities for the PF530 program continue to be explored, given the successful advancement of PF530 and the positive regulatory feedback.

Collaborations, Joint Development and Licenses

Jazz Pharmaceuticals

In July 2016, we entered into a development and license agreement with Jazz Pharmaceuticals for the development and commercialization of multiple early stage hematology/oncology product candidates, including PF743, a recombinant crisantaspase, and PF745, a recombinant crisantaspase with half-life extension technology, and in the third quarter of 2017, achieved a process development milestone. The agreement also includes an option for Jazz to negotiate a license for a recombinant pegaspargase product candidate with us. Under the agreement, we received an upfront and option payment totaling \$15.0 million in July 2016 and were eligible to receive additional payments based on achievement of certain research and development, regulatory and sales-related milestones

In December 2017, we and Jazz entered into an amended and restated agreement in which we will be eligible to receive an additional \$43.5 million in amendment fee and development milestone payments as compared to the 2016 agreement. The amended and restated agreement increases the total value of upfront, option and amendment fee payments and potential payments for the achievement of development, regulatory and sales-related milestones associated with the collaboration to an aggregate of \$224.5 million. We may also be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement. In connection with the amendment and restatement of the Jazz Agreement (as amended, the Jazz Agreement), we received a total of \$18.5 million, consisting of an upfront payment of \$5.0 million and a payment of \$13.5 million for development achievement. Pfenex may be eligible to receive additional payments under the Jazz Agreement of up to \$189.3 million based on achievement of certain research and development, regulatory and sales-related milestones. Both we and Jazz will be contributing to the development efforts. Unless terminated earlier, the Jazz Agreement will continue on a product-by-product basis for as long as Jazz is commercializing or having commercialized the products under the Jazz Agreement.

Pfizer

In February 2015, we entered into a development and license agreement with Pfizer to develop and commercialize PF582. In August 2016, we entered into a termination agreement with Pfizer pursuant to which the development and license agreement was terminated and all rights to PF582 have been returned to us. The termination accelerated recognition of \$45.8 million of revenue that had been previously deferred and we will not recognize any additional future revenue under the Pfizer development and license agreement. Following our strategic review in November 2017, we decided to pause our development activities for PF582 and focus our efforts and resources elsewhere in our product portfolio. While we are seeking a new collaboration partner for the

development and commercialization of PF582, there are no assurances that we will find a new collaboration partner or that the terms and timing of any such arrangements would be acceptable to us.

Strides Arcolab

In March 2013, we entered into a joint development and license agreement, or JDLA, and a joint venture agreement, or JVA, with Strides Arcolab to provide a vehicle for the advancement of certain biosimilars. In August of 2017, we and Strides Arcolab entered into a termination agreement pursuant to which both the JDLA and JVA were terminated. There had been no activity under the JVA.

The Dow Chemical Company

On November 30, 2009, we entered into a series of agreements with Dow Global Technologies LLC and/or The Dow Chemical Company, or collectively, Dow, including a technology assignment agreement, a technology licensing agreement, and a grant-back and technology license agreement. Under the technology assignment agreement, Dow assigned to us certain patents, know-how and trademarks relating to our Pfēnex Expression Technology®. Under the technology licensing agreement, Dow granted us exclusive licenses to exploit certain patents relating to RNA viruses and oral immunization methods (each of which were subsequently terminated), and certain amended recombinant cells, and a non-exclusive license to exploit certain patents relating to production and isolation techniques for peptides and proteins made using our Pfēnex Expression Technology®. Under the grant-back and technology license agreement, we granted to Dow exclusive and non-exclusive licenses under certain patents and know-how relating to our Pfēnex Expression Technology® to use certain biological materials to make, use and commercialize products in certain fields of use that do not include human therapeutics.

The U.S. Department of Health and Human Services

In July 2010, we entered into a contract with BARDA, a division of the Office of the Assistant Secretary for Preparedness and Response in the U.S. Department of Health and Human Services, to develop a production strain and process for the production of bulk recombinant Protective Antigen, or rPA, from anthrax. Under the contract, we agreed to provide protein production and process development services to BARDA. The contract was amended several times to advance development of the product, and BARDA exercised options to provide additional funding and extend the term of the contract. In December 2014, we filed the investigational new drug (IND) application for Px563L. BARDA extended the contract in December 2014 and provided additional funding, increasing the total contract to \$25.2 million. A total of \$24.8 million had been recognized as revenue under the development contract, which was completed in August 2015.

In August 2015, we entered into a five-year, cost plus fixed fee contract valued at up to \$143.5 million with BARDA for the advanced development of Px563L and RPA563, which are mutant recombinant protective antigen anthrax vaccines. The contract consists of a 30-month base period with total funding up to \$15.9 million related to cGMP manufacturing of drug product and a Phase 1a clinical study. In addition to the base period, there are eight option periods, with potential additional funding of up to \$127.6 million related to activities including completion of a Phase 1b clinical study, a Phase 2 clinical study and non-clinical efficacy studies, as well as manufacturing technology transfer and optimization, process and analytical method validation and consistency lot manufacture. In addition to the base period, BARDA has exercised additional phases of the development contract effective January 2017, allowing for the continuing development of Px563L. Subject to continued funding from BARDA, we expect to continue to advance the program with the potential to initiate a Phase 2 trial in 2019. We believe the successful completion of the activities under this contract could lead to a procurement contract for supply of Px563L or RPA563 to the Strategic National Stockpile.

As the prime contractor, we are responsible for performing activities under a research plan proposed by us and accepted by BARDA. We are also obligated under the contract to satisfy various federal reporting

requirements, including technical reporting with respect to our development activities, reporting with respect to intellectual property and financial reporting. In addition, certain technical documents and our clinical trial protocols may be reviewed by BARDA prior to their finalization and/or submission.

Under standard government contracting terms, the government receives only limited rights for government use of certain of our pre-existing data and certain data produced with non-federal funding, to the extent such data are required for delivery to BARDA under the project. The United States government receives unlimited rights to use and disclose new data first produced under the project with BARDA funding. If the product is successfully developed and achieves marketing authorization, we would have the commercial rights to the anthrax vaccine; provided that the United States government is entitled to a nonexclusive, worldwide, royalty-free license to practice or have practiced any patent on an invention that is conceived or first reduced to practice under the project, and may obtain additional rights if we do not elect to retain ownership of a subject invention or if we do not satisfy certain disclosure and patent prosecution obligations with respect to a subject invention. Our contract with BARDA does not entitle the government to any sales royalties or other post-commercialization financial rights.

BARDA is entitled to terminate the project for convenience at any time, and is not obligated to provide continued funding beyond current year amounts allotted from Congressionally approved annual appropriations.

The National Institute of Allergy and Infectious Diseases (NIAID)

In September 2012, we entered into a contract with NIAID for the development of a next generation anthrax vaccine. Under the contract, which was amended in April 2013 and November 2013, we agreed to provide services to NIAID for approximately 25 months under a cost plus fixed fee contract with a total value of approximately \$2.2 million. In addition to the base period, NIAID had 13 options to extend the term of the contract, with payments totaling approximately \$22.9 million. NIAID exercised an option effective January 2015 and another effective May 2016. The contract was extended through the end of December 31, 2017, when the development contract was completed in accordance with its terms.

Customers

As of December 31, 2017, we had generated only limited revenue from government contracts, service agreements, collaboration agreements, and reagent protein product sales. Our total revenue was \$28.8 million, \$60.2 million and \$9.6 million in 2017, 2016 and 2015, respectively. In 2017, our revenue was primarily derived from our collaboration agreement with Jazz, in which we achieved certain development milestones, and from our advanced development contract with BARDA. In 2016, a significant portion of our revenue was derived from recognizing \$45.8 million in revenue upon termination of the Pfizer agreement in August 2016, in addition to revenue derived from development and license agreements. In 2015, a significant portion of our revenue was derived from developing proprietary vaccine candidates for government agencies.

For the year ended December 31, 2017, Jazz and BARDA each accounted for more than 10% of our revenue. For the year ended December 31, 2016, Pfizer accounted for more than 10% of our revenue. For the year ended December 31, 2015, BARDA and Pfizer each accounted for more than 10% of our revenue.

Government Regulation

Government authorities in the United States, at the federal, state and local level, in the European Economic Area, at the European Union and national Member State level, extensively regulate, among other things, the research, development, testing, manufacturing, labeling, packaging, promotion, advertising, storage, distribution, marketing, post-approval monitoring and reporting, and export and import of drugs and biologics such as those we are developing. We, along with third-party contractors, will be required to navigate the various preclinical, clinical and commercial approval requirements of the governing regulatory agencies of the countries in which we

wish to conduct studies or seek approval or licensure of our product candidates. The process of obtaining regulatory approvals and the subsequent compliance with appropriate federal, state, local, and foreign statutes and regulations require the expenditure of substantial time and financial resources.

United States Government Regulation

505(b)(2) New Drug Applications

Under the Hatch-Waxman Act, a pharmaceutical manufacturer may file an abbreviated new drug application, or ANDA, seeking approval of a generic copy of an approved branded product. Additionally, a pharmaceutical manufacturer may, under Section 505(b)(2) of the Federal Food, Drug, and Cosmetic Act (FFDCA), file a new drug application (NDA) that relies on studies not conducted by the applicant, or for which the applicant has not obtained a right of reference. Drugs and biologics are also subject to other federal, state, and local statutes and regulation. If we fail to comply with applicable FDA or other requirements at any time during the drug development process, clinical testing, approval process or post-approval activities, we may become subject to administrative or judicial sanctions. These sanctions could include the FDA's refusal to approve pending applications, license suspension or revocation, withdrawal of an approval, warning letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, civil penalties or criminal prosecution. Any FDA enforcement action could have a material adverse effect on us.

The provisions of Section 505(b)(2) of the FFDCA were created, in part, to help avoid unnecessary duplication of studies already performed on a previously approved ("reference" or "listed") drug; the section gives the FDA express permission to rely on data not developed by the NDA applicant. Indeed, a new drug application filed under Section 505(b)(2) is one for which some of the information required for approval comes from studies not conducted by or for the applicant and for which the applicant has not obtained a right of reference. We are pursuing a Section 505(b)(2) regulatory strategy for our PF708 product candidate and will reference the Forteo (teriparatide) listed drug which is marketed by Eli Lilly for the treatment of osteoporosis.

The owner of an NDA for a branded drug product may list with the FDA certain patents whose claims allegedly cover the applicant's branded product. Each of the patents listed in the application for the drug is then published in the Orange Book. Any applicant who files a 505(b)(2) new drug application referencing a drug listed in the Orange Book must certify to the FDA that: (1) no patent information on the drug product that is the subject of the application has been listed in the orange book, referred to as a Paragraph I Certification; (2) such patent has expired, referred to as a Paragraph II Certification; (3) the date on which such patent expires, referred to as a Paragraph III Certification; or (4) such that any patent is invalid or will not be infringed upon by the manufacture, use or sale of the drug product for which the application is submitted, referred to as a Paragraph IV Certification. The applicant may also elect to submit a "section viii" statement certifying that its proposed label does not contain, or carves out, any language regarding the patented method-of-use rather than certify to a listed method-of-use patent. An applicant submitting a Paragraph IV Certification must provide notice to each owner of the patent that is the subject of the certification and to the holder of the approved branded drug to which the 505(b)(2) application refers. If the reference branded drug holder and patent owners assert a patent challenge directed to one of the Orange Book listed patents within 45 days of the receipt of the Paragraph IV Certification notice, the FDA is prohibited from approving the 505(b)(2) application until the earlier of 30 months from the receipt of the Paragraph IV Certification, expiration of the patent, settlement of the lawsuit, or a decision in the infringement case that is favorable to the applicant.

Additionally, a 505(b)(2) application also will not be approved until any applicable non-patent exclusivity listed in the Orange Book for the NDA branded reference drug has expired as described in further detail below. Market and data exclusivity provisions under the FFDCA can delay the submission or the approval of certain applications for competing products. In addition to patent exclusivity, the holder of the NDA for a reference listed drug may be entitled to a period of non-patent exclusivity, during which the FDA cannot approve another drug application that relies on the listed drug. For example, a pharmaceutical manufacturer may obtain five years

of non-patent exclusivity upon NDA approval of a new chemical entity, or NCE, which is a drug that contains an active moiety that has not been approved by the FDA in any other NDA. An “active moiety” is defined as the molecule or ion responsible for the drug substance’s physiological or pharmacologic action. During the five-year exclusivity period, the FDA cannot accept for filing any application for the same active moiety and that relies on the FDA’s findings regarding that drug; the FDA may accept an application for filing after four years if the follow-on applicant makes a Paragraph IV Certification. A drug may obtain a three-year period of exclusivity for a particular condition of approval, or change to a marketed product, such as a new formulation for a previously approved product, if one or more new clinical trials, other than bioavailability or bioequivalence studies, was essential to the approval of the application and was conducted or sponsored by the applicant. Should this occur, the FDA would be precluded from approving any ANDA that references such product until after that three-year exclusivity period has run. However, unlike NCE exclusivity, the FDA can accept an application and begin the review process during the entire exclusivity period.

Patent Term Restoration

Depending upon the timing, duration, and specifics of the FDA approval of the use of our product candidates, some of our U.S. patents may be eligible for limited patent term extension under the Drug Price Competition and Patent Term Restoration Act of 1984, commonly referred to as the Hatch-Waxman Amendments. The Hatch-Waxman Amendments permit a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. However, patent term restoration cannot extend the remaining term of a patent beyond a total of 14 years from the product’s approval date. The patent term restoration period is generally half the time between the effective date of an IND and the submission date of an NDA or Biologics License Application, or BLA, plus the time between the submission date and the approval of that application. Only one patent applicable to an approved product is eligible for the extension and the application for the extension must be submitted prior to the expiration of the patent. The U.S. Patent and Trademark Office, in consultation with the FDA, reviews and approves the application for any patent term extension or restoration. In the future, we may apply for restoration of patent term for one of our currently owned or licensed patents to add patent life beyond its current expiration date, depending on the expected length of the clinical studies and other factors involved in the filing of the relevant NDA or BLA.

Biologics

In the United States, section 351(i)(1) of the Public Health Service Act, or PHSA, defines a biological product (biologic) as a:

- “virus, therapeutic serum, toxin, antitoxin, vaccine, blood, blood component or derivative, allergenic product, protein (except any chemically synthesized polypeptide), or analogous product, ... applicable to the prevention, treatment, or cure of a disease or condition of human beings.”

The information that must be submitted to the FDA in order to obtain approval to market a new biologic varies depending on whether the application for the biological product is submitted under section 351(a) or section 351(k) of the PHSA. Any proposed biologic, including a new product whose safety, purity and potency has not previously been demonstrated in humans, may follow the BLA route as defined by section 351(a). However, a proposed biologic whose active ingredient(s) and certain other properties are highly similar (biosimilar) to those of a previously approved biologic may follow an abbreviated licensure pathway as defined by section 351(k) of the PHSA. The FDA, under the authority of the Secretary of Health and Human Services, reviews and ultimately approves applications for biological products submitted under either pathway.

In addition, in the FDA’s 2015 guidance document “Biosimilars: Questions and Answers Regarding Implementation of the Biologics Price Competition and Innovation Act of 2009,” the FDA clarified that it intends to regulate any polymer composed of 40 or fewer amino acids, and any polymer made entirely by

chemical synthesis and composed of fewer than 100 amino acids, as drugs under the Federal Food, Drug, and Cosmetic Act, or FDCA, and its implementing regulations, rather than as biologics under the PHSA, unless the polymer otherwise meets the statutory definition of a biological product. The process required by the FDA before a drug may be marketed in the United States generally involves the submission to the FDA of an NDA. The results of preclinical studies and clinical trials, along with information regarding the manufacturing process, analytical tests conducted on the chemistry of the drug, proposed labeling and other relevant information are submitted to the FDA as part of an NDA, and FDA review and approval of the NDA is necessary prior to any commercial marketing or sale of the drug in the United States.

BLA/NDA Approval Process

The process generally required by the FDA before a biologic or drug product candidate may be marketed in the United States involves the following:

- completion of preclinical laboratory tests and animal studies performed in accordance with the FDA's current Good Laboratory Practice, or GLP, regulations;
- submission to the FDA of an investigational new drug, or IND, application which must become effective before human clinical trials may begin and must be updated annually;
- approval by an independent institutional review board, or IRB, or ethics committee at each clinical site before the trial is initiated;
- performance of adequate and well-controlled clinical trials to establish the safety, purity and potency of the proposed biologic, and the safety and efficacy of the proposed drug for each indication;
- preparation of and submission to the FDA of a BLA or NDA after successful completion of all pivotal clinical trials;
- satisfactory completion of an FDA Advisory Committee review, if applicable;
- a determination by the FDA within 60 days of its receipt of an NDA or BLA to file the application for substantive review;
- satisfactory completion of an FDA pre-approval inspection of the manufacturing facility or facilities at which the proposed product is produced to assess compliance with cGMP and to assure that the facilities, methods and controls are adequate to preserve the biological product's continued safety, purity and potency; and
- FDA review and approval of the BLA or NDA prior to any commercial marketing or sale of the biologic product in the United States.

The preclinical and clinical testing and approval process requires substantial time, effort, and financial resources, and we cannot be certain that any approvals for our product candidates will be granted on a timely basis, if at all. An IND is a request for authorization from the FDA to administer an investigational new drug product to humans. The central focus of an IND submission is on the general investigational plan and the protocol(s) for human studies. The IND also includes results of animal and in vitro studies assessing the toxicology, pharmacokinetics, pharmacology, and pharmacodynamic characteristics of the product; chemistry, manufacturing, and controls information; and any available human data or literature to support the use of the investigational product. An IND must become effective before human clinical trials may begin. An IND will automatically become effective 30 days after receipt by the FDA, unless before that time the FDA raises concerns or questions related to the proposed clinical studies. In such a case, the IND may be placed on clinical hold and the IND sponsor and the FDA must resolve any outstanding concerns or questions before clinical studies can begin. Accordingly, submission of an IND may or may not result in the FDA allowing clinical studies to commence.

Clinical trials involve the administration of the investigational product to human subjects under the supervision of qualified investigators in accordance with current Good Clinical Practices (cGCPs), which include

the requirement that all research subjects provide their informed consent for their participation in any clinical study. Clinical trials are conducted under protocols detailing, among other things, the objectives of the study, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated. Each clinical protocol and any subsequent protocol amendments must be submitted to the FDA as part of the IND, and an IRB at each site where the study is conducted must also approve the study. The IRB must monitor the study until completed. There are also requirements governing the reporting of ongoing clinical studies and clinical study results to public registries. Clinical trials typically are conducted in three or four sequential phases, but the phases may overlap or be combined.

- Phase 1. The investigational product is initially introduced into healthy human subjects or patients with the target disease or condition. These studies are designed to evaluate the safety, dosage tolerance, metabolism and pharmacologic actions of the investigational product in humans, the side effects associated with increasing doses, and, if possible, to gain early evidence on effectiveness.
- Phase 2. The investigational product is administered to a limited patient population to evaluate dosage tolerance and optimal dosage, identify possible adverse side effects and safety risks, and preliminarily evaluate efficacy.
- Phase 3. The investigational product is administered to an expanded patient population, generally at geographically dispersed clinical study sites to generate enough data to statistically evaluate dosage, clinical effectiveness and safety, to establish the overall benefit-risk relationship of the investigational product, and to provide an adequate basis for product labeling and approval.
- Phase 4. In some cases, the FDA may condition approval of an NDA or BLA for a product candidate on the sponsor's agreement to conduct additional clinical studies after approval. In other cases, a sponsor may voluntarily conduct additional clinical studies after approval to gain more information about the product. Such post-approval studies are typically referred to as Phase 4 clinical trials.

A pivotal trial is a clinical study that is designed to generate substantial evidence of product's safety and efficacy that adequately meets regulatory agency requirements to justify the approval of the product. Generally, pivotal trials are Phase 3 trials, but the FDA may accept results from Phase 2 trials if the trial design provides a well-controlled and reliable assessment of clinical benefit, particularly in situations where there is an unmet medical need and the results are sufficiently robust.

Phase 1, Phase 2 and Phase 3 trials may not be completed successfully within a specified period, if at all, and there can be no assurance that the data collected will support FDA approval or licensure of the product. Furthermore, the FDA, the IRB, or the clinical study sponsor may suspend or terminate a clinical study at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Additionally, some clinical studies are overseen by an independent group of qualified experts organized by the clinical study sponsor, known as a data safety monitoring board or committee. This group provides authorization for whether or not a trial may move forward at designated check points based on access to certain data from the trial. We may also suspend or terminate a clinical study based on evolving business objectives and/or competitive climate.

Assuming successful completion of all required testing in accordance with all applicable regulatory requirements, detailed information regarding the investigational product is submitted to the FDA in the form of an NDA or BLA requesting approval to market the product for one or more indications. The NDA or BLA must include all relevant data available from pertinent preclinical and clinical trials, including negative or ambiguous results as well as positive findings, together with detailed information relating to the product's chemistry, manufacturing, controls, and proposed labeling, among other things. Data can come from company-sponsored clinical studies intended to test the safety and effectiveness of a use of the product, or from a number of alternative sources, including studies initiated by investigators. Under federal law, the submission of most NDAs and BLAs is subject to an application user fee, and the sponsor of an approved NDA or BLA is also subject to annual product and establishment user fees. These fees are typically increased annually. A waiver of user fees may be obtained under certain limited circumstances.

Once an NDA or BLA has been submitted, the FDA's goal is to review the application within ten months after it accepts the application for filing, or, if the application relates to an unmet medical need in a serious or life-threatening indication, six months after the FDA accepts the application for filing. The review process is often significantly extended by FDA requests for additional information or clarification. The FDA reviews a BLA to determine, among other things, whether a product is safe, pure and potent and the facility in which it is manufactured, processed, packed, or held meets standards designed to assure the product's continued safety, purity and potency. Similarly, the FDA reviews an NDA to determine, among other things, whether the proposed product is safe and effective for its intended use, and whether the product is being manufactured in accordance with cGMP to assure and preserve the product's quality and purity.

Before approving a BLA or NDA, the FDA typically will inspect the facility or facilities at which the product is manufactured. The FDA will not approve the application unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Additionally, before approving a BLA or NDA, the FDA will typically inspect one or more clinical sites to assure compliance with cGCP. If the FDA determines that the application, clinical data, manufacturing process or manufacturing facilities are not acceptable, it will outline the deficiencies in the submission and often will request additional testing or information. Notwithstanding the submission of any requested additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval.

The FDA is required to refer an application for a novel product to an advisory committee or explain why such referral was not made. Typically, an advisory committee is a panel of independent experts, including clinicians and other scientific experts, that reviews, evaluates and provides a recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions.

The testing and approval process requires substantial time, effort and financial resources, and each may take several years to complete. The FDA may not grant approval on a timely basis, or at all, and we and our partners may encounter difficulties or unanticipated costs in our efforts to secure necessary governmental approvals, which could delay or preclude us from marketing our products. After the FDA evaluates a BLA or NDA and conducts inspections of manufacturing facilities where the investigational product and/or its drug substance will be produced, the FDA may issue an approval letter or a Complete Response Letter. An approval letter authorizes commercial marketing of the product with specific prescribing information for specific indications. A Complete Response Letter indicates that the review cycle of the application is complete and the application is not ready for approval. A Complete Response Letter may require additional clinical data and/or an additional pivotal Phase 3 trial or trials, and/or other significant, expensive and time-consuming requirements related to clinical trials, preclinical trials or manufacturing. Even if such additional information is submitted, the FDA may ultimately decide that the BLA or NDA does not satisfy the criteria for approval. The FDA may also approve the BLA or NDA with a Risk Evaluation and Mitigation Strategy, or REMS, plan to mitigate risks, which could include medication guides, physician communication plans, or elements to assure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. The FDA also may condition approval on, among other things, changes to proposed labeling, development of adequate controls and specifications, or a commitment to conduct one or more post-market studies or clinical trials. Such post-market testing may include Phase 4 trials and surveillance to further assess and monitor the product's safety and effectiveness after commercialization. New government requirements, including those resulting from new legislation, may be established, or the FDA's policies may change, which could delay or prevent regulatory approval of our products under development.

Drugs and biologics manufactured or distributed pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product sampling and distribution, advertising and promotion and reporting of adverse experiences with the product. After approval, most changes to the approved product, such as adding new

indications or other labeling claims are subject to prior FDA review and approval. There also are continuing, annual user fee requirements for any marketed products and the establishments at which such products are manufactured, as well as new application fees for supplemental applications with clinical data. Manufacturers are subject to periodic unannounced inspections by the FDA and state agencies for compliance with cGMP requirements. Changes to the manufacturing process are strictly regulated, and, depending on the significance of the change, may require prior FDA approval before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP and impose reporting and documentation requirements upon us and any third-party manufacturers that we may decide to use. Accordingly, manufacturers must continue to expend time, money and effort in the area of production and quality control to maintain compliance with cGMP and other aspects of regulatory compliance.

We rely, and expect to continue to rely, on third parties for the production of clinical quantities of our product candidates, and expect to rely in the future on third parties for the production of commercial quantities. Future FDA and state inspections may identify compliance issues at our facilities or at the facilities of our contract manufacturers that may disrupt production or distribution, or require substantial resources to correct. In addition, discovery of previously unknown problems with a product or the failure to comply with applicable requirements may result in restrictions on a product, manufacturer or holder of an approved NDA or BLA, including withdrawal or recall of the product from the market or other voluntary, FDA-initiated or judicial action that could delay or prohibit further marketing.

The FDA may withdraw approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the approved labeling to add new safety information; imposition of post-market studies or clinical studies to assess new safety risks; or imposition of distribution restrictions or other restrictions under a REMS program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- adverse publicity, fines, warning letters or holds on post-approval clinical trials;
- refusal of the FDA to approve pending applications or supplements to approved applications, or suspension or revocation of product license approvals;
- product seizure or detention, or refusal to permit the import or export of products; or
- injunctions or the imposition of civil or criminal penalties.

The FDA strictly regulates marketing, labeling, advertising, and promotion of products that are placed on the market. Drugs and biologics may be promoted only for the approved indications and in accordance with the provisions of the approved label. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant enforcement action and liability.

Abbreviated Licensure Pathway of Biological Products as Biosimilar or Interchangeable

The Patient Protection and Affordable Care Act, or PPACA, or Affordable Care Act, or ACA, signed into law on March 23, 2010, includes a subtitle called the Biologics Price Competition and Innovation Act of 2009, or BPCIA, which amended the PHSA and created an abbreviated approval pathway for biological products shown to be highly similar to an FDA-licensed reference biological product. The BPCIA attempts to minimize duplicative testing, and thereby lower development costs and increase patient access to affordable treatments. An

application for licensure of a biosimilar product under section 351(k) of the PHS Act must include information demonstrating biosimilarity based upon the following, unless the FDA determines otherwise:

- analytical studies demonstrating that the biosimilar product is highly similar to the reference product notwithstanding minor differences in clinically inactive components;
- animal studies (including the assessment of toxicity); and
- a clinical study or studies (including the assessment of immunogenicity and pharmacokinetics or pharmacodynamics) sufficient to demonstrate safety, purity and potency in one or more conditions of use for which the reference biologic product is licensed and intended to be used and for which licensure is sought for the biosimilar product.

In addition, an application submitted under the 351(k) pathway must include information demonstrating that:

- the proposed biosimilar product and reference product utilize the same mechanism(s) of action for the condition(s) of use prescribed, recommended, or suggested in the proposed labeling, but only to the extent the mechanism(s) of action are known for the reference product;
- the condition or conditions of use prescribed, recommended, or suggested in the labeling for the proposed biosimilar product have been previously approved for the reference product;
- the route of administration, the dosage form, and the strength of the proposed biosimilar product are the same as those of the reference product; and
- the facility in which the biosimilar product is manufactured, processed, packed and held meets standards designed to assure that the biosimilar product continues to be safe, pure, and potent.

Biosimilarity, as defined in PHS Act §351(i), means that the biological product is highly similar to the reference product notwithstanding minor differences in clinically inactive components; and that there are no clinically meaningful differences between the biological product and the reference product in terms of the safety, purity, and potency of the product.

In addition, section 351(k)(4) of the PHS Act provides for a designation of “interchangeability” between the reference and biosimilar products, whereby the biosimilar may be substituted for the reference product without the intervention of the health care provider who prescribed the reference product. To date, the FDA has not approved any biosimilar product as being interchangeable to the reference product. The higher standard of interchangeability must be demonstrated by information sufficient to show that:

- the proposed product is biosimilar to the reference product;
- the proposed product is expected to produce the same clinical result as the reference product in any given patient; and
- for a product that is administered more than once to an individual, the risk to the patient in terms of safety or diminished efficacy of alternating or switching between use of the biosimilar and the reference product is no greater than the risk of using the reference product without such alternation or switch.

FDA approval is required before a biosimilar may be marketed in the United States. However, complexities associated with the large and intricate structures of biological products and the process by which such products are manufactured pose significant hurdles to the FDA’s implementation of the 351(k) approval pathway that are still being worked out by the FDA. For example, the FDA has discretion over the kind and amount of scientific evidence—laboratory, preclinical and/or clinical—required to demonstrate biosimilarity to a licensed biological product. According to FDA guidance:

“The implementation of an abbreviated licensure pathway for biological products can present challenges given the scientific and technical complexities that may be associated with the larger and

typically more complex structure of biological products, as well as the processes by which such products are manufactured. Most biological products are produced in a living system such as a microorganism, or plant or animal cells, whereas small molecule drugs are typically manufactured through chemical synthesis.”

The FDA intends to consider the totality of the evidence, provided by a sponsor to support a demonstration of biosimilarity, and recommends that sponsors use a stepwise approach in the development of their biosimilar products. Biosimilar product applications thus may not be required to duplicate the entirety of preclinical and clinical testing used to establish the underlying safety and effectiveness of the reference product. However, the FDA may refuse to approve a biosimilar application if there is insufficient information to show that the active ingredients are the same or to demonstrate that any impurities or differences in active ingredients do not affect the safety, purity or potency of the biosimilar product. In addition, as with BLAs, biosimilar product applications will not be approved unless the product is manufactured in facilities designed to assure and preserve the biological product’s safety, purity and potency.

The submission of an application via the 351(k) pathway does not guarantee that the FDA will accept the application for filing and review, as the FDA may refuse to accept applications that it finds are insufficiently complete. The FDA will treat a biosimilar application or supplement as incomplete if, among other reasons, any applicable user fees assessed under the Biosimilar User Fee Act of 2012 have not been paid. In addition, the FDA may accept an application for filing but deny approval on the basis that the sponsor has not demonstrated biosimilarity, in which case the sponsor may choose to conduct further analytical, preclinical or clinical studies and submit a BLA for licensure as a new biological product under section 351(a) of the PHSA.

The timing of final FDA approval of a biosimilar for commercial distribution depends on a variety of factors, including whether the manufacturer of the branded product is entitled to one or more statutory exclusivity periods, during which time the FDA is prohibited from approving any products that are biosimilar to the branded product. The FDA cannot approve a biosimilar application for twelve years from the date of first licensure of the reference product. Additionally, a biosimilar product sponsor may not submit an application under the 351(k) pathway for four years from the date of first licensure of the reference product. A reference product may also be entitled to exclusivity under other statutory provisions. For example, a reference product designated for a rare disease or condition (an “orphan drug”) may be entitled to seven years of exclusivity under section 360cc of the FFDCA, in which case no product that is biosimilar to the reference product may be approved until either the end of the twelve-year period provided under §351(k) or the end of the seven-year orphan drug exclusivity period, whichever occurs later. In certain circumstances, a regulatory exclusivity period can extend beyond the life of a patent, and thus block §351(k) applications from being approved on or after the patent expiration date. In addition, the FDA may under certain circumstances extend the exclusivity period for the reference product by an additional six months if the FDA requests, and the manufacturer undertakes, studies on the effect of its product in children, a so-called pediatric extension.

The first biological product determined to be interchangeable with a branded product for any condition of use is also entitled to a period of exclusivity, during which time the FDA may not determine that another product is interchangeable with the reference product for any condition of use. This exclusivity period extends until the earlier of: (1) one year after the first commercial marketing of the first interchangeable product; (2) 18 months after resolution of a patent infringement suit instituted under 42 U.S.C. § 262(1)(6) against the applicant that submitted the application for the first interchangeable product, based on a final court decision regarding all of the patents in the litigation or dismissal of the litigation with or without prejudice; (3) 42 months after approval of the first interchangeable product, if a patent infringement suit instituted under 42 U.S.C. § 262(1)(6) against the applicant that submitted the application for the first interchangeable product is still ongoing; or (4) 18 months after approval of the first interchangeable product if the applicant that submitted the application for the first interchangeable product has not been sued under 42 U.S.C. § 262(1)(6).

Post Approval Requirements

After obtaining regulatory approval of a product, manufacturers may be required to comply with a number of post-approval requirements. For example, as a condition of approval of a BLA or a §351(k) application the FDA may require post marketing testing and surveillance to monitor the product's safety or efficacy.

In addition, the holder of an approved BLA or §351(k) application is required to timely report certain adverse reactions and production problems involving its product to the FDA to provide updated safety and efficacy information and to comply with requirements concerning advertising and promotional labeling for the product. Quality control and manufacturing procedures must also continue to conform to cGMPs after approval and the FDA periodically inspects manufacturing facilities to assess compliance with cGMPs.

Patent Disputes under the BPCIA

The BPCIA includes a detailed framework for addressing potential patent disputes between the biosimilar product and reference product sponsors. Within 20 days after being notified that FDA has accepted its application for review, a 351(k) biosimilar applicant can decide whether or not it chooses to provide a copy of its 351(k) application to the reference product sponsor. If the applicant chooses to not provide the application, the reference product sponsor may file for a "declaration of infringement, validity, or enforceability of any patent that claims the biological product or a use of the biological product." If the applicant chooses to provide the application, the applicant shall also provide any other information that describes the process or processes used to manufacture the biosimilar product, to the reference product sponsor's in-house counsel, the reference product sponsor's outside counsel, and/or a representative of the owner of a patent exclusively licensed to the reference product sponsor with respect to the reference product who has retained a right to assert the patent or participate in litigation. The copy of the application and any other information provided are considered "confidential information" under the PHSA, and recipients are generally prohibited from disclosing anything contained therein and from using the information for any purposes other than to determine whether a patent infringement claim may reasonably be asserted. The reference product sponsor then has sixty days to provide the applicant with an initial list of patents owned or controlled by the reference product sponsor that could reasonably be asserted. The reference product sponsor shall also identify patents that it would be willing to license to the applicant.

Within sixty days of receiving the initial list of patents from the reference product sponsor, the applicant may provide the reference product sponsor with an initial list of patents that the applicant contends could reasonably be asserted by the reference product sponsor, and, for each patent on this list or the list provided by the reference product sponsor, must either (1) provide a claim-by-claim statement of the factual and legal basis for the applicant's opinion that the patent is invalid, unenforceable, or will not be infringed, or (2) provide a statement that the applicant does not intend to begin marketing its product prior to the patent's expiration. The applicant must also respond to the reference product sponsor's list of patents available for licensing. If the applicant provided any statement regarding the non-infringement, invalidity, or unenforceability of any of the patents-at-issue, the reference product sponsor has sixty days to rebut such arguments and to provide the factual and legal basis for the reference product sponsor's position that the patent(s) will be infringed by the commercial marketing of the biosimilar product.

Once the applicant has received the statement of the basis for the reference product sponsor's opinion, the parties have fifteen days to engage in good faith negotiations to agree on which if any of the patents will be the subject of an infringement action. The PHSA contemplates that the parties may not reach an agreement within this timeframe, in which case additional patent list exchange procedures are triggered. The applicant must first notify the reference product sponsor of the number of patents that it believes should be the subject of an infringement action. Subsequently, within five days of this notification and on a date agreed upon by the parties, the parties must simultaneously exchange lists of the patents that each believes should be the subject of an infringement action. The reference product sponsor may not list a greater number of patents than the number listed by the applicant, though if the applicant lists no patents the reference product sponsor may still list just one.

Under this provision, the biosimilar applicant thus controls the number of patents that will be the subject of the infringement action.

Following this last list exchange, the reference product sponsor has thirty days to bring an infringement action for each patent on both lists. Alternatively, if the parties successfully negotiate an agreement regarding the patents that will form the basis for an infringement action, the reference product sponsor has thirty days after such agreement to bring an infringement action for each of the negotiated patents. Within thirty days of being served with a complaint in the infringement action, the applicant must provide notice to the FDA, and the FDA will publish notice of the complaint in the Federal Register. Unlike the Hatch-Waxman Act, under which a reference product sponsor must list its patents in the Orange Book, and the FDA will suspend its review for thirty months if a reference product sponsor files a patent infringement suit, the BPCIA does not direct the FDA to suspend review of the biosimilar product application as a result of the patent dispute.

For patents that are issued or licensed after the reference product sponsor has identified its initial list, the reference product sponsor may supplement its initial list with the additional patents within thirty days of the new patents' issuance or licensing if the reference product sponsor reasonably believes that, due to the issuance of such patent, a claim of patent infringement could reasonably be asserted by the reference product sponsor. The biosimilar applicant must then respond within thirty days with a statement of the factual and legal basis for its opinion that the patent is invalid, unenforceable, or will not be infringed, or that the applicant does not intend to begin marketing its product prior to the patent's expiration. However, these patents do not become subject to the additional negotiation and list exchange procedures of the BPCIA, but rather are subject to preliminary injunction (PI) procedures. The BPCIA requires the biosimilar applicant to provide 180 day notice to the reference product sponsor of the applicant's intent to market the biosimilar product, and the reference product sponsor may then seek a PI on any patents there were included on any of the patent lists initially exchanged between the parties, but excluded from the patent list agreed to during negotiations or from the lists that were exchanged as a result of the parties' failure to reach an agreement. Both parties must reasonably cooperate to expedite discovery as is needed in connection with the PI motion.

The BPCIA limits both the reference product sponsor and the biosimilar applicant from bringing actions for declaratory judgment (DJ). In particular, if the reference product sponsor has been provided confidential access to the biosimilar application, neither party may bring a DJ action before the reference product sponsor receives the applicant's 180 day advance notice of commercial marketing. Moreover, DJ actions may only be brought against patents for which a PI motion has been filed. Importantly, if the biosimilar applicant fails to respond to the reference product sponsor as required at the various steps of the BPCIA's patent dispute resolution framework, the reference product sponsor may bring a DJ action on any patent included on the reference product sponsor's initial list and its list of newly issued or licensed patents. If the applicant fails to provide access to the confidential information required to be provided at the start of the patent dispute process, the reference product sponsor may bring a DJ action on any patent that claims the biological product or its use.

The FDA has approved nine applications submitted under the 351(k) pathway through December 31, 2017: Zarxio (filgrastim-sndz) on March 6, 2015, Inflectra (infliximab-dyyb) on April 5, 2016, Erelzi (etanercept-szsz) on August 30, 2016, Amjevita (adalimumab-atto) on September 23, 2016, Renflexis (infliximab-abda) on April 21, 2017, Cyltrezo (adalimumab-adbm) on Aug 25, 2017, Mvasi (bevacizumab-awwb) on Sept 14, 2017, Ogivri (trastuzumab-dkst) on December 1, 2017 and Ixifi (inflizimab-qbtx) on December 13, 2017. Thus, no typical review period for a biosimilar application has yet been established. However, the FDA aims to review 70%, 80%, 85%, and 90% of original (rather than resubmitted) biosimilar applications within 10 months of receipt in fiscal years 2014, 2015, 2016, and 2017 respectively. The FDA did complete review of the Zarxio application within 10 months of a BLA filing (May 8, 2014). While it may be possible for a biosimilar applicant and reference product sponsor to settle any patent disputes prior to approval, patent litigation may delay the ability of a biosimilar applicant to sell commercial product in the United States, as was the case with Zarxio, which was launched in September 2015.

The Animal Rule

In the case of product candidates that are intended to treat certain rare life-threatening diseases, such as our anthrax vaccine product candidates, conducting controlled clinical trials to determine efficacy may be unethical or unfeasible. Under regulations issued by the FDA in 2015, often referred to as the “Animal Rule,” the approval of such products can be based on clinical data from trials in healthy human subjects that demonstrate adequate safety and efficacy data from adequate and well-controlled animal studies. Among other requirements, the animal studies must establish that the drug or biological product is reasonably likely to produce clinical benefits in humans. Because the FDA must agree that data derived from animal studies may be extrapolated to establish safety and effectiveness in humans, seeking approval under the Animal Rule may add significant time, complexity and uncertainty to the testing and approval process. In addition, products approved under the Animal Rule are subject to additional requirements including post-marketing study requirements, restrictions imposed on marketing or distribution or requirements to provide information to patients.

European Economic Area Regulation

In the European Economic Area, or EEA, comprising the European Community (European Union) plus Iceland, Liechtenstein and Norway, the information that must be submitted to the European Medicines Agency, or EMA, or to the competent authorities in the relevant European Union Member States varies depending on whether the biological medicinal product is a new product, whose quality, safety and efficacy has not previously been demonstrated in humans or a product whose known biological active substance and certain other properties are similar to those of a previously authorized (reference) biological medicinal product. The European Directive 2001/83/EC as amended defines a medicinal product as any substance or combination of substances:

- presented as having properties for treating or preventing disease in human beings; or
- which may be used in or administered to human beings either with a view to restoring, correcting or modifying physiological functions by exerting a pharmacological, immunological or metabolic action, or to making a medical diagnosis.

Directive 2001/83/EC as amended further defines the category of biological medicinal products as:

- a product, the active substance of which is a biological substance. A biological substance is a substance that is produced by or extracted from a biological source and that needs for its characterization and the determination of its quality a combination of physico-chemical-biological testing, together with the production process and its control.

Examples of biological medicinal products include recombinant proteins, monoclonal antibodies, vaccines, and products derived from human blood or plasma.

Approval of New Biological Medicinal Products

In the EEA, all medicinal products (biological or not) can only be commercialized after obtaining a Marketing Authorization, or MA. There are two types of MA:

The Community MA, which is issued by the European Commission through the Centralized Procedure, based on the opinion of the CHMP of the EMA, is valid throughout the entire territory of the EEA. The Centralized Procedure is mandatory for certain types of products, such as medicinal products derived from certain biotechnology processes (including biotechnology-derived proteins such as the ones we make), orphan medicinal products, and medicinal products containing a new active substance indicated for the treatment of AIDS, cancer, neurodegenerative disorders, diabetes and auto-immune and viral diseases. The Centralized Procedure is optional for products containing a new active substance not yet authorized in the EEA, or for products that constitute a significant therapeutic, scientific or technical innovation or which are in the interest of public health in the European Union.

National MAs, which are issued by the competent authorities of the Member States of the EEA and only cover their respective territory, are available for products not falling within the mandatory scope of the Centralized Procedure. Where a product has already been authorized for marketing in a Member State of the EEA, this National MA can be recognized in other Member States through the Mutual Recognition Procedure. If the product has not received a National MA in any Member State at the time of application, it can be approved simultaneously in various Member States through the Decentralized Procedure.

Under the above described procedures, before granting the MA, the EMA or the competent authorities of the Member States of the EEA make an assessment of the risk-benefit balance of the product on the basis of scientific criteria concerning its quality, safety and efficacy.

More concretely, the requirements for centralized marketing authorization of a new biological medicinal product in the EEA generally include but are not limited to:

- submission of the results of pharmaceutical (physico-chemical, biological or microbiological) tests and preclinical (toxicological and pharmacological) tests through laboratory tests and animal studies in compliance with Good Laboratory Practice, or GLP;
- submission to the competent authorities of a Clinical Trial Application, or CTA, which must become effective before human clinical trials may begin and must include the protocol, Investigator's Brochure, Investigational Medicinal Product-related data, and independent Ethics Committee approval;
- submission of the results of adequate and well-controlled clinical trials to establish the quality, safety and efficacy of the product for each indication;
- a statement to the effect that clinical trials carried outside the European Union meet the ethical requirements of Directive 2001/20/EC;
- submission of an application for marketing authorization to the EMA or to the competent authorities of the relevant EU Member States;
- establishment of the applicant in the EEA;
- description of the qualitative and quantitative particulars of all constituents of the medicinal product;
- evaluation of the potential environmental risks posed by the medicinal product;
- description of the manufacturing method, description of the control measures employed by the manufacturer, and a document showing that the manufacturer is authorized in his own country to produce medicinal products;
- a summary of product characteristics, therapeutic indications, adverse reactions, dosage, pharmaceutical form, route of administration and expected shelf life;
- additional information for specific classes of medicinal products, such as a Vaccine Antigen Master File documentation for vaccine products;
- a summary of the pharmacovigilance system, the risk management plan describing the risk-management system, and proof that the applicant has the services of a qualified person responsible for pharmacovigilance as well as the necessary means for fulfilling the EU pharmacovigilance obligations including the notification of any adverse reaction suspected of occurring either in the EEA or in a third country; and
- review by EMA's CHMP or the competent authorities in the relevant European Union Member States and approval of the marketing authorization application.

Preclinical tests include laboratory evaluations of the product's structure, purity and biological activity, as well as animal studies to determine toxicity and pharmacology. An Investigational Medicinal Product (IMP)

sponsor must submit a CTA to the competent authority prior to initiation of human clinical trials. The application process to perform a clinical trial in the EEA is governed on a country-by-country basis. A sponsor must apply in each country in which it intends to conduct any part of a human clinical trial. While the process is similar in most countries, additional materials may be required in certain instances. For example, in many, but not all European countries, a sponsor must submit a copy of the insurance coverage obtained to cover the clinical study. Australia and New Zealand adhere to EMA guidelines with respect to the regulation of IMPs and clinical trials.

Assuming successful completion of the required clinical testing, and having met all criteria set forth by Directive 2001/83/EC and Regulation (EC) No 726/2004, the applicant may choose to proceed with submission of marketing authorization application. If the application is accepted for review in the Centralized Procedure, within 210 days (excluding clock stops), the EMA's CHMP will issue an opinion on whether the conditions for granting market authorization are satisfied. During the review period, the scientific committees will review the scientific data, may request for independent testing of the medicinal product, its starting materials, or other constituent materials, may request supplemental information from the applicant, may request for proof of cGMP compliance of the manufacturer, and may request for said manufacturing facilities to be inspected.

Accelerated Review

Under the Centralized Procedure in the European Union, the maximum timeframe for the evaluation of a marketing authorization application is 210 days (excluding clock stops, when additional written or oral information is to be provided by the applicant in response to questions asked by the EMA's CHMP). Accelerated evaluation might be granted by the CHMP in exceptional cases, when a medicinal product is expected to be of a major public health interest, particularly from the point of view of therapeutic innovation. In this circumstance, EMA ensures that the opinion of the CHMP is given within 150 days, excluding clock stops.

Approval of Similar Biological Medicinal Products

Similar biological medicinal product applications of medicinal products authorized via the Centralized Procedure have automatic access to the Centralized Procedure. Similar biological medicinal products that do not fall under the mandatory scope can, at the request of the applicant, be accepted for consideration under the Centralized Procedure, when the applicant shows that the medicinal product constitutes a significant therapeutic, scientific or technical innovation or when the applicant shows that the granting of a Community authorization for the medicinal product is in the interest of patients at European Union level.

A similar biological medicinal product, also known as a biosimilar, is a product that is similar to a biological medicine that has already been authorized, the so-called "reference medicinal product". The active substance of a similar biological medicinal product is a known biological active substance and similar to the one of the reference medicinal product. A similar biological medicinal product and its reference medicinal product are expected to have the same safety and efficacy profile and are generally used to treat the same conditions.

The similar nature of a biosimilar and a reference product is demonstrated by comprehensive comparability studies covering quality, biological activity, safety and efficacy. The dosage and route of administration should be the same while deviations in formulation or inactive substances require justification or further studies. Intended changes to improve efficacy are not compatible with a biosimilarity approach. The minimum expectation of data supplied with the application will include pharmaceutical, chemical, and biological preclinical data, as well as bioequivalence and bioavailability (bodily distribution and concentration) clinical data. The type and amount of additional information, such as toxicological and other preclinical and clinical data, is determined on a case-by-case basis. Unlike in the United States, the directives and guidelines governing the EEA do not explicitly provide for the designation of interchangeability of similar biological medicinal products, nor does the EMA submit an opinion on whether a biosimilar can be used interchangeably with its reference product.

EMA guidelines suggest that clinical trials comparing a biosimilar candidate to a reference medicinal product be designed such that they will demonstrate not only similar efficacy but also similar clinical outcome with respect to safety. Clinical trials designed to establish the expectation of equivalent clinical outcomes for any one patient require a sufficiently large number of patients in the study such that certain statistical measures are satisfied. As such, equivalence trials are usually more expensive and longer in duration than non-inferiority trials that may be employed in other medicinal product categories. The EMA recommends engaging in discussions with regulatory authorities if the use of a non-inferiority design is being considered. If a reference product is approved for more than one therapeutic indication, the efficacy and safety of the biosimilar has to be justified or, if necessary, demonstrated separately for each of the claimed indications. This may include a review of clinical experience and available literature data, or the execution of further non-clinical or appropriate clinical studies.

The EMA provides additional specific guidance and requirements for products being developed as biosimilar candidate to EEA-authorized Interferon-beta 1a or 1b and Interferon-alpha 2a or 2b. The guidance outlines specific types of preclinical data and clinical studies required to support the claim of biosimilarity. Additionally, the guidelines provide specific considerations for assessing clinical safety and for post-authorization pharmacovigilance monitoring.

European Union legislation provides (with respect to reference products for which a marketing authorization was applied for after October 30, 2005 under the Decentralized, Mutual Recognition and national procedures, or after November 20, 2005, for products authorized under the Centralized Procedure) for an eight-year period of data protection and ten-year period of market exclusivity for medicinal products which received marketing authorization in accordance with, respectively, Directive 2001/83/EC as amended or Regulation (EC) No 726/2004 as amended. The provisions also state that if, during the first eight years of authorization, the holder obtains an authorization for one or more new therapeutic indications which are deemed to have significant clinical benefit as compared to existing therapies, the original market exclusivity can be extended to a maximum of 11 years. The data and market exclusivity periods start from the date of the initial authorization, which for reference medicinal products authorized through the Centralized Procedure is the date of notification of the marketing authorization decision to the marketing authorization holder of the reference product.

Post-Approval Requirements

Once granted, initial marketing authorization of a medicinal product is valid for five years. The authorization may be renewed after five years on the basis of a reevaluation of the risk-benefit balance. At that point, once renewed, the marketing authorization is valid indefinitely or, if justified on grounds of pharmacovigilance, may be restricted to an additional five-year authorization period.

Marketing authorization holders are required to maintain a pharmacovigilance system and to maintain detailed records of all suspected adverse reactions in the EEA or in a third country. Serious suspected adverse reactions are to be communicated to the appropriate EEA regulatory authorities no later than 15 days after receipt of the information. EEA regulations require periodic safety reporting leading up to and following market authorization, based on a defined schedule, for as long as the product is marketed, or when immediately requested by regulatory authorities. An increase in incidents of adverse events or any cause for a change in opinion by the EMA pertaining to the risk-benefit balance may lead to suspension, variation, or revocation of marketing authorization and would severely impact our business.

EEA regulations also stipulate that regulators, such as the Competent Authorities of the EEA Member States, independently or coordinated by the EMA, may carry out repeated or unannounced inspections of the medicinal product manufacturer or at the premises of the marketing authorization holder, regarding compliance with cGMP principles and guidelines. Compliance issues identified at our facilities or at third-party manufacturers may disrupt clinical or commercial production or distribution or require substantial resources to correct. This may result in the delay of clinical trials or commercial product launch. Discovery or problems with the product or the failure to comply with applicable requirements may result in restrictions on a product, the

manufacturer or the holder of a marketing authorization, including withdrawal or recall of the product from the market or other EMA or EEA Competent Authority initiated action that could delay or prohibit future marketing. Additionally, new government regulations may be established that could delay or prevent regulatory approval of our products under development.

Pharmaceutical Coverage, Pricing and Reimbursement

Significant uncertainty exists as to the coverage and reimbursement status of any products for which we obtain regulatory approval. In the United States and markets in other countries, sales of any products for which we receive regulatory approval for commercial sale will depend in part on the availability of coverage and reimbursement from third-party payors. Third-party payors include government authorities, managed care providers, private health insurers and other organizations. The process for determining whether a payor will provide coverage for a drug product may be separate from the process for setting the reimbursement rate that the payor will pay for the drug product. Third-party payors may limit coverage to specific drug products on an approved list, or formulary, which might not include all of the FDA-approved drugs for a particular indication. Moreover, a payor's decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved. Adequate third-party reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in product development.

Third-party payors are increasingly challenging the price and examining the medical necessity and cost-effectiveness of medical products and services, in addition to their safety and efficacy. In order to obtain coverage and reimbursement for any product that might be approved for sale, we may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of our products, in addition to the costs required to obtain regulatory approvals. Our product candidates may not be considered medically necessary or cost-effective. If third-party payors do not consider a product to be cost-effective compared to other available therapies, they may not cover the product after approval as a benefit under their plans or, if they do, the level of payment may not be sufficient to allow a company to sell its products at a profit.

The United States government, state legislatures and foreign governments have shown significant interest in implementing cost containment programs to limit the growth of government-paid health care costs, including price controls, restrictions on reimbursement and requirements for substitution of therapeutic equivalent products for branded prescription drugs. By way of example, the ACA contains provisions that may reduce the profitability of drug products, including, for example, increased the minimum rebates owed by manufacturers under the Medicaid Drug Rebate Program, extended the rebate program to individuals enrolled in Medicaid managed care plans, addressed a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted or injected, established mandatory discounts for certain Medicare Part D beneficiaries and annual fees based on pharmaceutical companies' share of sales to federal health care programs. Furthermore, the current presidential administration and Congress are also expected to attempt broad sweeping changes to the current health care laws. We face uncertainties that might result from modification or repeal of any of the provisions of the ACA, including as a result of current and future executive orders and legislative actions. The impact of those changes on us and potential effect on biosimilar manufacturers as a whole is currently unknown. But, any changes to the ACA are likely to have an impact on our results of operations, and may have a material adverse effect on our results of operations. We cannot predict what other healthcare programs and regulations will ultimately be implemented at the federal or state level or the effect of any future legislation or regulations in the United States may have on our business.

In the European Union, governments influence the price of pharmaceutical products through their pricing and reimbursement rules and control of national health care systems that fund a large part of the cost of those products to consumers. Some jurisdictions operate positive and negative list systems under which products may only be marketed once a reimbursement price has been agreed to by the government. To obtain reimbursement or pricing approval, some of these countries may require the completion of clinical studies that compare the

cost-effectiveness of a particular product candidate to currently available therapies. Other member states allow companies to fix their own prices for medicines, but monitor and control company profits. The downward pressure on health care costs in general, particularly prescription drugs, has become very intense. As a result, increasingly high barriers are being erected to the entry of new products. In addition, in some countries, cross-border imports from low-priced markets exert a commercial pressure on pricing within a country.

The marketability of any products for which we and our collaboration partner receive regulatory approval for commercial sale may suffer if the government and third-party payors fail to provide adequate coverage and reimbursement. In addition, an increasing emphasis on cost containment measures in the United States and other countries has increased and we expect will continue to increase the pressure on pharmaceutical pricing. Coverage policies and third-party reimbursement rates may change at any time. Even if favorable coverage and reimbursement status is attained for one or more products for which we receive regulatory approval, less favorable coverage policies and reimbursement rates may be implemented in the future.

Other Healthcare Laws and Compliance Requirements

If we and our collaboration partner obtain regulatory approval for any of our product candidates, we may be subject to various federal and state laws targeting fraud and abuse in the healthcare industry. These laws may impact, among other things, our proposed sales, marketing and education programs. In addition, we may be subject to patient privacy regulation by both the federal government and the states in which we conduct our business. The laws that may affect our ability to operate include:

- The federal Anti-Kickback Statute, which prohibits, among other things, persons from knowingly and willfully soliciting, receiving, offering or paying remuneration, directly or indirectly, to induce, or in return for, the purchase or recommendation of an item or service reimbursable under a federal healthcare program, such as the Medicare and Medicaid programs;
- Federal civil and criminal false claims laws and civil monetary penalty laws, which prohibit, among other things, individuals or entities from knowingly presenting, or causing to be presented, claims for payment from Medicare, Medicaid, or other third-party payors that are false or fraudulent;
- The federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which created new federal criminal statutes that prohibit executing a scheme to defraud any healthcare benefit program and making false statements relating to healthcare matters;
- The federal transparency laws, including the federal Physician Payment Sunshine Act, that requires drug manufacturers to disclose payments and other transfers of value provided to physicians and teaching hospitals and ownership and investment interests held by such physicians and their immediate family members;
- HIPAA, as amended by the Health Information Technology and Clinical Health Act, or HITECH, and its implementing regulations, which imposes certain requirements relating to the privacy, security and transmission of individually identifiable health information; and
- State law equivalents of each of the above federal laws, such as anti-kickback and false claims laws which may apply to items or services reimbursed by any third-party payor, including commercial insurers; state 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 and other potential referral sources; state 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 laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and may not have the same effect, thus complicating compliance efforts.

Because of the breadth of these laws and the narrowness of the statutory exceptions and safe harbors available, it is possible that some of our future business activities could be subject to challenge under one or more of such laws. In addition, the ACA broadened the reach of the fraud and abuse laws by, among other things, amending the intent requirement of the federal Anti-Kickback Statute and certain criminal healthcare fraud statutes. Pursuant to the statutory amendment, a person or entity no longer needs to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation. In addition, the ACA provides that the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the False Claims Act, or FCA, (discussed below) or the civil monetary penalties statute.

We are also subject to the Foreign Corrupt Practices Act, or FCPA, which prohibits improper payments or offers of payments to foreign governments and their officials for the purpose of obtaining or retaining business. Safeguards we implement to discourage improper payments or offers of payments by our employees, consultants, and others may be ineffective, and violations of the FCPA and similar laws may result in severe criminal or civil sanctions, or other liabilities or proceedings against us, any of which would likely harm our reputation, business, financial condition and result of operations.

If our operations are found to be in violation of any of the laws described above or any other governmental regulations that apply to us, we may be subject to penalties, including civil and criminal penalties, exclusion from participation in government healthcare programs, such as Medicare and Medicaid and imprisonment, damages, fines and the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our results of operations.

Hazardous Materials

Our research and development processes may involve the controlled use of hazardous materials and chemicals. We are subject to federal, state and local laws and regulations governing the use, manufacture, storage, handling and disposal of hazardous materials and waste products. We cannot predict how changes in laws or development of new regulations will affect our business operations or the cost of compliance.

Competition

The development and commercialization of protein therapeutics is highly competitive. While we believe that our Pfēnex Expression Technology[®], knowledge, experience and scientific resources provide us with competitive advantages, we face potential competition from many different sources, including major pharmaceutical, generic pharmaceutical, specialty pharmaceutical and biotechnology companies. In the event that we and our collaboration partner were to market and sell any of our biopharmaceutical products, we would face competition from the companies producing branded reference drugs, as well as any other firms developing the biosimilars that would compete with the product candidates in our pipeline and other novel products with similar indications. For example, PF708, our teriparatide 505(b)(2) candidate, may face competition from the reference product sponsor, Eli Lilly, or other competition from companies like Teva and Gedeon Richter Plc., and from Amgen Inc. and Radius Health, Inc. as developers of novel products. Key competitive factors affecting the success of our lead product candidates, if approved, are likely to be price, the level of biosimilar, therapeutic equivalent and novel product competition and the availability of coverage and reimbursement from government and other third-party payors.

Similarly, our novel vaccine development programs face substantial competition from major pharmaceutical and other biotechnology companies that are actively working on improved and novel vaccines. We believe that our primary competitors include Emergent BioSolutions, Inc. and Altimmune, Inc. These companies are receiving funding from BARDA for the development of next generation anthrax vaccines. All of our novel vaccine efforts will face competition for limited government funding from other non-vaccine defensive measures as well, including medical countermeasures for biological, chemical and nuclear threats, diagnostic testing systems and other emergency preparedness countermeasures.

Further, many of our competitors, either alone or with their strategic partners, have substantially greater financial, technical and human resources than we do and significantly greater experience in the discovery and development of product candidates, obtaining FDA and other regulatory approvals of treatments and commercializing those treatments. Accordingly, our competitors may be more successful than we are in obtaining approval for treatments and achieving widespread market acceptance. Our competitors' treatments may be more effective or more effectively marketed and sold than any treatment we may commercialize and may render our treatments obsolete or non-competitive before we can recover the expenses of developing and commercializing any of our product candidates. For further discussion of risks related to government contracting, see the discussion in Item 1A, "*Risk Factors*" in this Form 10-K.

Mergers and acquisitions in the biotechnology and pharmaceutical industries may result in even more resources being concentrated among a smaller number of our competitors. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical study sites and subject registration for clinical studies, as well as in acquiring technologies complementary to or necessary for our programs. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies.

Sales and Marketing

To date, none of our product candidates have completed clinical development, been submitted for regulatory review or received marketing authorization from any regulatory agency, and therefore we have not received revenue from the sale of any of our product candidates.

In light of our stage of development, we have not yet established commercial organization or distribution capabilities. Except for our agreement with Jazz with respect to certain hematology/oncology product candidates, we generally expect to retain commercial rights for our product candidates. To the extent that we retain commercial rights to product candidates, we intend to use an internal sales force to commercialize products for which we may receive marketing approvals in territories in which we believe it is possible to access the market through a focused, specialty sales force.

Upon marketing approval, Jazz, our collaboration partner, will assume responsibility for the manufacturing and commercialization of certain hematology/oncology products globally. Given the initial emerging markets focus for those products, we generally expect to jointly seek collaboration, distribution and/or marketing arrangements with third parties.

We have sales and marketing capabilities to support our commercial efforts for our protein production services and reagent protein product sales. In addition, we have sales and marketing capabilities to support those products under development that receive FDA approval that will ultimately be procured by the United States government.

Intellectual Property

We strive to protect and enhance the proprietary technologies that we believe are important to our business, and seek to obtain and maintain patents for any patentable aspects of our platform technology and our products or product candidates, their methods of use and any other inventions that are important to the development of our business. Our success depends substantially on our ability to obtain and maintain patent and other proprietary protection for our technology and product candidates, to defend and enforce our patents to prevent others from infringing our proprietary rights, maintain our licenses to use intellectual property owned by third parties, preserve the confidentiality of our trade secrets and to operate without infringing on the valid and enforceable patents and other proprietary rights of third parties. Our policy is to seek to protect our proprietary position by, among other methods, filing United States and foreign patent applications related to our proprietary technology and product candidates that are important to the development of our business. We also rely on trade secrets,

know-how, continuing technological innovation and in-licensing opportunities to develop and maintain our proprietary position relating to our platform technology and product candidates.

We are the owner or licensee of a portfolio of patents and patent applications and possess substantial know-how and trade secrets which protect various aspects of our business. As of December 31, 2017, we were the sole owner of a patent portfolio that consisted of a total of 22 U.S. issued patents and three U.S. non-provisional patent applications that provide material coverage for our platform technology and our lead product candidates as well as foreign granted and pending patent applications which are counterparts to certain of the foregoing U.S. patents and patent applications. Our U.S. issued patents expire during the time period beginning in 2025 and ending in 2033. Our owned and exclusively licensed patent portfolio includes claims directed to:

- methods for bacterial protein production and methods for rapid screening of an array of expression systems
- *P. fluorescens* promoter sequences and secretion leader sequences
- auxotrophic marker systems for antibiotic free maintenance of expression plasmids in high cell density cultures,
- improved incorporation of non-natural amino acids
- expression of classes of proteins such as cytokines
- antibody derivatives
- microbial toxins in *P. fluorescens*
- methods and expression strains for production and/or purification of soluble full length human cytokines, Interferon beta and G-CSF
- vaccine antigens recombinant anthrax protective antigen, microbial toxins and toxoids, and the malarial vaccine candidate antigen *P. falciparum* circumsporozoite protein (CSP)
- fusion partners for peptide production

Pursuant to the technology licensing agreement, The Dow Chemical Company, or TDCC, and Dow Global Technologies LLC, or DGTI, also grant to us non-exclusive licenses to U.S. patents and applications and their foreign counterparts covering methods and technologies for recovery of proteins and peptides from *P. fluorescens* cells. In conjunction with the licenses granted by TDCC and DGTI to us under the technology licensing agreement, we also entered into a grant-back and technology license agreement, pursuant to which we granted to TDCC exclusive and non-exclusive licenses under certain patent rights and know-how relating to our Pfēnex Expression Technology® to use certain biological materials to make, use and commercialize products in certain fields of use that do not include human therapeutics. See “Business—Collaborations, Joint Development and Licenses” for a detailed description of our agreements with TDCC and DGTI.

The patent positions of companies like ours are generally uncertain and involve complex legal and factual questions. Our ability to obtain and maintain our proprietary position for our technology will depend on our success in obtaining issued claims that cover our technology and product candidates, and being able to enforce those claims against our competitors once granted. We do not know whether any of our pending patent applications will result in the issuance of any patents. Moreover, even our issued patents do not guarantee us the right to practice the patented technology in relation to the commercialization of our product candidates. Third parties may have blocking patents that could be used to prevent us from commercializing our patented products and practicing our patented technology. Our issued patents and those that may be issued in the future may be challenged, invalidated or circumvented, which could limit our ability to stop competitors from marketing related products or the length of the term of patent protection that we may have for our products. In addition, the rights granted under any issued patents may not provide us with proprietary protection or competitive advantages

against competitors with similar technology. Furthermore, our competitors may independently develop similar technologies. For these reasons, we may have competition for both our biosimilar and vaccine products. Moreover, because of the extensive time required for development, testing and regulatory review of a potential product, it is possible that, before any of our products can be commercialized, any related patent may expire or remain in force for only a short period following commercialization, thereby reducing any advantage of the patent.

We may rely, in some circumstances, on trade secrets to protect our technology. However, trade secrets are difficult to protect. We seek to protect our technology and product candidates, in part, by entering into confidentiality agreements with those who have access to our confidential information, including our employees, consultants, advisors, contractors and collaborators. We also seek to preserve the integrity and confidentiality of our proprietary technology and processes by maintaining physical security of our premises and physical and electronic security of our information technology systems. While we have confidence in these individuals, organizations and systems, agreements or security measures may be breached and we may not have adequate remedies for any breach. In addition, our trade secrets may otherwise become known or be independently discovered by competitors. To the extent that our employees, consultants, advisors, contractors and collaborators use intellectual property owned by others in their work for us, disputes may arise as to the rights in related or resulting know-how and inventions. For this and more comprehensive risks related to our proprietary technology and processes, please see “*Risk Factors—Risks related to our intellectual property.*”

Environmental Matters

Our research and development and manufacturing activities and our third-party manufacturers’ and suppliers’ activities involve the controlled storage, use and disposal of hazardous materials owned by us, including, small quantities of acetonitrile, methanol, ethanol, ethidium bromide and compressed gases, and other hazardous compounds. We and our manufacturers and suppliers are subject to laws and regulations governing the use, manufacture, storage, handling and disposal of these hazardous materials. In some cases, these hazardous materials and various wastes resulting from their use are stored at our and our manufacturers’ facilities pending their use and disposal. We seek to comply with applicable laws regarding the handling and disposal of such materials. Given the small volume of such materials used or generated at our facilities, we do not expect our compliance efforts to have a material effect on our capital expenditures, earnings, and competitive position. However, we cannot eliminate the risk of accidental contamination or discharge and any resultant injury from these materials. We do not currently maintain separate environmental liability coverage and any such contamination or discharge could result in significant cost to us in penalties, damages, and suspension of our operations.

Suppliers

We currently rely on, and expect to continue to rely on, contract manufacturers to produce sufficient quantities of our product candidates for use in our clinical trials. In addition, we intend to rely on third parties to manufacture any products that we may commercialize in the future. We have established an internal pharmaceutical development group to develop manufacturing methods for our product candidates, to optimize manufacturing processes, and to select and transfer these manufacturing technologies to our suppliers. We contract with multiple manufacturers to ensure adequate product supply and to mitigate risk.

There currently are a limited number of these manufacturers. Furthermore, some of the contract manufacturers that we have identified to date only have limited experience at manufacturing, formulating, analyzing and packaging our product candidates in quantities sufficient for conducting clinical trials or for commercialization. For further discussion of risks related to government contracting, see the discussion in Item 1A, “*Risk Factors*” in this Form 10-K.

Manufacturing

We do not own or operate facilities for cGMP manufacturing of any products. Although we intend to rely on contract manufacturers, we have personnel with experience in the development of United States and European Union cGMP-compliant processes and management of Contract Manufacturing Organizations (CMOs), to oversee the technology transfer to the manufacturers of PF708, Px563L and other product candidates that we may develop. For example, we are currently working with a CMO to produce clinical supplies for PF708. Our manufacturing processes employ standard equipment common to CMOs. Our processes also use common and widely available materials, and our well-established manufacturing procedures are robust, scalable, and readily transferable to support our clinical development programs and commercialization of our products. We believe that there are alternate sources of supply that can satisfy our clinical and commercial requirements, although we cannot be certain that identifying and establishing relationships with such sources, if necessary, would not result in significant delay or material additional costs. For a discussion of risks related to our sources and availability of supplies, see *“Risk Factors—Risks Relating to our Reliance on Third Parties—We rely on third-party suppliers, and in some instances a single third-party supplier, for the manufacture and supply of certain materials in our protein production services, and these suppliers could cease to manufacture the materials, go out of business or otherwise not perform as anticipated.”*

In each of our agreements with contract manufacturers, we retain ownership of our intellectual property and generally own and/or are assigned ownership of processes, developments, data, results and other intellectual property generated during the course of the performance of each agreement that primarily relate to our products. Where applicable, we are granted non-exclusive licenses to certain contract manufacturer intellectual property for purposes of exploiting the products that are the subject of the agreement, and in a few instances, we grant non-exclusive licenses to the contract manufacturers for use outside of our product area. In each contract, we have the right to terminate for convenience. The agreements also contain typical provisions for both parties to terminate for material breach, and bankruptcy and insolvency.

Protein Production

Utilizing our Pfenex Expression Technology[®], we provide protein production and process development services to third parties on a fee for service basis in support of the development of novel biopharmaceuticals. Pursuant to a license agreement, the third-party licenses a production strain from us and then pays us an up-front payment, milestone payments based upon clinical progression and regulatory filings, and a royalty based on product net sales. Our protein production efforts enable us to maximize the utilization of our Pfenex Expression Technology[®], expand our institutional knowledge and generate revenue.

Seasonality

Our revenues are not seasonal in nature.

Segment Information

We operate in one segment. Management uses one measurement of profitability and does not segregate its business for internal reporting.

U.S. Government Contracts

Revenue from U.S. Government contracts varies by year. A portion of our government business is subject to renegotiation of profits or termination of contracts or subcontracts at the election of the U.S. Government. In addition to contract terms, we must comply with procurement laws and regulations relating to the formation, administration, and performance of U.S. Government contracts. Failure to comply with these laws and regulations could lead to the termination of contracts at the election of the government or the suspension or

debarment from U.S. Government contracting or subcontracting. U.S. Government revenue as a percentage of our total revenue was approximately 20%, 10% and 48% for fiscal years 2017, 2016 and 2015, respectively. For further discussion of risks related to government contracting, see the discussion in Item 1A, “*Risk Factors*” in this Form 10-K.

Employees

We believe that our success will depend greatly on our ability to identify, attract and retain capable employees. As of December 31, 2017, we had 67 employees, including a total of 16 employees who hold M.D. and/or Ph.D. degrees. Our employees are not represented by any collective bargaining unit, and we believe our relations with our employees are good.

Backlog

We have no material backlog of orders.

Research and Development

Over the last three fiscal years, we have invested over \$82.5 million in principal research and development programs (\$31.9 million, \$32.4 million and \$18.2 million for the years ended December 31, 2017, 2016 and 2015, respectively). Please see “*Management’s Discussion and Analysis of Financial Condition and Results of Operations*” in this Annual Report on Form 10-K for additional information related to research and development expenditures.

Geographic Information

During 2017, 2016 and 2015, substantially all of our long-lived assets were located within the United States. Approximately 77% of our revenue for 2017, 9% of our 2016 revenue, and 12% of our 2015 revenue came from international markets. Please see *Note 1* to our audited financial statements included in Item 8 of this Annual Report on Form 10-K for additional information related to our U.S. and non-U.S. revenue.

Corporate Information

We were founded in November 2009 as a Delaware corporation spun out of The Dow Chemical Company. Our principal executive offices are located at 10790 Roselle St., San Diego, California 92121 and our telephone number is (858) 352-4400. Our website is www.pfenex.com. We make available on our website, free of charge, our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and any amendments to those reports, as soon as reasonably practicable after we electronically file such material with, or furnish it to, the Securities and Exchange Commission (SEC). Our SEC reports can be accessed through the investor relations page of our website located at <http://pfenex.investorroom.com>. Additionally, a copy of this Annual Report on Form 10-K is located at the SEC’s Public Reference Room at 100 F Street, NE, Washington, D.C. 20549. Information on the operation of the Public Reference Room can be obtained by calling the SEC at 1-800-SEC-0330.

We webcast our earnings calls and certain events we participate in or host with members of the investment community on our investor relations page of our website. Corporate governance information, including our board committee charters, code of ethics and conduct, and corporate governance principles, is also available on our investor relations page of our website located at <http://pfenex.investorroom.com/corporate-governance>. In addition, we use our website (<http://www.pfenex.com>), our investor relations website (<http://pfenex.investorroom.com>), press releases, SEC filings, public conference calls, corporate Twitter account (<https://twitter.com/pfenex>), Facebook page (<https://www.facebook.com/Pfenex-Inc-105908276167776/timeline>), and LinkedIn page (<https://www.linkedin.com/company/pfenex-inc>) in order to achieve broad, non-exclusionary distribution of

information to the public. We encourage our investors and others to review the information we make public in these locations as such information could be deemed to be material information. Please note that this list may be updated from time to time.

The contents of our website and the information we post through social media are not a part of, and are not incorporated by reference into, this Annual Report on Form 10-K or any other report or document we file with the SEC, and any references to our website and social media sites are intended to be inactive textual references only.

Pfenex™, the Pfenex logo and other trademarks or service marks of Pfenex appearing in this Annual Report on Form 10-K are the property of Pfenex Inc. Trade names, trademarks and service marks of other companies appearing in this Annual Report on Form 10-K are the property of their respective holders.

Executive Officers

The following table identifies certain information about our executive officers as of March 2, 2018.

<u>Name</u>	<u>Age</u>	<u>Position</u>
Evert B. Schimmelpennink	46	Chief Executive Officer, President and Secretary
Susan A. Knudson	54	Chief Financial Officer
Patricia Lady	59	Chief Accounting Officer
Patrick K. Lucy	50	Chief Business Officer
Hubert C. Chen	49	Chief Medical and Scientific Officer

Evert B. Schimmelpennink has served as our Chief Executive Officer, President and Secretary since August 2017. Prior to his appointment, Mr. Schimmelpennink served as the Chief Executive Officer of Alvotech, a biosimilar development company from 2015 to July 2017. From September 2015 to November 2015, Mr. Schimmelpennink served as Vice President—Global Sterile Injectables of Pfizer Inc., a pharmaceutical company. Prior to that, Mr. Schimmelpennink served as Vice President—Global Generics from 2012 to 2015 and Director of Specialty Injectable Pharma Marketing EMEA & Director of Distributor Operations EMEA from 2011 to 2012 of Hospira, Inc., a pharmaceutical company. From 2002 to 2011, Mr. Schimmelpennink held various roles at Synthon BV, a generics medicine company, including Vice President Marketing and Sales from 2008 to 2011. From 1997 to 2002 he held various roles with Numico NV, a Dutch maker of baby foods and nutritional bars and shakes, including International Product Manager from 2000 to 2002 and Researcher Product Development from 1999 to 2000. Prior to Numico, Mr. Schimmelpennink served as a vaccine technologist at the Dutch National Institute for Public Health and the Environment from 1998 to 1999. Mr. Schimmelpennink received a Masters in bioprocess engineering from the Wageningen University in the Netherlands.

Susan A. Knudson has served as our Chief Financial Officer since February 2018. From 2009 to 2017, Ms. Knudson held various roles at Neothetics, Inc., a specialty pharmaceutical company, including Chief Financial Officer from 2014 to 2017 and Vice President of Finance and Administration from 2009 to 2014. Prior to joining Neothetics, Ms. Knudson served as Senior Director of Finance and Administration at Avera Pharmaceuticals, a pharmaceutical company, from May 2002 to January 2009. Prior to May 2002, Ms. Knudson served as Director of Finance and Administration at MD Edge, Inc., a medical communications company, from October 2000 to April 2002. Prior to joining MD Edge, Ms. Knudson served as Assistant Director of Accounting at Isis Pharmaceuticals, a pharmaceutical company, from April 2000 to October 2000. Ms. Knudson has also held senior positions at CombiChem, General Atomics and Deloitte & Touche. Ms. Knudson holds a B.A. in Accounting from the University of San Diego.

Patricia Lady has served as our Chief Accounting Officer since 2011. Prior to serving in her current role, Ms. Lady served as our Director of Finance and Corporate Controller from 2009 to 2011. From 2007 to 2009, she served as Director of Finance and Accounting at Neurocrine Biosciences, Inc., a biopharmaceutical company.

From 2006 to 2007, Ms. Lady held the position of Corporate Controller of Avanir Pharmaceuticals, Inc., a pharmaceutical company. From 2001 to 2005, Ms. Lady held the position of Vice President of Finance at 3E Company, a technology company. From 2000 to 2001, she served as Vice President of Business Development of Everypath, Inc., a technology company. From 1999 to 2000, Ms. Lady held the position of Vice President of Business Development and Marketing at iOwn, Inc., a technology company. From 1997 to 1999, she served as Vice President of Business Development at Careerbuilder, a technology company. Ms. Lady is a certified public accountant, a chartered global management accountant and a certified management accountant. Ms. Lady holds a Bachelor's degree in Accounting from California State University, Fullerton and an M.B.A. from the University of California, Los Angeles.

Patrick K. Lucy has served as our Chief Business Officer since 2014. Mr. Lucy also served as our Interim Chief Executive Officer, President and Secretary from January 2017 to August 2017, when Mr. Schimmelpennink was appointed to the role. Mr. Lucy previously served as our Vice President of Business Development and Marketing between 2009 and 2014. Prior to joining us, Mr. Lucy held the position of Director of Business Development at DowPharma, a business within The Dow Chemical Company, a chemicals manufacturer, from 2002 to 2009. From 1999 to 2002, he held the position of Director of Business Development at Collaborative BioAlliance, Inc., a biotechnology company, which was acquired by The Dow Chemical Company. From 1998 to 1999, Mr. Lucy worked as a Validation Manager and Capital Project Manager and from 1996 to 1998, as a Quality Control Biochemistry Supervisor at Lonza Biologics Inc., a chemicals and biotechnology company. From 1991 to 1996, Mr. Lucy held various positions at Repligen Corporation, a life sciences company. Mr. Lucy holds a Bachelor's degree in Biology from Villanova University.

Hubert C. Chen has served as our Chief Medical & Scientific Officer since May 2017. He previously served as our Chief Medical Officer from November 2014 until May 2017. From 2012 to 2014, Dr. Chen served as Vice President, Clinical Development of Aileron Therapeutics, a biopharmaceutical company developing and advancing drugs using novel peptide-stabilizing technologies. From 2009 to 2012, Dr. Chen served as Vice President, Translational Medicine of Regulus Therapeutics, a biopharmaceutical company focused on the discovery and development of microRNA therapeutics. From 2006 to 2009, Dr. Chen served as Director, Clinical Research and Senior Director, Clinical Research and Corporate Development of Amylin Pharmaceuticals, a biopharmaceutical company engaged in the discovery, development and commercialization of drug candidates for the treatment of diabetes, obesity and other diseases. From 2004 to 2006, Dr. Chen served as Associate Director, Medical Sciences of Amgen, Inc., a biopharmaceutical company discovering, developing, and manufacturing of innovative human therapeutics. Additionally, from 2002 to 2012, Dr. Chen served as Assistant Clinical Professor of Medicine and Clinical Instructor of Medicine at the University of California, San Francisco. From 2001 to 2004, Dr. Chen served as a Staff Research Investigator, Staff Scientist, and Research Scientist at the Gladstone Institute of Cardiovascular Disease. Dr. Chen received his medical residency training at Massachusetts General Hospital from 1995 to 1998, his M.D. from Columbia University in 1995 and his B.A.S. in political science and biological sciences from Stanford University in 1991.

Item 1A. Risk Factors

RISK FACTORS

Investing in our common stock involves a high degree of risk. You should carefully consider the risks and uncertainties described below, together with all of the other information in this Annual Report on Form 10-K, before making an investment decision. The risks and uncertainties described below may not be the only ones we face. If any of the risks actually occur, our business, financial condition, operating results, cash flows and prospects could be materially and adversely affected. In that event, the market price of our common stock could decline, and you could lose part or all of your investment.

Risks Relating to our Financial Condition and Need for Additional Capital

We have a limited operating history and expect to generate significant losses for the foreseeable future. If we do not generate significant revenue, we will not be profitable.

With the exception of two years, we have incurred annual net operating losses since inception, and to date have generated only limited revenue from government contracts, service agreements, collaboration agreements, and reagent protein product sales. We have recognized a net loss of \$25.7 million for the year ended December 31, 2017, net income of \$5.5 million for the year ended December 31, 2016 and a net loss of \$28.2 million for the year ended December 31, 2015. We had an accumulated deficit of \$161.7 million and net working capital of \$43.0 million as of December 31, 2017. To date, we have funded our operations primarily through the sale and issuance of common stock in our public offerings, revenue from our collaboration agreements, government contracts, service agreements, and reagent protein product sales, our prior credit facility and the private placement of equity securities. As of December 31, 2017, we had capital resources consisting of cash and cash equivalents of \$57.7 million. As we continue to develop and invest more resources into the development and commercialization of our product candidates, our net operating losses will increase over the next several years. To become profitable, we must successfully develop and obtain regulatory approval for our product candidates, and effectively manufacture and commercialize the product candidates we develop. If we obtain regulatory approval to market a product candidate, our future revenue will depend upon the size of any markets in which our product candidates may receive approval, and our and our collaboration partner's ability to achieve sufficient market acceptance, pricing, reimbursement from third-party payors, and adequate market share for our product candidates in those markets. We may never succeed in these activities and therefore may never generate revenue that is significant or large enough to achieve profitability. 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 could depress the market price of our common stock and could impair our ability to raise capital, expand our business, diversify our product offerings or continue our operations.

We will require substantial additional funds to seek and obtain regulatory approval for and commercialize our most advanced product and vaccine candidates and our other product candidates and, if additional capital is not available, we may need to limit, scale back or cease our operations.

Since our inception, a significant portion of our resources have been dedicated to the preclinical and clinical development of our product candidates, including PF708, Px563L/RPA563, PF582, and PF529. We believe that we will continue to expend substantial resources for the foreseeable future for the preclinical and clinical development of our current product pipeline, and the development of any other indications and product candidates we may choose to pursue, either alone or with a strategic collaboration partner. These expenditures will include costs associated with research and development, conducting preclinical studies and clinical studies, and manufacturing and supply as well as marketing and selling any products that receive marketing authorization. In addition, other unanticipated costs may arise. Because the outcome of any clinical trial is highly uncertain, we cannot reasonably estimate the actual amounts necessary to successfully complete the development and commercialization of PF708, Px563L/RPA563, and our pipeline of other product candidates and preclinical

products under development. Following our strategic review in November 2017, we decided to pause our development activities for PF582 and PF529, and focus our efforts and resources elsewhere in the product portfolio until strategic partnerships for these candidates are forged. In the future, we may be required to devote additional resources to the development of PF582 or PF529, or obtain a new collaboration partner on short notice, and the terms of any additional collaboration or other arrangements that we establish may not be favorable to us. We may also need to obtain substantial additional sources of funding to develop PF708 and Px563L/RPA563 as currently contemplated. If such additional funding is not available on favorable terms or at all, we may need to delay or reduce the scope of our PF708 and Px563L/RPA563 development programs, or grant rights in the United States, as well as outside the United States, to our product candidates to one or more partners.

We believe that our available cash and cash equivalents, including the proceeds from any revenue from our government contracts, service agreements, collaboration agreement, and reagent protein product sales will allow us to fund our operations for at least the next 12 months, including costs associated with the anticipated submission of the PF708 new drug application (NDA) to the U.S. Food and Drug Administration (FDA). However, changing circumstances and risks and uncertainties associated with our product development efforts may cause us to consume capital significantly faster than we currently anticipate, and we may need to spend more money than currently expected. Our future capital requirements may vary depending on the following:

- the timing and extent of spending on our research and development efforts, including with respect to PF708 and our other product candidates;
- our ability to enter into and maintain collaboration, licensing, commercialization and other arrangements and the terms and timing of such arrangements;
- the cost of manufacturing and commercialization activities, if any;
- the receipt of any collaboration or milestone payments;
- the scope, rate of progress, results and cost of our clinical trials, preclinical testing and other related activities;
- the emergence of competing technologies or other adverse market developments;
- the time and costs involved in seeking and obtaining regulatory and marketing approvals in multiple jurisdictions for our product candidates that successfully complete clinical trials;
- the cost of preparing, filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights;
- the introduction of new product candidates and the number and characteristics of product candidates that we pursue;
- the timing, receipt and amount of sales, profit sharing or royalties, if any, from our potential products;
- if approved, the degree and rate of market acceptance of any products launched by us or our collaboration partner;
- the expansion of our sales and marketing activities; and
- the potential acquisition and in-licensing of other technologies, products or assets.

If we were to experience any delays or encounter issues with any of the above, including clinical holds, failed studies, inconclusive or hard-to-interpret results, safety or efficacy issues, or other regulatory challenges that require longer follow-up of existing studies, additional major studies, or additional supportive studies in order to pursue marketing approval, it could further increase the costs associated with the above and delay revenues.

We will need to raise additional capital to fund our operations in the near future. If we seek additional funding in the future, additional funds may not be available to us on acceptable terms or at all. We may seek to

raise additional funds through equity, equity-linked or debt financings. If we raise additional funds through the incurrence of indebtedness, such indebtedness would have rights that are senior to holders of our equity securities and could contain covenants that restrict our operations. Any additional equity financing may be dilutive to our stockholders. If we are unable to obtain funding on a timely basis, we may be required to significantly curtail the advancement of one or more of our product candidates. We also could be required to seek funds through arrangements with collaboration partners or others that may require us to relinquish rights to some of our technologies or product candidates which we would otherwise pursue on our own.

Any further development of PF582 and PF529 will require significant resources from us or another collaboration partner, and in the event that we do not find a collaboration partner, the development of PF582 and PF529 could be significantly delayed or result in the discontinuation of the development of PF582 and PF529.

In November 2017, we completed our strategic review of PF582 and PF529, our biosimilar product candidates to Lucentis® and Neulasta®, respectively. The strategic review considered the timeline for development and cost of both programs. As a result of our strategic review, we decided to pause development activities on PF582 and PF529 and focus development efforts elsewhere within the product portfolio while we continue to engage potential strategic partners to monetize PF582 and PF529. Further development of PF582 and PF529 will require significant resources from us or another collaboration partner. We or a new collaboration partner will be responsible for funding any new PF582 and PF529 development and clinical trial activities going forward. Any such further development will require significant resources to develop and commercialize PF582 and PF529, and such further development may not be possible in the near term without a new collaboration partner. There are no assurances that we will have access to additional capital or find a new collaboration partner or that the terms and timing of any such arrangements would be acceptable to us. As a result, we could experience a significant delay in the PF582 and PF529 development processes. If we determine instead to discontinue the development of PF582 or PF529, we will not receive any future return on our investment from that product candidate.

Our quarterly operating results may fluctuate significantly.

Our operating results are subject to quarterly fluctuations. Our operating results are affected by numerous factors, including:

- variations in the level of expenses related to our PF708, Px563L/RPA563 and other development programs;
- addition or termination of clinical trials;
- any intellectual property infringement lawsuit in which we may become involved;
- regulatory developments affecting any of our products; and
- our execution of any service, collaborative, licensing or similar arrangements, and the timing of payments we may make or receive under these arrangements.

If our quarterly operating results fall below the expectations of investors or securities analysts, the market price of our common stock could decline substantially. Furthermore, any quarterly fluctuations in our operating results may, in turn, cause the market price of our stock to fluctuate substantially.

Risks Relating to our Business and our Industry

Our business operations are dependent upon our new senior management team and the ability of our other new employees to execute on our business strategy. If we fail to attract, integrate, and keep senior management and key scientific personnel, we may be unable to successfully develop PF708, Px563L/RPA563 or any other product candidates, conduct our clinical trials and commercialize PF708, Px563L/RPA563 or any other product candidates we develop.

Our success depends in part on our continued ability to attract, integrate, retain, and motivate highly qualified management, clinical and scientific personnel, including our ability to develop an effective working relationship among senior management. Our senior management has substantially changed over the last year, including, for example, the recent departures of our former chief executive officer, Bertrand Liang, former chief financial officer, Paul Wagner, and former chief manufacturing officer, Steven Sandoval. We have a new president and chief executive officer, Eef Schimmelpennink, who started in August 2017, and a new chief financial officer, Susan Knudson, who started in February 2018.

As new employees gain experience in their roles, we could experience inefficiencies or a lack of business continuity due to loss of historical knowledge and a lack of familiarity of new employees with business processes, operating requirements, policies and procedures, and we may experience additional costs as new employees gain necessary experience. It is important to our success that these key employees quickly adapt to and excel in their new roles. If they are unable to do so, our business and financial results could be materially adversely affected. In addition, the loss of the services of any member of our senior management or our scientific or technical support staff might significantly delay or prevent the development of our products or achievement of other business objectives by diverting management's attention to transition matters and identification of suitable replacements, if any, and could have a material adverse effect on our business.

We believe that our future success is highly dependent upon the contributions of our senior management, particularly our Chief Executive Officer, Chief Financial Officer, Chief Business Officer, and Chief Medical and Scientific Officer, as well as our senior scientists and other members of our senior management team. Employment agreements with our Chief Executive Officer, Chief Business Officer, and Chief Medical and Scientific Officer, as well as our offer letters with our senior scientists, all provide for "at-will" employment. The loss of services of any of these individuals could delay or prevent the successful development of our product pipeline, completion of our planned clinical trials or the commercialization of PF708, Px563L/RPA563, or any other products we develop.

Competition for qualified personnel in the biotechnology and pharmaceuticals industry is intense due to the limited number of individuals who possess the skills and experience required. To help attract, retain, and motivate qualified employees, we use share-based incentive awards such as employee stock options. Other companies may provide more generous compensation and benefits, more diverse opportunities and better chances for career advancement than we do. Some of these advantages may be more appealing to high-quality candidates and employees than those we have to offer. In addition, the decline in our stock price has created additional challenges related to our ability to compete effectively with respect to equity compensation. We may need to hire additional personnel as we expand our clinical development and commercial activities. We may not be able to attract and retain quality personnel on acceptable terms, or at all, which may cause our business and operating results to suffer.

If an improved version of a reference product or reference listed drug, such as Forteo, is developed, or if the market for a reference product or reference listed drug significantly declines, sales or potential sales of our biosimilar and therapeutic equivalent product candidates may suffer.

Reference product or reference listed drug ("originator") sponsor companies may develop improved versions as part of a life cycle extension strategy, and may obtain regulatory approval of the improved version under a supplemental biologics license application (BLA) or NDA. If an originator sponsor company succeeds in

obtaining an approval of an improved product, it may capture a significant share of the collective market and significantly reduce the market for the reference product/reference listed drug, and thereby the potential size of the market for our biosimilar and therapeutic equivalent product candidates. In addition, the improved product may be protected by additional patent rights.

Additionally, competition in the pharmaceutical market is intense. Reference products/reference listed drugs face competition on numerous fronts as technological advances are made that may offer patients a more convenient form of administration or increased efficacy, or as new products are introduced. As new products are approved that compete with the reference product/reference listed drug to our biosimilar or therapeutic equivalent product candidates, such as Forteo, sales may be significantly and adversely impacted and may render the originator obsolete. If the market for the originator is impacted, we in turn may lose significant market share or market potential for our products and product candidates. As a result, the value of our product pipeline could be negatively impacted and our business, prospects and financial condition could suffer.

Our product candidates, if approved, will face significant competition from the reference products and from other biosimilars and therapeutic equivalent products of the reference products, and from other products. Our failure to effectively compete may prevent us from achieving significant market penetration and expansion.

We expect to enter highly competitive pharmaceutical markets. Successful competitors in the pharmaceutical market have the ability to effectively discover, obtain patents, develop, test and obtain regulatory approvals for products, as well as the ability to effectively commercialize, market and promote approved products, including communicating the effectiveness, safety and value of products to consumers and medical professionals. Numerous companies, universities, and other research institutions are engaged in developing, patenting, manufacturing and marketing of products competitive with those that we are developing. Many of these potential competitors, such as Novartis AG, Genentech, Inc., a wholly-owned member of the Roche Group, Amgen Inc. and Eli Lilly and Company, are large, experienced companies that enjoy significant competitive advantages, such as substantially greater financial, research and development, manufacturing, personnel and marketing resources. Recent and potential future merger and acquisition activity in the biotechnology and pharmaceutical industries are likely to result in even more resources being concentrated among a smaller number of our competitors. These companies also maintain greater brand recognition and more experience and expertise in undertaking preclinical testing and clinical trials of product candidates, and obtaining the FDA and other regulatory approvals of products. Established pharmaceutical companies may also invest heavily to accelerate discovery and development of novel compounds that could make our product candidates obsolete.

In addition, our biosimilar, therapeutic equivalent and vaccine products may face competition from companies that develop and commercialize biosimilars, therapeutic equivalent products and vaccines that compete directly with our products. See *“Risks Related to Government Regulation—If other therapeutic equivalent or generic products to Forteo are approved and successfully commercialized before PF708, our business would suffer.”*

Use of our product candidates could be associated with side effects or adverse events.

Use of our product candidates could be associated with side effects or adverse events which can vary in severity (from minor reactions to death) and frequency (infrequent or prevalent). Side effects or adverse events associated with the use of our product candidates may be observed at any time, including in clinical trials or when a product is commercialized, and any such side effects or adverse events may negatively affect our and our collaboration partner’s ability to obtain and maintain regulatory approval or market our product candidates. Side effects such as toxicity or other safety issues associated with the use of our product candidates could require us or our collaboration partner to perform additional studies or halt development or sale of these product candidates or expose us to product liability lawsuits which would harm our business. We may be required by regulatory agencies to conduct additional animal or human studies regarding the safety and efficacy of our product candidates which we have not planned or anticipated. We may also be required to change our product labeling,

including increasing the prominence and content of warnings and contraindications for our products. There can be no assurance that we will resolve any issues related to any product-related adverse events to the satisfaction of the FDA or any regulatory agency in a timely manner or ever, which could harm our business, prospects and financial condition.

In addition, if we and any future collaboration partner are successful in commercializing PF708, Px563L/RPA563 or any other product candidates, the FDA, European Medicines Agency (EMA), competent authorities of the Member States of the European Economic Area (EEA), and other foreign regulatory agency regulations require that we timely report certain information about adverse medical events if those products may have caused or contributed to those adverse events. The timing of our obligation to report would be triggered by the date we become aware of the adverse event as well as the nature of the event. We or our collaboration partner may fail to report adverse events we become aware of within the prescribed timeframe. We or our collaboration partner may also fail to appreciate that we or our collaboration partner have become aware of a reportable adverse event, especially if it is not reported to us as an adverse event or if it is an adverse event that is unexpected or removed in time from the use of our products. If we or our collaboration partner fail to comply with our reporting obligations, the FDA, the EMA, competent authorities of the Member States of the EEA, or other foreign regulatory agencies could take action including criminal prosecution, the imposition of civil monetary penalties, seizure of our products, or delay in approval or clearance of our products.

We currently rely on a limited number of third parties for a substantial portion of our revenue. The loss of or a change in any of these third parties, including its creditworthiness, could materially reduce our revenue and adversely impact our financial position.

Two third parties accounted for more than 10% of our 2017 and 2015 revenue and one third party accounted for more than 10% of our 2016 revenue. Jazz Pharmaceuticals Ireland Limited (Jazz) and the Biomedical Advanced Research and Development Authority (BARDA) each accounted for more than 10% of our revenue in 2017, Pfizer accounted for more than 10% of our 2016 revenue, and Pfizer and BARDA each accounted for more than 10% of our revenue in 2015.

In August 2016, we entered into a termination agreement with Pfizer pursuant to which our development and license agreement was terminated and all rights to PF582 returned to us. The termination accelerated recognition of \$45.8 million of revenue that had been previously deferred and we will not recognize any additional future revenue under this agreement. Pfizer will no longer be responsible for manufacturing, clinical studies and commercialization of PF582. We will not receive additional revenue from Pfizer.

In addition, in August of 2017, we and Strides Arcolab entered into a termination agreement pursuant to which our joint venture was terminated. While there was no activity under the joint venture with Strides Arcolab to date, following the termination we solely own the product candidates that were previously subject to the joint venture with Strides Arcolab.

The loss of any key collaboration partner or any significant adverse change in the size or terms of a contract with a key third party, such as the termination of the development and license agreement with Pfizer in August 2016, could significantly reduce our revenue over the short term. Moreover, having our revenue concentrated among a limited number of entities creates a concentration of financial risk for us, and in the event that any significant third party is unable to fulfill its payment obligations to us, our operating results and cash position would suffer. See *“Risks Relating to our Reliance on Third Parties—We are substantially dependent on the expertise of Jazz to develop and commercialize some of our product candidates. If we fail to maintain our current strategic relationship with Jazz, our business, commercialization prospects and financial condition may be materially adversely affected.”*

We may fail to select or capitalize on the most scientifically, clinically or commercially promising or profitable product candidates.

We continue to evaluate our business strategy and, as a result, may modify our strategy in the future. In this regard, we may, from time to time, focus our product development efforts on different product candidates or may delay, suspend or terminate the future development of a product candidate at any time for strategic, business, financial or other reasons. For example, in 2017 we decided to pause development activities on PF582 and PF529 and focus development efforts elsewhere within the product portfolio while we continue to engage potential strategic partners for PF582 and PF529 to advance the programs and maximize value. As a result of changes in our strategy, we have and may in the future change or refocus our existing product development, commercialization and manufacturing activities. This could require changes in our facilities and our personnel. Any product development changes that we implement may not be successful. In particular, we may fail to select or capitalize on the most scientifically, clinically or commercially promising or profitable product candidates. Our decisions to allocate our research and development, management and financial resources toward particular product candidates may not lead to the development of viable commercial products and may divert resources from better opportunities. Similarly, our decisions to delay or terminate product development programs may also prove to be incorrect and could cause us to miss valuable opportunities.

We currently have limited marketing capabilities and no sales organization.

We currently have limited sales and marketing capabilities. We have no prior experience in the marketing, sale and distribution of pharmaceutical products and there are significant risks involved in building and managing a sales organization, including our ability to hire, retain and incentivize qualified individuals, generate sufficient sales leads, provide adequate training to sales and marketing personnel and effectively manage a geographically dispersed sales and marketing team.

For PF708, if approved, we will need to identify potential sales, marketing and distribution partners or establish our own internal sales force. In the future, we may choose to collaborate with other third parties that have direct sales forces and established distribution systems, either to augment our own sales force or in lieu of our own sales force. If we are unable to enter into such arrangements on acceptable terms or at all, we may not be able to successfully commercialize our product candidates. If we are not successful in commercializing our product candidates, either on our own or through collaborations with one or more third parties, our future product revenue will suffer and we would incur significant additional losses.

We enter into various contracts in the normal course of our business that periodically incorporate provisions whereby we indemnify the other party to the contract. In the event we would have to perform under these indemnification provisions, it could have a material adverse effect on our business, financial position and results of operations.

In the normal course of business, we periodically enter into academic, commercial and consulting agreements that contain indemnification provisions. With respect to our academic agreements, we may be required to indemnify the institution and related parties from losses arising from claims relating to the products, processes or services made, used, sold or performed pursuant to the agreements for which we have secured licenses, and from claims arising from our or our sublicensees' exercise of rights under the agreement. With respect to commercial agreements entered into with our protein production customers, we typically provide indemnification for claims from third parties arising out of any potential intellectual property infringement associated with our Pfenex Expression Technology® in the course of performing our services. With respect to our commercial agreements, the bulk of which are with contract manufacturers, we indemnify our vendors from third-party product liability claims which result from the production, use or consumption of the product, as well as for certain alleged infringements of any patent or other intellectual property right by a third party. With respect to consultants, we indemnify them from claims arising from the good faith performance of their services. In all of the above cases, we do not indemnify the parties for claims resulting from the negligence or willful misconduct of the indemnified party.

In certain circumstances, we maintain insurance coverage which we believe may limit our obligations under certain of these indemnification provisions. However, we do not carry insurance for all risks that our business may encounter, including our obligations under certain indemnification provisions. To the extent we do not have insurance to cover certain indemnification obligations, we are denied insurance coverage, or our obligation under an indemnification provision exceeds applicable insurance coverage, any significant, uninsured liability may require us to pay substantial amounts, which would adversely affect our working capital and results of operations.

We may have difficulty expanding our operations successfully.

As we advance our product candidates through the development process, we will need to expand our development, regulatory, manufacturing, quality, sales and marketing capabilities or contract with other organizations to provide these capabilities for us. As our operations expand, we expect that we will need to manage additional relationships with various collaboration partners, suppliers and other organizations.

As of December 31, 2017, we had 67 full-time employees, including a total of 16 employees who hold M.D. and/or Ph.D. degrees. Our management and personnel, systems and facilities currently in place may not be adequate to support this future growth. Therefore, we will need to continue to expand our managerial, operational, finance and other resources to manage our operations and clinical trials, continue our development activities and commercialize our product candidates, if approved. In order to effectively execute our growth strategy, we will be required to:

- manage our clinical trials effectively;
- identify, recruit, retain, incentivize and integrate additional employees;
- establish and maintain collaborations with third parties for the development and commercialization of our product candidates, or otherwise build and maintain a sales, marketing and distribution infrastructure to commercialize any products for which we may obtain marketing approval;
- manage our internal development efforts effectively while carrying out our contractual obligations to third parties; and
- continue to improve our operational, financial and management controls, reporting systems and procedures.

Due to our limited financial resources and our limited experience 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. In addition, this 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 development and strategic objectives, or disrupt our operations, which could materially impact our business, revenue, and operating results.

The U.S. government holds certain intellectual property rights related to our Anthrax vaccines, Px563L and RPA563 and Malaria vaccine, Px533.

Although we have intellectual property related to expression of recombinant protective antigen in *P. fluorescens*, the U.S. government holds certain patents related to the recombinant protective antigen in Px563L and RPA563, as well as certain license rights to intellectual property related to other Px563L components used to produce the final vaccine, which, if exercised, could materially impact our business, revenue and operating results. We have rights to utilize this intellectual property held by the U.S. government by virtue of the Authorization and Consent clauses of our contracts with the U.S. government.

Our contracts with the U.S. government, and our subcontracts with U.S. government contractors, require ongoing funding decisions by the U.S. government; reduced or discontinued funding of these contracts could cause our financial condition and operating results to suffer materially.

Development of our anthrax vaccines, Px563L and RPA563, is funded by BARDA and development of our Px563L-SDI anthrax vaccine and our malaria vaccine, Px533, is funded by The National Institute of Allergy and Infectious Diseases (NIAID). The funding for government programs is subject to Congressional appropriations, often made on a fiscal year basis, even for programs designed to continue for several years. These appropriations can be subject to political considerations and stringent budgetary constraints. Additionally, our government-funded development contracts give the U.S. government the right, exercisable in its sole discretion, to extend this contract for successive options following a base period of performance. The value of the services to be performed during these options may constitute the majority of the total value of the underlying contract. If levels of government expenditures and authorizations for biodefense decrease or shift to programs in areas where we do not offer products or are not developing product candidates, or if the U.S. government otherwise declines to exercise its options under its contracts with us, our business, revenue and operating results would suffer.

Our current contract with BARDA is a cost plus fixed fee contract and potential future contracts with the U.S. government may also be structured this way. Under our cost plus fixed fee contracts, we are allowed to recover our approved costs plus a fixed fee. The total price on a cost plus fixed fee contract is based primarily on allowable costs incurred, but generally is subject to contract funding limitations. U.S. government regulations require us to notify our customer of any cost overruns or underruns on a cost plus contract. If we incur costs in excess of the funding limitation specified in the contract, we may not be able to recover those cost overruns.

Moreover, changes in U.S. government contracting policies could directly affect our financial performance. Factors that could materially adversely affect our U.S. government contracting business include:

- budgetary constraints affecting U.S. government spending generally, or specific departments or agencies in particular;
- changes in U.S. government fiscal policies or available funding;
- changes in U.S. government defense and homeland security priorities;
- changes in U.S. government programs or requirements;
- adoption of new laws or regulations;
- technological developments;
- U.S. government shutdowns, threatened shutdowns or budget delays;
- competition and consolidation in our industry; and
- general economic conditions.

These or other factors could cause U.S. government departments or agencies to reduce their development funding or future purchases under contracts, to exercise their right to terminate contracts or fail to exercise their options to extend our contracts, any of which could have a material adverse effect on our business, financial condition, operating results and ability to meet our financial obligations.

Unfavorable provisions in government contracts, some of which are customary, may subject our business to material limitations, restrictions and uncertainties and may have a material adverse impact on our financial condition and operating results.

Government contracts contain provisions that give the U.S. government substantial rights and remedies, many of which are not typically found in commercial contracts, including provisions that allow the U.S. government to:

- terminate existing contracts, in whole or in part, for any reason or no reason;

- unilaterally reduce or modify the government's obligations under such contracts or subcontracts, without the contractor's consent, including by imposing equitable price adjustments;
- audit contract-related costs and fees, including allocated indirect costs;
- claim rights, including intellectual property rights, in products and data developed under such agreements;
- under certain circumstances involving public health and safety, license inventions made under such agreements to third parties;
- suspend the contractor from receiving new contracts pending resolution of alleged violations of procurement laws or regulations;
- impose U.S. manufacturing requirements for products that embody inventions conceived or first reduced to practice under such contracts;
- suspend or debar the contractor from doing future business with the government;
- decline to exercise an option to continue a contract;
- exercise an option to purchase only the minimum amount, if any, specified in a contract;
- decline to exercise an option to purchase the maximum amount, if any, specified in a contract;
- claim rights to facilities or to products, including intellectual property, developed under the contract;
- require repayment of contract funds spent on construction of facilities in the event of contract default;
- take actions that result in a longer development timeline than expected;
- change the course of a development program in a manner that differs from the contract's original terms or from our desired development plan, including decisions regarding our partners in the program;
- pursue civil or criminal remedies under the False Claims Act (FCA) and False Statements Act; and
- control or prohibit the export of products.

Generally, government contracts, including our contract with BARDA, contain provisions permitting unilateral termination or modification, in whole or in part, at the U.S. government's convenience. Under general principles of government contracting law, if the U.S. government terminates a contract for convenience, the government contractor may recover only its incurred or committed costs, settlement expenses and profit on work completed prior to the termination. If the U.S. government terminates a contract for default, the government contractor is entitled to recover costs incurred and associated profits on accepted items only and may be liable for excess costs incurred by the government in procuring undelivered items from another source. In addition, government contracts normally contain additional requirements that may increase our costs of doing business, reduce our profits, and expose us to liability for failure to comply with these terms and conditions. These requirements include, for example:

- specialized accounting systems unique to government contracts;
- mandatory financial audits and potential liability for price adjustments or recoupment of government funds after such funds have been spent;
- public disclosures of certain contract information, which may enable competitors to gain insights into our research program;
- mandatory internal control systems and policies; and
- mandatory socioeconomic compliance requirements, including labor standards, non-discrimination and affirmative action programs and environmental compliance requirements.

If we fail to maintain compliance with these requirements, we may be subject to potential contract or FCA liability and to termination of our contracts.

Furthermore, we are required to enter into agreements and subcontracts with third parties, including suppliers, consultants and other third-party contractors in order to satisfy our contractual obligations pursuant to our agreements with the United States government. Negotiating and entering into such arrangements can be time-consuming and we may not be able to reach agreement with such third parties. Any such agreement must also be compliant with the terms of our government contract. Any delay or inability to enter into such arrangements or entering into such arrangements in a manner that is non-compliant with the terms of our contract, may result in violations of our contract.

We may not have the right to prohibit the U.S. government from using certain technologies developed by us, and we may not be able to prohibit third-party companies, including our competitors, from using those technologies in providing products and services to the U.S. government. The U.S. government generally takes the position that it has the right to royalty-free use of technologies that are developed under U.S. government contracts.

Most U.S. government contracts grant the U.S. government the right to use on a royalty free basis, for or on behalf of the U.S. government, any technologies developed and data first produced by the contractor under the government contract. If we were to develop technology under a contract with such a provision, we might not be able to prohibit third parties, including our competitors, from using that technology in providing products and services to the U.S. government.

Our business is subject to audit by the U.S. government and a negative audit could adversely affect our business.

U.S. government agencies such as the Department of Health and Human Services (HHS) and the Defense Contract Audit Agency (DCAA) routinely audit and investigate government contractors and recipients of federal grants and contracts. These agencies review a contractor's performance under its contracts, cost structure and compliance with applicable laws, regulations and standards.

The HHS and the DCAA also review the adequacy of, and a contractor's compliance with, its internal control systems and policies, including the contractor's accounting, purchasing, property, estimating, compensation and management information systems. Any costs found to be improperly allocated to a specific contract will not be reimbursed, while such costs already reimbursed must be refunded. If an audit uncovers improper or illegal activities, we may be subject to civil and criminal penalties and administrative sanctions, including:

- termination of contracts;
- forfeiture of profits;
- suspension of payments;
- fines; and
- suspension or prohibition from conducting business with the U.S. government.

In addition, we could suffer serious reputational harm if allegations of impropriety were made against us, which could cause our stock price to decrease.

The United States government's determination to award a future contract may be challenged by an interested party, such as another bidder, at the United States Government Accountability Office (GAO) or in federal court. If such a challenge is successful, any future contract we may be awarded may be terminated.

The laws and regulations governing the procurement of goods and services by the U.S. government provide procedures by which other bidders and interested parties may challenge the award of a government contract. If

we are awarded a government contract, such challenges or protests could be filed even if there are not any valid legal grounds on which to base the protest. If any such protests are filed, the government agency may decide to suspend our performance under the contract while such protests are being considered by the GAO or the applicable federal court, thus potentially delaying delivery of payment. In addition, we could be forced to expend considerable funds to defend any potential award. If a protest is successful, the government may be ordered to terminate the contract and resolicit proposals. The government agencies with which we have contracts could even be directed to award a potential contract to one of the other bidders.

Laws and regulations affecting government contracts make it more costly and difficult for us to successfully conduct our business.

We must comply with numerous laws and regulations relating to the formation, administration and performance of government contracts, which can make it more difficult for us to retain our rights under our government contracts, including our contract with BARDA. These laws and regulations affect how we conduct business with government agencies. Among the most significant government contracting regulations that affect our business are:

- the Federal Acquisition Regulations (FAR) and agency-specific regulations supplemental to the FAR, which comprehensively regulate the procurement, formation, administration and performance of government contracts;
- the Truth in Negotiations Act, which requires certification and disclosure of cost or pricing data in connection with contract negotiations;
- business ethics and public integrity obligations, which govern conflicts of interest and the hiring of former government employees, restrict the granting of gratuities and funding of lobbying activities and include other requirements such as the Anti-Kickback Statute and Foreign Corrupt Practices Act;
- export and import control laws and regulations; and
- laws, regulations and executive orders restricting the use and dissemination of information classified for national security purposes and the exportation of certain products and technical data.

Any material changes in applicable laws and regulations could restrict our ability to maintain our existing BARDA contract and obtain new contracts, which could limit our ability to conduct our business and materially adversely affect our results of operations.

Agreements with government agencies may lead to claims against us under the Federal False Claims Act, and these claims could result in substantial fines and other penalties.

The biopharmaceutical industry is, and in recent years has been, under heightened scrutiny as the subject of government investigations and enforcement actions. Our government contracts are subject to substantial financial penalties under the Federal Civil Monetary Penalties Act and the FCA. Under the FCA's "whistleblower" provisions, private enforcement of fraud claims against businesses on behalf of the U.S. government has increased due in part to amendments to the FCA that encourage private individuals to sue on behalf of the government. These whistleblower suits, known as qui tam actions, may be filed by private individuals, including present and former employees. The FCA statute provides for treble damages and up to approximately \$22,000 per false claim. If our operations are found to be in violation of any of these laws, or any other governmental regulations that apply to us, we may be subject to penalties, including civil and criminal penalties, damages, fines, exclusion from the Medicare and Medicaid programs, and the curtailment or restructuring of our operations. Any penalties, damages, fines, exclusions, curtailment, or restructuring of our operations could adversely affect our ability to operate our business and our financial results.

If product liability lawsuits are brought against us, we may incur substantial liabilities and may be required to limit commercialization of products we develop.

We face a risk of product liability as a result of the clinical testing of our product candidates and will face an even greater risk if we commercialize any products. For example, we may incur liability if any product we develop allegedly causes injury or is found to be otherwise unsuitable during product 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 and a breach of warranties. Claims could also be asserted under state consumer protection acts. If we cannot successfully defend ourselves against product liability claims, we may incur substantial liabilities or be required to limit commercialization of our products. Regardless of the merits or eventual outcome, liability claims may result in:

- decreased demand for PF708, Px563L/RPA563 or any other product candidates or products we develop;
- injury to our reputation and significant negative media attention;
- withdrawal of clinical trial participants or cancellation of clinical trials;
- costs to defend the related litigation;
- a diversion of management's time and our resources;
- substantial monetary awards to trial participants or patients;
- regulatory investigations, product recalls, withdrawals or labeling, marketing or promotional restrictions;
- loss of revenue; and
- the inability to commercialize any products we develop.

Our inability to obtain and maintain sufficient product liability insurance at an acceptable cost and scope of coverage to protect against potential product liability claims could impact the commercialization of PF708, Px563L/RPA563 and any other products we develop. We currently carry product liability insurance covering our clinical trials in the amount of \$10.0 million in the aggregate. Although we maintain such insurance, any claim that may be brought against us could result in a court judgment or settlement that is in excess of the limits of our insurance coverage. Our insurance policies also have various exclusions and deductibles, and we may be subject to a product liability claim for which we have no coverage. We will have to pay any amounts awarded by a court or negotiated in a settlement that exceed our coverage limitations or that are not covered by our insurance, and we may not have, or be able to obtain, sufficient capital to pay such amounts. Moreover, in the future, we may not be able to maintain insurance coverage at a reasonable cost or in sufficient amounts to protect us against losses. If and when we obtain approval for marketing PF708, Px563L/RPA563 or any other product candidates, we intend to expand our insurance coverage to include the sale of such products; however, we may be unable to obtain this liability insurance on commercially reasonable terms.

Our employees, independent contractors, principal investigators, CROs, consultants and collaboration partner may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements and insider trading.

We are exposed to the risk that our employees, independent contractors, principal investigators, third-party clinical research organizations (CROs), consultants and collaboration partner may engage in fraudulent conduct or other illegal activity. Misconduct by these parties could include intentional, reckless and/or negligent conduct or unauthorized activities that violate: (1) regulations of the FDA and comparable foreign authorities, including those laws requiring the reporting of true, complete and accurate information to such authorities; (2) manufacturing standards; (3) federal and state healthcare fraud and abuse laws and regulations; or (4) laws that require the reporting of true and accurate financial information and data. In particular, sales, marketing and business

arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, misconduct, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. These activities also include the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions and serious harm to our reputation. We have adopted a Code of Ethics and Conduct, but it is not always possible to identify and deter misconduct by employees and other third parties, 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 including the imposition of significant civil, criminal and administrative penalties, damages, monetary fines, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, contractual damages, reputational harm, diminished profits and future earnings, and curtailment of our operations, any of which could adversely affect our ability to operate our business and our results of operations.

Our cash and cash equivalents and short term investments could be adversely affected if the financial institutions in which we hold our cash and cash equivalents and short term investments fail.

We regularly maintain cash balances at third-party financial institutions in excess of the Federal Deposit Insurance Corporation (FDIC) insurance limit. While we monitor the cash balances in our accounts and adjust the balances as appropriate, these balances could be impacted, and there could be a material adverse effect on our business, if one or more of the financial institutions with which we deposit fails or is subject to other adverse conditions in the financial or credit markets. To date, we have experienced no loss or lack of access to our invested cash or cash equivalents; however, we can provide no assurance that access to our invested cash and cash equivalents will not be impacted by adverse conditions in the financial and credit markets.

We may be subject to information technology failures, including data protection breaches and cyber-attacks, that could disrupt our operations, damage our reputation and adversely affect our business, operations, and financial results.

We rely on our information technology systems for the effective operation of our business and for the secure maintenance and storage of confidential data relating to our business and third party businesses. Although we have implemented security controls to protect our information technology systems, experienced programmers or hackers may be able to penetrate our security controls, and develop and deploy viruses, worms and other malicious software programs that compromise our confidential information or that of third parties and cause a disruption or failure of our information technology systems. Any such compromise of our information technology systems could result in the unauthorized publication of our confidential business or proprietary information, result in the unauthorized release of customer, supplier or employee data, result in a violation of privacy or other laws, expose us to a risk of litigation, or damage our reputation. The cost and operational consequences of implementing further data protection measures either as a response to specific breaches or as a result of evolving risks, could be significant. In addition, our inability to use or access our information systems at critical points in time could adversely affect the timely and efficient operation of our business. Any delayed sales, significant costs or lost customers resulting from these technology failures could adversely affect our business, operations and financial results.

Third parties with which we conduct business have access to certain portions of our sensitive data. In the event that these third parties do not properly safeguard our data that they hold, security breaches could result and negatively impact our business, operations and financial results.

Our business involves the use of hazardous materials and we, our collaboration partner, and our third-party manufacturers and suppliers must comply with environmental laws and regulations, which can be expensive and restrict how we do business.

Our research and development and manufacturing activities and our third-party manufacturers' and suppliers' activities involve the controlled storage, use and disposal of hazardous materials owned by us, including small quantities of acetonitrile, methanol, ethanol, ethidium bromide and compressed gases, and other hazardous compounds. We and our collaboration partner, manufacturers and suppliers are subject to laws and regulations governing the use, manufacture, storage, handling and disposal of these hazardous materials. In some cases, these hazardous materials and various wastes resulting from their use are stored at our and our manufacturers' facilities pending their use and disposal. We cannot eliminate the risk of contamination, which could cause an interruption of our commercialization efforts, research and development efforts and business operations, environmental damage resulting in costly clean-up and liabilities under applicable laws and regulations governing the use, storage, handling and disposal of these materials and specified waste products.

Although we believe that the safety procedures utilized by us and our third-party manufacturers for handling and disposing of these materials generally comply with the standards prescribed by these laws and regulations, we cannot guarantee that this is the case or eliminate the risk of accidental contamination or injury from these materials. In such an event, we may be held liable for any resulting damages and such liability could exceed our resources and state or federal or other applicable authorities may curtail our use of certain materials and interrupt our business operations.

We are also subject to numerous environmental, health and workplace safety laws and regulations, including those governing laboratory procedures, and the handling of biohazardous materials. 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 these materials, this insurance may not provide adequate coverage against potential liabilities. For claims not covered by workers' compensation insurance, we also maintain an employer's liability insurance policy in the amount of \$1.0 million per occurrence and in the aggregate. We do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us.

Environmental laws and regulations are complex, change frequently and have tended to become more stringent. We cannot predict the impact of such changes and cannot be certain of our future compliance. Any inability to comply with environmental laws and regulations may adversely affect our business and operating results.

Changes in accounting principles, or interpretations thereof, could have a significant impact on our financial position and results of operations.

We prepare our consolidated financial statements in accordance with accounting principles generally accepted in the United States of America, referred to as GAAP. These principles are subject to interpretation by the Securities and Exchange Commission (SEC) and various bodies formed to interpret and create appropriate accounting principles. A change in these principles can have a significant effect on our reported results and may even retroactively affect previously reported transactions. Additionally, the adoption of new or revised accounting principles may require that we make significant changes to our systems, processes and controls.

It is not clear if or when these potential changes in accounting principles may become effective, whether we have the proper systems and controls in place to accommodate such changes and the impact that any such changes may have on our financial position and results of operations.

Even if PF708, Px563L/RPA563 or any of our other product candidates obtain regulatory approval, they may never achieve market acceptance or commercial success.

Even if we or our collaboration partner obtain FDA or other regulatory approvals, PF708, Px563L/RPA563 or any of our other product candidates may not achieve market acceptance among physicians and patients, and

may not be commercially successful. The degree and rate of market acceptance of PF708, Px563L/RPA563 or any of our other product candidates for which we receive approval depends on a number of factors, including:

- the safety and efficacy of the product as demonstrated in clinical trials;
- the clinical indications for which the product is approved;
- acceptance by physicians, major operators of clinics and patients of the product as a safe and effective treatment;
- proper training and administration of our products by physicians and medical staff;
- the potential and perceived advantages of our products over alternative treatments;
- the cost of treatment in relation to alternative treatments and willingness to pay for our products, if approved, on the part of physicians and patients;
- relative convenience and ease of administration;
- the prevalence and severity of adverse events; and
- the effectiveness of our sales and marketing efforts.

Any failure by our product candidates that obtain regulatory approval to achieve market acceptance or commercial success would materially adversely affect our results of operations and delay, prevent or limit our ability to generate revenue and continue our business.

Risks Relating to our Reliance on Third Parties

We rely on third parties, and in some cases a single third party, to manufacture nonclinical and clinical supplies of our product candidates and to store critical components of our product candidates for us. Our business could be harmed if those third parties fail to provide us with sufficient quantities of product candidates, or fail to do so at acceptable quality levels or prices.

We do not currently have the infrastructure or capability internally to manufacture supplies of our product candidates for use in clinical studies, and we lack the resources and the capability to manufacture any of our product candidates on a clinical or commercial scale. We rely on third-party manufacturers, including with respect to PF708, to manufacture our product candidates for preclinical and clinical studies. Successfully transferring complicated manufacturing techniques to manufacturing organizations and scaling up these techniques for commercial quantities will be time consuming and we may not be able to achieve such transfer. Moreover, the market for contract manufacturing services for protein therapeutics is highly cyclical, with periods of relatively abundant capacity alternating with periods in which there is little available capacity. If our need for contract manufacturing services increases during a period of industry-wide production capacity shortage, we may not be able to produce our product candidates on a timely basis or on commercially viable terms. Although we generally do not begin a clinical study unless we believe we have a sufficient supply of a product candidate to complete such study, any significant delay or discontinuation in the supply of a product candidate for an ongoing clinical study due to the need to replace a third-party manufacturer could considerably delay completion of our clinical studies, product testing, and potential regulatory approval of our product candidates, which could harm our business and results of operations.

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, and the possible termination or nonrenewal of the agreement by the third party at a time that is costly or inconvenient for us. In addition, third-party manufacturers may not be able to comply with cGMP, 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 fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of products,

operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supplies of our product candidates or any other product candidates or products that we may develop. Any failure or refusal to supply the components for our product candidates that are being developed could delay, prevent or impair clinical development or commercialization efforts. If our manufacturers were to breach or terminate their manufacturing arrangements with us, the development or commercialization of the affected products or product candidates could be delayed, which could have an adverse effect on our business. Any change in our manufacturers could be costly because the commercial terms of any new arrangement could be less favorable and because the expenses relating to the transfer of necessary technology and processes could be significant.

If PF708 or any of our other product candidates are approved, in order to produce the quantities necessary to meet anticipated market demand, any manufacturer that we engage may need to increase manufacturing capacity. If we or our manufacturers are unable to produce PF708 or any of our product candidates in sufficient quantities to meet the requirements for the launch of these products or to meet future demand, our revenue and gross margins could be adversely affected. Although we currently believe that we and our manufacturers will not have any material supply issues, we cannot be certain that we will be able to obtain long-term supply arrangements for PF708 or any of our other product candidates or materials used to produce such product candidate on acceptable terms, if at all. If we are unable to arrange for third-party manufacturing, or to do so on commercially reasonable terms, we may not be able to complete development of or market PF708 or any of our other product candidates.

We also rely on third parties to store master and working cell banks for our product candidates. We have master and working cell banks and believe we would have adequate backup should any cell bank be lost in a catastrophic event. However, it is possible that we could lose multiple cell banks and have our manufacturing severely impacted by the need to replace the cell banks, which could materially and adversely affect our business, financial condition and results of operations.

We are substantially dependent on the expertise of Jazz to develop and commercialize some of our product candidates. If we fail to maintain our current strategic relationship with Jazz or with any future collaboration partner, our business, commercialization prospects and financial condition may be materially adversely affected.

Because we have limited or no capabilities for late-stage product development, manufacturing, sales, marketing and distribution, we may need to enter into alliances with other companies to develop our product candidates. For example, we have entered into an agreement with Jazz, pursuant to which we will transfer the development, manufacturing and commercialization of some of our products.

In February 2015, we entered into a development and license agreement with Pfizer to develop and commercialize PF582. In August 2016, we entered into a termination agreement with Pfizer pursuant to which the development and license agreement was terminated and all rights to PF582 have been returned to us. The termination accelerated recognition of \$45.8 million of revenue that had been previously deferred and we will not recognize any additional future revenue under the Pfizer development and license agreement. Following our strategic review in November 2017, we decided to pause our development activities for PF582 and focus our efforts and resources elsewhere in our product portfolio. While we are seeking a new collaboration partner for the development and commercialization of PF582, there are no assurances that we will find a new collaboration partner or that the terms and timing of any such arrangements would be acceptable to us.

In addition, in August of 2017, we and Strides Arcolab entered into a termination agreement pursuant to which our joint venture was terminated. While there was no activity under the joint venture with Strides Arcolab to date, following the termination we solely own the product candidates that were previously subject to the joint venture with Strides Arcolab.

In July 2016, we entered into a license and option agreement with Jazz, pursuant to which we and Jazz are collaboratively developing hematology/oncology products, including PF743, a recombinant crisantaspase, and PF745, a recombinant crisantaspase with half-life extension technology, and Jazz has the exclusive right to

manufacture and commercialize such products throughout the world. In December 2017, we amended the agreement. We may be eligible to receive additional payments under the amended agreement of up to \$189.3 million based on achievement of certain research and development, regulatory and sales-related milestones, bringing the total value of payments and potential payments associated with the collaboration to \$224.5 million. In addition, we may be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement.

The prospects for the product candidates developed under this collaboration depend on the expertise, development and commercial skills, and financial strength of Jazz. Our collaboration with Jazz or any future collaboration partner may not be successful, and we may not realize the expected benefits from such collaborations, due to a number of important factors, including but not limited to the following:

- Jazz or any future collaboration partner may terminate their agreements with us prior to completing development or commercialization of our product candidates, in whole or in part, adversely impacting our potential approval and revenue from licensed products;
- the timing and amount of any payments we may receive under these agreements will depend on, among other things, the efforts, allocation of resources, and successful commercialization of the relevant product candidates by Jazz or any future collaboration partner, as applicable, under our agreements;
- the timing and amounts of expense reimbursement that we may receive are uncertain; or
- Jazz or any future collaboration partner may change the focus of their development or commercialization efforts or pursue or emphasize higher priority programs.

A failure of Jazz or any future collaboration partner to successfully develop our product candidates which are covered by the collaboration, or commercialize such product candidates, or the termination of our agreement with Jazz or any future collaboration partner, as applicable, may have a material adverse effect on our business, results of operations and financial condition.

Our existing product development and/or commercialization arrangements, and any that we may enter into in the future, may not be successful, which could adversely affect our ability to develop and commercialize our product candidates.

We are a party to, and continue to seek additional, collaboration arrangements with other pharmaceutical companies for the development and/or commercialization of our current and future product candidates. In such alliances, we would expect our collaboration partners to provide substantial capabilities in clinical development, manufacturing, regulatory affairs, sales and marketing, both in the United States and internationally.

To the extent that we decide to enter into additional collaboration agreements, we will face significant competition in seeking appropriate collaboration partners. Any failure to meet our clinical milestones with respect to an unpartnered product candidate would make finding a collaboration partner more difficult. Moreover, collaboration arrangements are complex and time consuming to negotiate, document and implement, and we cannot guarantee that we can successfully maintain such relationships or that the terms of such arrangements will be favorable to us. If we fail to maintain, establish and implement collaboration or other alternative arrangements, the value of our business and operating results will be adversely affected.

We may not be successful in our efforts to establish, implement and maintain collaborations or other alternative arrangements if we choose to enter into such arrangements. The terms of any collaboration or other arrangements that we may establish may not be favorable to us. The management of collaborations may take significant time and resources that distract our management from other matters. Our ability to successfully collaborate with any current or future collaboration partners may be impaired by multiple factors including:

- a collaboration partner may shift its priorities and resources away from our programs due to a change in business strategies, or a merger, acquisition, sale or downsizing of its company or business unit;

- a collaboration partner may cease development in therapeutic areas which are the subject of alliances with us;
- a collaboration partner may change the success criteria for a particular program or product candidate thereby delaying or ceasing development of such program or candidate;
- a significant delay in initiation of certain development activities by a collaboration partner will also delay payments tied to such activities, thereby impacting our ability to fund our own activities;
- a collaboration partner could develop a product that competes, either directly or indirectly, with our current or future products, if any;
- a collaboration partner with commercialization obligations may not commit sufficient financial or human resources to the marketing, distribution or sale of a product;
- a collaboration partner with manufacturing responsibilities may encounter regulatory, resource or quality issues and be unable to meet demand requirements;
- a collaboration partner may exercise its rights under the agreement to terminate our collaboration;
- a dispute may arise between us and a collaboration partner concerning the research or development of a product candidate or commercialization of a product resulting in a delay in milestones, royalty payments or termination of a program and possibly resulting in costly litigation or arbitration which may divert management attention and resources;
- the results of our clinical trials may not match our collaboration partners' expectations, even if statistically significant;
- a collaboration partner may not adequately protect or enforce the intellectual property rights associated with a product or product candidate; and
- a collaboration partner may use our proprietary information or intellectual property in such a way as to invite litigation from a third party.

Any such activities by our current or future collaboration partners could adversely affect us financially and could harm our business reputation.

In addition to product development and commercialization capabilities, we may depend on our alliances with other companies to provide substantial additional funding for development and potential commercialization of our product candidates. We may not be able to obtain funding on favorable terms from these alliances, and if we are not successful in doing so, we may not have sufficient funds to develop a particular product candidate internally, or to bring product candidates to market. Failure to bring our product candidates to market will prevent us from generating sales revenue, and this may substantially harm our business. Furthermore, any delay in entering into these alliances could delay the development and commercialization of our product candidates and reduce their competitiveness even if they reach the market. As a result, our business and operating results may be adversely affected.

We rely on CROs to conduct and oversee our planned clinical trials for our product candidates and other clinical trials for product candidates we are developing or may develop in the future. If our CROs do not successfully carry out their contractual duties, meet expected deadlines, or otherwise conduct the trials as required or comply with regulatory requirements, we and our collaboration partner may not be able to seek or obtain regulatory approval for or commercialize our product candidates when expected or at all, and our business could be substantially harmed.

We will continue to rely upon medical institutions, clinical investigators and contract laboratories to conduct our trials in accordance with our clinical protocols and in accordance with applicable legal and regulatory requirements. These third parties play a significant role in the conduct of these trials and the subsequent

collection and analysis of data from the clinical trials. These third parties are not our employees, and except for remedies available to us under our agreements with such third parties, there is no guarantee that any such third party will devote adequate time and resources to our clinical trial. If our CRO or any other third parties upon which we rely for administration and conduct of our clinical trials do not successfully carry out their contractual duties or obligations or meet expected deadlines, if they need to be replaced or if the quality or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our clinical protocols, regulatory requirements, or for other reasons, or if they otherwise perform in a substandard manner, our clinical trials may be extended, delayed, suspended or terminated, and we may not be able to complete development of, seek or obtain regulatory approval for, or successfully commercialize our product candidates. We plan to rely heavily on these third parties for the execution of clinical trials for products we are developing or may develop in the future, and will control only certain aspects of their activities. Nevertheless, we are responsible for ensuring that each of our clinical trials is conducted in accordance with the applicable protocol, legal, regulatory and scientific standards, and our reliance on our CRO does not relieve us of our regulatory responsibilities.

We, our CRO and our collaboration partner are required to comply with Good Clinical Practice (GCP), which are regulations and guidelines enforced by regulatory authorities around the world for products in clinical development. Regulatory authorities enforce these GCP regulations through periodic inspections of clinical trial sponsors, principal investigators and clinical trial sites. If we, our CRO or our collaboration partner fail to comply with applicable GCP regulations, the clinical data generated in clinical trials may be deemed unreliable and submission of marketing applications may be delayed or the regulatory authorities may require us to perform additional clinical trials before accepting our applications for review or approving marketing applications. We cannot assure that, upon inspection, a regulatory authority will determine that any of our clinical trials comply or complied with applicable GCP regulations. In addition, clinical trials must be conducted with product produced under current Good Manufacturing Practices (cGMP) regulations, which are enforced by regulatory authorities. Any failure to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory approval process. Moreover, our business may be implicated if our CRO violates federal or state fraud and abuse or false claims laws and regulations or healthcare privacy and security laws.

Comparative clinical trials require a substantial number of patients that can form the basis for generating statistically significant results. Delays in site initiation or unexpectedly low patient enrollment rates may delay the results of the clinical trial. CROs may also generate higher costs than anticipated. As a result, our results of operations and the commercial prospects for our product candidates would be harmed, our costs could increase, and our ability to generate revenue could be delayed. Further, if our relationship with our CRO is terminated, we may be unable to enter into arrangements with an alternative CRO on commercially reasonable terms, or at all. Switching or adding CROs can involve substantial cost and require extensive management time and focus. In addition, there is a natural transition period when a new CRO commences work. As a result, delays may occur, which can materially impact our ability to meet our desired clinical development timelines. Although we carefully manage our relationship with our CROs, there can be no assurance that we will not encounter such challenges or delays in the future or that these delays or challenges will not have a material adverse impact on our business, prospects, financial condition or results of operations.

We rely on third-party suppliers, and in some instances a single third-party supplier, for the manufacture and supply of certain materials in our protein production services, and these suppliers could cease to manufacture the materials, go out of business or otherwise not perform as anticipated.

We rely on third-party suppliers for our protein production services and in some instances a single third-party supplier, for the manufacture and supply of certain materials. We currently rely, and expect to continue to rely, on a single-source supplier for the manufacture and supply of CRM197. To meet these demands, our supplier is in the process of increasing production capacity, and we also have established a repository in the United States that is capable of storing a safety supply of CRM197 and the CRM197 cell bank. Furthermore, we have taken steps to identify alternate sources of supply sufficient to support future needs; however, there may be delays in switching to these alternative suppliers if our contract with primary sources are terminated without

notice. Regardless of the foregoing alternative measures, we cannot guarantee that we will have an adequate supply of CRM197. If we are unable to secure adequate quantities of CRM197 from our primary supplier, from potential secondary suppliers or from our safety supply, we may be required to identify additional suppliers. If we are required to engage additional suppliers, we may not be able to enter into an alternative supply arrangement on commercially reasonable terms, or at all. Even if we are able to identify additional suppliers and enter into agreements on commercially reasonable terms, we may incur delays associated with identifying and qualifying additional suppliers and negotiating the terms of any supply contracts. These delays could adversely impact our business and negatively affect profitability of our protein production services.

We have entered into collaborations with third parties in connection with the development of certain of our product candidates. Even if we believe that the development of our technology and product candidates is promising, our partners may choose not to proceed with such development.

Our existing agreement with our collaboration partner, Jazz, and any future collaboration agreements we may enter into, are generally subject to termination by the counterparty on short notice upon the occurrence of certain circumstances. Accordingly, even if we believe that the development of product candidates is worth pursuing, our partners may choose not to continue with such development. If any of our collaborations are terminated, such as the termination of our collaboration with Pfizer in August 2016 and the termination of the joint venture agreement with Strides Arcolab in August 2017, we may be required to devote additional resources to the development of our product candidates or seek a new collaboration partner on short notice, and the terms of any additional collaboration or other arrangements that we establish may not be favorable to us.

We are also at risk that our current and any potential collaborations or other arrangements may not be successful. Factors that may affect the success of our collaborations include the following:

- our collaboration partners may incur financial and cash flow difficulties that force them to limit or reduce their participation in our joint projects;
- our collaboration partners may be pursuing alternative technologies or developing alternative products that are competitive to our technology and products, either on their own or in partnership with others;
- our collaboration partners may terminate their collaboration with us, which could make it difficult for us to attract new partners or adversely affect perception of us in the business and financial communities; and
- our collaboration partners may pursue higher priority programs or change the focus of their development programs, which could affect their commitment to us.

If we cannot maintain successful collaborations, our business, financial condition and operating results may be adversely affected.

If we are unable to maintain our commercial supply agreements with key customers purchasing CRM197 or if third-party distributors of our reagent proteins fail to perform as expected, sales revenue could decline.

We primarily sell CRM197 directly to biopharmaceutical companies and currently have several commercial supply agreements in place for long-term supply of CRM197. To establish and maintain relationships with customers, we believe we need to maintain adequate supplies of CRM197, remain price competitive, comply with regulatory regulations and provide high quality products. If we are unable to establish and maintain arrangements for the sale of CRM197, our revenue and profits would decline.

Although we sell our protein reagents through multiple sales channels, including our ecommerce website, we also sell our protein reagents to some of our customers through third-party distributors. Many of such third parties also market and sell products from our competitors. Our third-party distributors may terminate their relationships with us at any time, or with short notice. Our future performance will also depend, in part, on our

ability to attract additional third-party distributors that will be able to market protein reagents effectively, especially in markets in which we have not previously distributed our protein reagents. If our current third-party distributors fail to perform as expected, our revenue and results of operations could be harmed.

Risks Relating to Our Intellectual Property

Our collaboration partner and other third parties may assert ownership or commercial rights to inventions we develop from our use of the materials which they provide to us, or otherwise arising from our collaboration.

We collaborate with other companies and institutions with respect to research and development matters. Also, we rely on numerous third parties to provide us with materials that we use to develop our technology. If we cannot successfully negotiate sufficient ownership, licensing and/or commercial rights to any inventions that result from our use of any third-party collaborator's materials, or if disputes arise with respect to the intellectual property developed with the use of a collaborator's materials, or data developed in a collaborator's study, our ability to capitalize on the market potential of these inventions or developments may be limited or precluded altogether.

If our efforts to protect our intellectual property related to our platform technology and our current or future product candidates are not adequate, we may not be able to compete effectively in our market.

We rely upon a combination of patents, trade secret protection and confidentiality agreements to protect the intellectual property related to our current product candidates and our development programs. If we do not adequately protect our intellectual property, competitors may be able to use our technologies and erode or negate any competitive advantage we may have, which could harm our business and ability to achieve profitability. In particular, 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 platform and product candidates. However, we may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. We may also fail to identify patentable aspects of our research and development before it is too late to obtain patent protection. Any disclosure to or misappropriation by third parties of our confidential proprietary information could enable competitors to quickly duplicate or surpass our technological achievements, eroding our competitive position in our market.

The patentability of inventions, and the validity, enforceability and scope of patents in the biotechnology and pharmaceutical industry involve complex legal and scientific questions and can be uncertain. This uncertainty includes changes to the patent laws through either legislative action to change statutory patent law or court action that may reinterpret existing law in ways affecting the scope or validity of issued patents. The patent applications that we own or license may fail to result in issued patents in the United States or foreign countries. There is a substantial amount of prior art in the biotechnology and pharmaceutical fields, including scientific publications, patents and patent applications. Our ability to obtain and maintain valid and enforceable patents depends on whether the differences between our technology and the prior art allow our technology to be patentable over the prior art. We may be unaware of certain prior art relating to our patent applications and patents, which could prevent a patent from issuing from a pending patent application, or result in an issued patent being invalidated. Even if the patents do successfully issue, third parties may challenge the validity, enforceability or scope of such issued patents or any other issued patents we own or license, which may result in such patents being narrowed, invalidated or held unenforceable.

Patents granted by the European Patent Office may be opposed by any person within nine months from the publication of their grant and, in addition, may be challenged before national courts at any time. Furthermore, even if they are unchallenged, our patents and patent applications may not adequately protect our intellectual property or prevent others from designing around our claims. If the breadth or strength of protection provided by the patents and patent applications we hold, license or pursue with respect to our product candidates is threatened, it could threaten our ability to commercialize our product candidates. In addition, recent changes to

the patent laws of the United States provide additional procedures for third parties to challenge the validity of issued patents based on patent applications filed after March 15, 2013. If the breadth or strength of protection provided by the patents and patent applications we hold or pursue with respect to our current or future product candidates is challenged, then it could threaten our ability to commercialize our current or future product candidates, and could threaten our ability to prevent competitive products from being marketed. Further, if we encounter delays in our clinical trials, the period of time during which we could market our current or future product candidates under patent protection would be reduced. Since patent applications in the United States and most other countries are confidential for a period of time after filing, we cannot be certain that we were the first to either (i) file any patent application related to our product candidates, or (ii) invent any of the inventions claimed in our patents or patent applications. Furthermore, for applications filed before March 16, 2013, or patents issuing from such applications, an interference proceeding can be provoked by a third party, or instituted by the United States Patent and Trademark Office (USPTO), to determine who was the first to invent any of the subject matter covered by the patent claims of our applications and patents. As of March 16, 2013, the United States transitioned to a “first-to-file” system for deciding which party should be granted a patent when two or more patent applications are filed by different parties claiming the same invention. A third party that files a patent application in the USPTO before us could therefore be awarded a patent covering an invention of ours even if we had made the invention before it was made by the third party. The change to “first-to-file” from “first-to-invent” is one of the changes to the patent laws of the United States resulting from the Leahy-Smith America Invents Act (Leahy-Smith Act) signed into law on September 16, 2011. Among some of the other significant changes to the patent laws are changes that limit where a patentee may file a patent infringement suit and provide opportunities for third parties to challenge any issued patent in the USPTO. It is not yet 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.

Even where laws provide protection, costly and time-consuming litigation could be necessary to enforce and determine the scope of our proprietary rights, and the outcome of such litigation would be uncertain. Moreover, any actions we may bring to enforce our intellectual property against our competitors could provoke them to bring counterclaims against us, and some of our competitors have substantially greater intellectual property portfolios than we have.

Even if PF708 is approved by the FDA or the EMA we may be delayed in selling PF708 due to direct or indirect legal challenges.

Even if PF708 receives marketing approval in the U.S. or the E.U., we may also be subject to direct legal challenges from Eli Lilly and Company, the manufacturer of Forteo, and we could be delayed or prevented from launching PF708 as a result of court orders, regulatory stays, or the time necessary to resolve such challenges. Similarly, we may be subject to indirect legal challenges in the U.S. as a result of new executive orders from the President of the United States or the amendment or reversal of various laws by the U.S. Congress that govern or impact the approval of products being developed pursuant to the 505(b)(2) pathway, including the Hatch-Waxman Act, which in aggregate may cause a delay in or prevent the approval or commercial launch of PF708.

If we are unable to protect the confidentiality of our trade secrets, the value of our technology could be materially adversely affected and our business would be harmed.

In addition to the protection afforded by patents, we also rely on trade secret protection and confidentiality agreements to protect proprietary know-how that may not be patentable, processes for which patents may be difficult to obtain or enforce and any other elements of our product development processes that involve proprietary know-how, information or technology that is not covered by patents.

As part of our efforts to protect our trade secrets and other confidential information, we require our employees, consultants, collaborators and advisors to execute confidentiality agreements upon the

commencement of their relationships with us. These agreements require that all confidential information developed by the individual or made known to the individual by us during the course of the individual's relationship with us be kept confidential and not disclosed to third parties. These agreements, however, may not provide us with adequate protection against improper use or disclosure of confidential information, and these agreements may be breached. Adequate remedies may not exist in the event of unauthorized use or disclosure of our confidential information. We also note in this respect that trade secret protection in foreign countries may not provide protection to the same extent as federal and state laws in the United States. A breach of confidentiality could significantly affect our competitive position. In addition, in some situations, these agreements may conflict with, or be subject to, the rights of third parties with whom our employees, consultants, collaborators or advisors have previous employment or consulting relationships. To the extent that our employees, consultants or contractors use any intellectual property owned by others in their work for us, disputes may arise as to the rights in any related or resulting know-how and inventions. Also, third parties, including our competitors, may independently develop substantially equivalent proprietary information and technologies or otherwise lawfully gain access to our trade secrets and other confidential information. In such a case, we would have no right to prevent such third parties from using such proprietary information or technologies to compete with us, which could harm our competitive position.

If we infringe or are alleged to infringe intellectual property rights of third parties, our business could be harmed.

Our research, development and commercialization activities may infringe or otherwise violate or be claimed to infringe or otherwise violate patents owned or controlled by other parties. Our competitors have developed large portfolios of patents and patent applications in fields relating to our business and it may not always be clear to industry participants, including us, which patents cover various types of products or methods of use. There may also be patent applications that have been filed but not published that, when issued as patents, could be asserted against us. The coverage of patents is subject to interpretation by the courts, and the interpretation is not always uniform. If we are sued for patent infringement, we would need to demonstrate that our product candidates, products or methods either do not infringe the patent claims of the relevant patent or that the patent claims are invalid, and we may not be able to do this. Proving that a patent is invalid is difficult. For example, in the United States, proving invalidity requires a showing of clear and convincing evidence to overcome the presumption of validity enjoyed by issued patents. Also in proceedings before courts in Europe, the burden of proving invalidity of the patent usually rests on the party alleging invalidity. Third parties could bring claims against us that would cause us to incur substantial expenses and, if successful against us, could cause us to pay substantial damages. Further, if a patent infringement suit were brought against us, we could be forced to stop or delay research, development, manufacturing or sales of the product or product candidate that is the subject of the suit.

As a result of patent infringement claims, or to avoid potential claims, we may choose or be required to seek licenses from third parties. These licenses may not be available on acceptable terms, or at all. Even if we are able to obtain a license, the license would likely obligate us to pay license fees or royalties or both, and the rights granted to us might be nonexclusive, which could result in our competitors gaining access to the same intellectual property. Ultimately, we could be prevented from commercializing a product, or be forced to cease some aspect of our business operations, if, as a result of actual or threatened patent infringement claims, we are unable to enter into licenses on acceptable terms.

There has been substantial litigation and other proceedings regarding patent and other intellectual property rights in the pharmaceutical industry. In addition to infringement claims against us, we may become a party to other patent litigation and other proceedings, including interference, derivation or post-grant proceedings declared or granted by the USPTO and similar proceedings in foreign countries, regarding intellectual property rights with respect to our current or future products. Third parties may submit applications for patent term extensions in the United States and/or supplementary protection certificates in the European Union (EU) member States seeking to extend certain patent protection which, if approved, may interfere with or delay the launch of

one or more of our biosimilar or vaccine products. The cost to us of any patent litigation or other proceeding, even if resolved in our favor, could be substantial. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their substantially greater financial resources. Patent litigation and other proceedings may also absorb significant management time. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could impair our ability to compete in the marketplace. The occurrence of any of the foregoing could have a material adverse effect on our business, financial condition or results of operations. We may become involved in lawsuits to protect or enforce our inventions, patents or other intellectual property or the patents of our licensors, which could be expensive and time consuming.

Competitors may infringe our intellectual property, including our patents or the patents of our licensors. In addition, one or more of our third-party collaborators may have submitted, or may in the future submit, a patent application to the USPTO without naming a lawful inventor that developed the subject matter in whole or in part while under an obligation to execute an assignment of rights to us. As a result, we may be required to file infringement or inventorship claims to stop third-party infringement, unauthorized use, or to correct inventorship. This can be expensive, particularly for a company of our size, and time-consuming. Any claims that we assert against perceived infringers could also provoke these parties to assert counterclaims against us alleging that we infringe their intellectual property rights. In addition, in an infringement proceeding, a court may decide that a patent of ours is not valid or is unenforceable, or may refuse to stop the other party from using the technology at issue on the grounds that our patent claims do not cover its technology or that the factors necessary to grant an injunction against an infringer are not satisfied.

An adverse determination of any litigation or other proceedings could put one or more of our patents at risk of being invalidated, held unenforceable or interpreted narrowly and could put our patent applications at risk of not issuing.

Interference, derivation or other proceedings brought at the USPTO or any foreign patent authority may be necessary to determine the priority or patentability of inventions with respect to our patent applications or those of our licensors or collaborators. Litigation or USPTO proceedings brought by us may fail. An unfavorable outcome in any such proceedings could require us to cease using the related technology or to attempt to license rights to it from the prevailing party, or could cause us to lose valuable intellectual property rights. Our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms, if any license is offered at all. Even if we are successful, domestic or foreign litigation or USPTO or foreign patent office proceedings may result in substantial costs and distraction to our management. We may not be able, alone or with our licensors or collaborators, to prevent misappropriation of our trade secrets, confidential information or proprietary rights, particularly in countries where the laws may not protect such rights as fully as in the United States.

Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation or other proceedings, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation or proceedings. In addition, during the course of this kind of litigation or proceedings, there could be public announcements of the results of hearings, motions or other interim proceedings or developments or public access to related documents. If investors perceive these results to be negative, the market price for our common stock could be significantly harmed.

We may not be able to globally protect our intellectual property rights.

Filing, prosecuting and defending patents on product candidates in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. In addition, the laws of some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the United States and in some cases may even force us to grant a compulsory license to competitors or other third parties. Consequently, we may not

be able to prevent third parties from practicing our inventions in all countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products and further, may export otherwise infringing products to territories where we have patent protection, but enforcement is not as strong as that in the United States. These products may compete with our products and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property protection, particularly those relating to biopharmaceuticals, which could make it difficult for us to stop the infringement of our patents or marketing of competing products in violation of our proprietary rights generally. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business, could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate and the damages or other remedies awarded, if any, may not be commercially meaningful. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

In addition, our ability to protect and enforce our intellectual property rights may be adversely affected by unforeseen changes in domestic and foreign intellectual property laws.

Obtaining and maintaining patent protection depends on compliance with various procedural, document submission, fee payment and other requirements imposed by governmental patent agencies, and our patent protection could be reduced or eliminated for non-compliance with these requirements.

Periodic maintenance fees, renewal fees, annuity fees and various other governmental fees on patents and/or applications will be due to be paid to the USPTO and various governmental patent agencies outside of the United States in several stages over the lifetime of the patents and/or applications. The USPTO and various non-U.S. governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process. In many cases, an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with the applicable rules. However, there are situations in which noncompliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, our competitors might be able to use our technologies and this circumstance would have a material adverse effect on our business.

We may be subject to claims that our employees or consultants have wrongfully used or disclosed alleged trade secrets of former or other employers.

Many of our employees and consultants, including our senior management, have been employed or retained by other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that our employees and consultants do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or these employees or consultants have used or disclosed intellectual property, including trade secrets or other proprietary information, of any such employee's or consultant's former or other employer. We are not aware of any material threatened or pending claims related to these matters, but in the future litigation may be necessary to defend against such claims. If we fail in 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 defending against such claims, litigation could result in substantial costs and be a distraction to management.

Risks Related to Government Regulation

The approval processes of the FDA, EMA, and comparable foreign authorities are lengthy, time consuming and inherently unpredictable, and if we and our collaborators are ultimately unable to obtain regulatory approval for our product candidates, our business will be substantially harmed.

The research, development, testing, manufacturing, labeling, packaging, approval, promotion, advertising, storage, marketing, distribution, post-approval monitoring and reporting, and export and import of drug and biologic products are subject to extensive regulation by the FDA and other regulatory authorities in the United States, by the EMA and competent authorities of the Member States of the EEA, and by other regulatory authorities in other countries, which regulations differ from country to country. Neither we nor any collaboration partner is permitted to market PF708, Px563L/RPA563 or any other product candidates in the United States until approval from the FDA is received, or in the EEA until we receive EU Commission approval or approval from one or more competent authorities of the Member States of the EEA, as applicable. The time required to obtain approval from regulatory authorities is unpredictable, typically takes many years following the commencement of clinical trials, and depends upon numerous factors, including the substantial discretion of such regulatory authorities. In addition, approval policies, regulations, or the type and amount of clinical data necessary to gain approval may change during the course of a product candidate's clinical development and may vary among jurisdictions, which may cause delays in the approval or the decision not to approve an application. We and our collaboration partner have not submitted any market application to regulatory authorities or obtained regulatory approval for any product candidate and it is possible that none of our existing product candidates or any product candidates we may seek to develop in the future will ever obtain regulatory approval.

Applications for our product candidates could fail to receive regulatory approval for many reasons, including but not limited to the following:

- the data collected from clinical studies of our product candidates may not be sufficient to support the submission of a BLA; an NDA under the 505(b)(2) section of the Food, Drug, and Cosmetic Act; a biosimilar product application under the 351(k) pathway of the Public Health Service Act (PHSA), a biosimilar marketing authorization under Article 6 of Regulation (EC) No. 726/2004 and/or Article 10(4) of Directive 2001/83/EC in the EEA, or other submission or to obtain regulatory approval in the United States, the EEA, or elsewhere;
- regulatory authorities may disagree with the design or implementation of our clinical trials and may, at any time, determine that the regulatory pathway that we have committed to for PF708, Px563L/RPA563 or any other product candidate is inappropriate;
- the population studied in the clinical program may not be sufficiently broad or representative to assure efficacy and safety in the full population for which we seek approval;
- regulatory authorities may disagree with our interpretation of data from preclinical studies or clinical trials;
- we may be unable to demonstrate to the satisfaction of regulatory authorities that a product candidate's risk-benefit ratio for its proposed indication is acceptable;
- regulatory authorities may fail to approve the manufacturing processes, test procedures and specifications, or facilities of third-party manufacturers with whom we contract for clinical and commercial supplies; and
- the approval policies or regulations of regulatory authorities may significantly change in a manner that renders our clinical data insufficient for approval.

This lengthy approval process as well as the unpredictability of future clinical trial results may result in our failing to seek or obtain regulatory approval to market PF708, Px563L/RPA563 or any other product candidates, which would significantly harm our business, results of operations and prospects. Moreover, any delays in the commencement or completion of clinical testing could significantly impact our product development costs and could result in the need for additional financing.

In addition, even if we or our collaboration partner were to obtain approval, regulatory authorities may approve any of our product candidates for fewer or more limited indications than requested, 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 the foregoing scenarios could materially harm the commercial prospects for our product candidates.

If we fail to obtain approval for our most advanced product candidates or if our most advanced product candidates are not commercially successful, we may have to curtail our product development programs and our business would be materially harmed.

We have invested a significant portion of our time, financial resources and efforts in the development of our most advanced product candidates, including PF708 and Px563L/RPA563. The clinical and commercial success of our product candidates will depend on a number of factors, including the following:

- timely and successful completion of all necessary clinical trials and our Study PF708-301 in subjects with osteoporosis, which may be significantly slower or cost more than we currently anticipate and will depend substantially upon the accurate and satisfactory performance of third-party contractors;
- our ability to find suitable collaboration partners to develop our product candidates or our ability to obtain substantial additional sources of funding to develop our product candidates;
- timely receipt of necessary marketing approvals from the FDA, the EU Commission, and similar foreign regulatory authorities;
- maintaining an acceptable safety and adverse event profile of our products following approval;
- achieving and maintaining compliance with all regulatory requirements applicable to our product candidates or any approved products;
- making arrangements with third-party manufacturers for, or establishing, commercial manufacturing capabilities;
- launching commercial sales of our products, if and when approved, whether alone or in collaboration with others;
- obtaining and maintaining patent and trade secret protection and regulatory exclusivity, where available, for our product candidates;
- the availability, perceived advantages, relative cost, relative safety and relative efficacy of alternative and competing treatments;
- acceptance of our products, if and when approved, by patients, the medical community and third-party payors; and
- the ability to raise additional capital on acceptable terms to achieve our goals.

If we and our collaboration partner are unable to seek and obtain regulatory approval for any of our product candidates in a timely manner or at all, we may never realize revenue from these products and we may have to curtail our other product development programs. As a result, our business, financial condition and results of operations would be materially harmed.

Our ability to market our products in the United States may be significantly delayed or prevented by the BPCIA patent dispute resolution mechanism.

The Biologics Price Competition and Innovation Act of 2009, Title VII, Subtitle A of the Patient Protection and Affordable Care Act, collectively referred to as the Affordable Care Act (ACA), Pub.L.No.111-148, 124 Stat.119, Sections 7001-02 signed into law March 23, 2010, and codified in 42 U.S.C. §262 (BPCIA) created an

elaborate and complex patent dispute resolution mechanism for biosimilars that could prevent us from launching our product candidates in the United States or could substantially delay such launches. The BPCIA mechanism required for 351(k) biosimilar applicants may pose greater risk as compared to the litigation risk to which we might be exposed under a traditional 351(a) BLA regulatory pathway.

The BPCIA sets forth patent disclosure and briefing that are demanding and time-sensitive. The following is an overview of the patent exchange and patent briefing procedures set forth in the BPCIA:

- **Disclosure of the Biosimilar Application.** Within 20 days after the FDA publishes a notice that its application has been accepted for review, a 351(k) biosimilar applicant can decide whether or not it chooses to provide a copy of its application to the originator. If the applicant does not provide its application, the originator may file for a “declaration of infringement, validity, or enforceability of any patent that claims the biological product or a use of the biological product.”
- **Identification of Pertinent Patents.** Within 60 days of the date of receipt of the application the originator must identify patents owned or controlled by the originator which it believes could reasonably be asserted against the biosimilar applicant.
- **Statement by the Biosimilar Applicant.** Within 60 days of the date of receipt of the originator’s patent list, the biosimilar applicant must state either that it will not market its product until the relevant patents have expired or alternatively provide its arguments that the patents are invalid, unenforceable or would not be infringed by the proposed biosimilar product candidate. The biosimilar applicant may also provide the originator with a list of patents the biosimilar applicant believes the originator could reasonably assert against a person not licensed by the originator engaged in the making, using, offering to sell, selling, or importing into the United States of the reference product.
- **Statement by the Originator.** In the event the biosimilar applicant has asserted that the patents are invalid, unenforceable or would not be infringed by the proposed follow-on product, the originator must provide the biosimilar applicant with a response within 60 days. The response must provide the legal and factual basis of the opinion that such patent will be infringed by the commercial marketing of the proposed biosimilar and a response to any arguments offered from the biosimilar applicant concerning validity and enforceability.
- **Patent Resolution Negotiations.** If the originator provides its detailed views that the proposed biosimilar would infringe valid and enforceable patents, then the parties are required to engage in good faith negotiations to identify which of the discussed patents will be the subject of a patent infringement action. If the parties agree on the patents to be litigated, the originator firm must bring an action for patent infringement within 30 days.
- **Simultaneous Exchange of Patents.** If those negotiations do not result in an agreement within 15 days, then the biosimilar applicant must notify the originator of how many patents (but not the identity of those patents) that it wishes to litigate. Within five days, the parties are then required to exchange lists identifying the patents to be litigated. The number of patents identified by the originator may not exceed the number provided by the biosimilar applicant. However, if the biosimilar applicant previously indicated that no patents should be litigated, then the originator may identify one patent.
- **Commencement of Patent Litigation.** The originator must then commence patent infringement litigation within 30 days. That litigation will involve all of the patents on the originator’s list and all of the patents on the follow-on applicant’s list. The follow-on applicant must then notify the FDA of the litigation. The FDA must then publish a notice of the litigation in the Federal Register.
- **Notice of Commercial Marketing.** The BPCIA requires the biosimilar applicant to provide notice to the originator at least 180 days in advance of its first commercial marketing of its proposed follow-on biologic. The originator is allowed to seek a preliminary injunction blocking such marketing based upon any patents that either party had preliminarily identified, but were not subject to the initial phase of patent litigation. The litigants are required to “reasonably cooperate to expedite such further discovery as is needed” with respect to the preliminary injunction motion.

Biosimilar companies such as ours have the option of applying for U.S. regulatory approval for our products under either a traditional 351(a) BLA approval route, or under the recently enacted streamlined 351(k) approval route established by the BPCIA. The factors underpinning such a decision are extremely complex and involve, among other things, balancing legal risk (in terms of, e.g., the degree and timing of exposure to potential patent litigation by the originator) versus regulatory risks (in terms of, e.g., the development costs and the differing scope of regulatory approval that may be afforded under 351(a) versus 351(k)).

A significant legal risk in pursuing regulatory approval under the 351(k) regulatory approval route is that the above-summarized patent exchange process established by the BPCIA could result in the initiation of patent infringement litigation prior to FDA approval of a 351(k) application, and such litigation could result in blocking the market entry of our products. In particular, while the 351(k) route is more attractive to us (versus 351(a)) for reasons related to development time and costs and the potential broader scope of eventual regulatory approval for our proposed biosimilar candidates, the countervailing risk in such a regulatory choice is that the complex patent exchange process mandated by the BPCIA could ultimately prevent or substantially delay us from launching our products in the United States.

Moreover, the disclosure process set forth in Step 1 of the process outlined above, which is directed to disclosure by the biosimilar applicant of not only its regulatory application but also the applicant's manufacturing process, has the potential to afford originators an easier path than traditional infringement litigation for developing any factual grounds they may require to support allegations of infringement. The rules established in the BPCIA's patent dispute procedures (versus the rules governing traditional patent infringement litigation) place biosimilar firms at a significant disadvantage by affording originators a much easier mechanism for factual discovery, thereby increasing the risk that a biosimilar product could be blocked from the market more quickly than under traditional patent infringement litigation processes. However, a June 12, 2017 decision by the United States Supreme Court held that no injunction is available under federal law to force compliance with the patent exchange and patent briefing process. The Supreme Court remanded the case to the Federal Circuit to answer: (1) whether an injunction is available under state law; and (2) whether such a state-law injunction is preempted by federal law. The Federal Circuit recently held that the "BPCIA preempts state law remedies for an applicant's failure to comply with § 262(l)(2)(A)."

Preparing for and conducting the patent exchange, briefing and negotiation process outlined above will require extraordinarily sophisticated legal counseling and extensive planning, all under extremely tight deadlines. Moreover, it may be difficult for us to secure such legal support if large, well-funded originators have already entered into engagements with highly qualified law firms or if the most highly qualified law firms choose not to represent biosimilar applicants due to their long standing relationships with originators. Furthermore, we could be at a serious disadvantage in this process as an originator company, as competitors may be able to apply substantially greater legal and financial resources to this process than we could.

We are aware that some biosimilar companies, namely Sandoz International GmbH (Sandoz), a subsidiary of Novartis AG, and Celltrion, Inc. have engaged in legal challenges against originators to establish their right to bring declaratory judgment actions against such originators outside the complex framework of the BPCIA patent exchange rules in order to challenge the validity of the originators' patents *prior* to the filing of any biosimilar regulatory application. For example, in the Sandoz case against the originator Amgen (relating to Sandoz' proposed etanercept (Enbrel®) biosimilar) the federal district court ruled that Sandoz did not have the right to bring a declaratory judgment action against Amgen to challenge the validity of certain Amgen-controlled patents directed to Enbrel®, but instead determined that Sandoz must use the patent exchange mechanism established in the BPCIA. Sandoz appealed this decision to the United States Court of Appeals for the Federal Circuit, and on December 5, 2014 the Federal Circuit Court ruled that Sandoz had not met the legal requirements to pursue a declaratory judgment action against Amgen. The Federal Circuit court did not address whether the patent resolution mechanism established in the BPCIA would preclude Sandoz from filing its declaratory judgment action against Amgen if and when it files an FDA application under the BPCIA for its etanercept biosimilar.

In October 2014, Amgen filed suit in federal district court against Sandoz alleging that Sandoz unlawfully refused to follow the patent resolution provisions of the BPCIA in connection with Sandoz' July 2014 regulatory approval application under 351(k) for its Neupogen® (filgrastim) biosimilar, Zarxio®. Amgen sought declaratory and injunctive relief. Following litigation at the federal district court and appeals to the Federal Circuit, on February 16, 2016, Sandoz petitioned the United States Supreme Court for certiorari review of the Federal Circuit decision that biosimilar applicants must wait until FDA approval before providing 180-day notice and Amgen filed a cross petition to review the decision the patent exchange and briefing process is optional. On June 12, 2017, the Supreme Court issued a unanimous opinion in *Amgen v. Sandoz* holding that notice of commercial marketing may be given prior to FDA approval of the biosimilar product. The Court also held that no injunction is available under federal law to force compliance with the patent exchange and patent briefing process. The Court remanded the case to the Federal Circuit to answer: (1) whether an injunction is available under state law; and (2) whether such a state-law injunction is preempted by federal law. On December 14, 2017, the Federal Circuit affirmed the dismissal of Amgen's unfair competition and conversion claims and that Amgen's state law claims are preempted on both field and conflict grounds. In particular, the Federal Circuit noted that the "BPCIA preempts state law remedies for an applicant's failure to comply with § 262(1)(2)(A)."

If we file a 351(k) regulatory approval application for one or more of our products, we may consider it necessary or advisable to adopt the strategy of selecting one or more patents of the originator to litigate in the above described BPCIA process (for example in steps 3 and 7, of the process, as outlined above), either to assert our non-infringement of such patents or to challenge their validity; but we may ultimately not be successful in that strategy and could be prevented from marketing the product in the United States.

Under the complex and uncertain rules of the BPCIA patent provisions, coupled with the inherent uncertainty surrounding the legal interpretation of any originator patents that might be asserted against us in this new process, we see substantial risk that the BPCIA process may significantly delay or defeat our ability to market our products in the United States.

Our ability to market our therapeutic equivalent products in the United States may be significantly delayed or prevented by the Hatch-Waxman patent dispute resolution mechanism, including a potential automatic 30 month stay of regulatory approval of our marketing applications.

The Hatch-Waxman Act. The provisions of Section 505(b)(2) of the Federal Food, Drug, and Cosmetic Act (FFDCA) were created, in part, to help avoid unnecessary duplication of studies already performed on a previously approved ("reference" or "listed") drug; the section gives the FDA express permission to rely on data not developed by the NDA applicant. Indeed, an NDA filed under Section 505(b)(2) is one for which one or more of the investigations relied upon by the applicant for approval were not conducted by or for the applicant and for which the applicant has not obtained a right of reference or use from the person by or for whom the investigations were conducted. We are pursuing a Section 505(b)(2) regulatory strategy for our PF708 product candidate and we plan to reference the Forteo (teriparatide) listed drug which is marketed by Eli Lilly for the treatment of osteoporosis. It is possible that for one reason or another, we will not be able to establish that our PF708 product candidate is suitable for approval under the Section 505(b)(2) framework. In addition, to the extent we rely on certain data and information that was submitted to the FDA related to the safety of Forteo, the FDA may likely require any approved labeling for PF708 to include certain safety information that is included in the Forteo label, including contraindications, warnings, precautions and other safety information.

The owner of an NDA for a branded drug product may list with the FDA certain patents whose claims allegedly cover the applicant's branded product. Each of the patents listed in the application for the drug is then published in the Orange Book. Any applicant who files a 505(b)(2) NDA referencing a drug listed in the Orange Book must certify to the FDA that: (1) no patent information on the drug product that is the subject of the application has been submitted to the FDA, referred to as a Paragraph I Certification; (2) such patent has expired, referred to as a Paragraph II Certification; (3) the date on which such patent expires, referred to as a Paragraph III Certification; or (4) such patent is invalid or will not be infringed upon by the manufacture, use or sale of the drug product for which the application is submitted, referred to as a Paragraph IV Certification.

The applicant may also elect to submit a “section viii” statement certifying that its proposed label does not contain, or carves out, any language regarding the patented method-of-use rather than certify to a listed method-of-use patent. An applicant submitting a Paragraph IV Certification must provide notice to each owner of the patent that is the subject of the certification and to the holder of the approved branded drug to which the 505(b)(2) application references. If the reference branded drug holder and patent owners file a lawsuit directed to one of the Orange Book listed patents within 45 days of the receipt of the Paragraph IV Certification notice, the FDA is prohibited from approving the 505(b)(2) application until the earlier of 30 months from the receipt of the Paragraph IV Certification, expiration of the patent, settlement of the lawsuit, or a decision in the infringement case that is favorable to the applicant. In the event we commercially launch our PF708 product candidate at a time when one or more unexpired patents are listed in the Orange Book for a reference listed drug product, we see substantial risk that the Paragraph IV certification process, including the likelihood of imposition of a 30 month stay and necessity of defending against accusation of patent infringement, may significantly delay or defeat our ability to competitively market our PF708 product in the United States.

Non-Patent Exclusivity and Approval of Competing Products. Additionally, a 505(b)(2) application also will not be approved until any applicable non-patent exclusivity listed in the Orange Book for the NDA branded reference drug has expired as described in further detail below. Market and data exclusivity provisions under the FDCA can delay the submission or the approval of certain applications for competing products. In addition to patent exclusivity, the holder of the NDA for a reference listed drug may be entitled to a period of non-patent exclusivity, during which the FDA cannot approve another drug application that relies on the listed drug. For example, a pharmaceutical manufacturer may obtain five years of non-patent exclusivity upon NDA approval of a new chemical entity (NCE), which is a drug that contains an active moiety that has not been approved by the FDA in any other NDA. An “active moiety” is defined as the molecule or ion responsible for the drug substance’s physiological or pharmacologic action. During the five-year exclusivity period, the FDA cannot accept for filing any application for the same active moiety and that relies on the FDA’s findings regarding that drug; the FDA may accept an application for filing after four years if the 505(b)(2) applicant makes a Paragraph IV Certification. A drug may obtain a three-year period of exclusivity for a particular condition of approval, or change to a marketed product, such as a new formulation for a previously approved product, if one or more new clinical trials, other than bioavailability or bioequivalence studies, was essential to the approval of the application and was conducted or sponsored by the applicant. Should this occur, the FDA would be precluded from approving any Abbreviated New Drug Application (ANDA) that references such product until after that three-year exclusivity period has run. However, unlike NCE exclusivity, the FDA can accept an application and begin the review process during the entire exclusivity period.

Clinical drug development involves a lengthy and expensive process with an uncertain outcome, and results of earlier studies and trials may not be predictive of future trial results.

Clinical testing is expensive and can take many years to complete, and its outcome is inherently uncertain. Furthermore, we rely on our collaboration partner, CROs, and clinical trial sites to ensure the proper and timely conduct of our clinical trials for our product candidates. While we have agreements governing the committed activities of our collaboration partner and CROs, we have limited influence over their actual performance. A failure of one or more clinical trials can occur at any time during the trial process. The results of preclinical studies and early clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials. Product candidates that have shown promising results in early studies may still suffer significant setbacks in subsequent clinical studies. For example, the results generated to date in the clinical trial for PF708 do not ensure that later clinical trials will demonstrate similar results. There is a high failure rate for drugs and biologics proceeding through clinical studies, and product candidates in later stages of clinical trials may fail to show the desired safety and efficacy despite having progressed through preclinical studies and initial clinical trials. A number of companies in the biopharmaceutical industry have suffered significant setbacks in advanced clinical trials due to lack of efficacy or adverse safety profiles, notwithstanding promising results in earlier clinical trials, and we cannot be certain that we will not face similar setbacks. Even if the clinical trials for our

product candidates are completed, nonclinical and clinical data are often susceptible to varying interpretations and analyses, and the results may not be sufficient to obtain regulatory approval for our product candidates.

We have in the past and may in the future experience delays in ongoing clinical trials for our product candidates, and we do not know whether future clinical trials, if any, will begin on time, need to be redesigned, enroll an adequate number of patients on time or be completed on schedule, if at all. The commencement or completion of clinical trials can be delayed or aborted for a variety of reasons, including delay or failure to:

- generate sufficient preclinical, toxicology, or other in vivo or in vitro data to support the initiation of human clinical studies;
- raise sufficient capital to fund a trial;
- obtain regulatory approval, or feedback on trial design, necessary to commence a trial;
- identify, recruit and train suitable clinical investigators;
- reach agreement on acceptable terms with prospective CROs and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- obtain institutional review board (IRB) approval at each site;
- identify, recruit, and enroll suitable patients to participate in a trial;
- have patients complete a trial or return for post-treatment follow-up;
- ensure clinical sites observe trial protocol or continue to participate in a trial;
- address any patient safety concerns that arise during the course of a trial;
- address any conflicts with new or existing laws or regulations;
- add a sufficient number of clinical trial sites;
- manufacture sufficient quantities of product candidate for use in clinical trials; and
- avoid delays in manufacturing, testing, releasing, validating, or importing/exporting sufficient stable quantities of our product candidates for use in clinical studies, or the inability to do any of the foregoing.

Patient enrollment is a significant factor in the completion of clinical trials and is affected by many factors, including the size and nature of the patient population, the proximity of patients to clinical sites, the eligibility criteria for the trial, the design of the clinical trial, competing clinical trials and clinicians' and patients' perceptions as to the potential advantages of the drug being studied in relation to other available therapies, including any new drugs or treatments that may be approved for the indications we are investigating.

We could also encounter delays if a clinical trial is suspended or terminated by us, by the IRBs of the institutions in which such trials are being conducted, by the data safety monitoring board, for such trial or by the FDA or other regulatory authorities. Such authorities may suspend or terminate a clinical trial due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a drug, changes in governmental regulations or administrative actions or lack of adequate funding to continue the clinical trial.

If we or our collaboration partner experience delays in the completion of, or termination of, any clinical trial of our product candidates, the commercial prospects of our product candidates may be harmed, and our ability to generate product revenue from any of these product candidates will be delayed. In addition, any delays in

completing clinical trials for our product candidates will increase our costs, slow down our product candidate development and approval process and jeopardize our ability to commence product sales and generate revenue. Any of these occurrences may significantly harm our business, financial condition and prospects. In addition, many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may also ultimately lead to the denial of regulatory approval of our product candidates.

The development, manufacture and commercialization of biosimilar, therapeutic equivalent, and vaccine products pose unique risks, and our failure to successfully introduce biosimilar, therapeutic equivalent products, and vaccine products could have a negative impact on our business and future operating results.

We are actively working to develop multiple biosimilar, therapeutic equivalent products and vaccines, including our most advanced product candidates, PF708, and Px563L/RPA563. The cost to develop each biosimilar, therapeutic equivalent, and vaccine product candidate could vary significantly and is highly dependent on the specific compound and the amount and type of clinical work that will be necessary for regulatory approval. There can be no assurance that our clinical work will be successful, or that regulatory authorities will not require additional clinical development beyond that which we have planned. Additionally, we may enter into alliances and collaborations to fund biosimilar and therapeutic equivalent product research and development activities, and the success of any such biosimilar or therapeutic equivalent product program may depend on our ability to realize the benefits under such arrangements. Due to events beyond our control or the risks identified herein, we may be unable to fund all or some of our internal biosimilar, therapeutic equivalent, and vaccine product research and development initiatives, which would have an adverse impact on our strategy and growth initiatives.

We intend to pursue market authorization globally when commercially appropriate. Since October 2005, the EU has had a regulatory framework for the approval of biosimilar products and as of December 31, 2017, 40 biosimilar medicinal products, less three subsequently withdrawn, have been approved. In the United States, an abbreviated pathway for approval of biosimilar products was established by the BPCIA, enacted on March 23, 2010, as part of the ACA. The BPCIA established this abbreviated pathway under section 351(k) of the PHSA. Subsequent to the enactment of the BPCIA, the FDA issued draft guidance regarding the demonstration of biosimilarity as well as the submission and review of biosimilar applications. However, to date, only nine biosimilars have been approved by the FDA, and no biosimilar product has been designated as interchangeable to the reference drug. Moreover, market acceptance of biosimilar products in the U.S. is unclear. Numerous states are considering or have already enacted laws that regulate or restrict the substitution by state pharmacies of biosimilars for biological products already licensed by the FDA pursuant to BLAs, or “reference products.” Market success of biosimilar products will depend on demonstrating to patients, physicians, payors, and relevant authorities that such products are safe and efficacious compared to other existing products.

We will continue to analyze and incorporate into our biosimilar development plans any final regulations issued by the FDA, pharmacy substitution policies enacted by state governments, and other applicable requirements established by relevant authorities. The costs of development and approval, along with the probability of success for our biosimilar product candidates, will be dependent upon application of any laws and regulations issued by the relevant regulatory authorities.

Biosimilar products may also be subject to extensive patent clearances and patent infringement litigation, which will likely delay and could prevent the commercial launch of a product. Moreover, the BPCIA prohibits the FDA from accepting an application for a biosimilar candidate to a reference product within four years of the reference product’s licensure by the FDA. In addition, the BPCIA provides innovative biologics with 12 years of exclusivity from the date of their licensure, during which time the FDA cannot approve any application for a biosimilar candidate to the reference product. The proposal to award biologic manufacturers seven years of exclusivity rather than 12 years carried forward in President Obama’s proposed budget for fiscal year 2017. He also proposed to prohibit additional periods of exclusivity due to minor changes in product formulations, a practice often referred to as “evergreening.” We are also aware of congressional measures H.R. 5573 and S.3094

(“PRICED ACT”) introduced to both the House and Senate on June 23, 2016, seeking to shorten the exclusivity period for brand name biological products from 12 to 7 years. It is possible that Congress may take these or other measures to reduce or eliminate periods of exclusivity.

The BPCIA is complex and only beginning to be interpreted and implemented by the FDA. As a result, its ultimate impact, implementation, and meaning is subject to significant uncertainty. Future implementation decisions by the FDA could result in delays in the development or commercialization of our product candidates or increased costs to assure regulatory compliance, and could adversely affect our operating results by restricting or significantly delaying our ability to market new biosimilar products. In the EEA, holders of marketing authorizations of reference products (for which a marketing authorization was applied for under the centralized procedure after November 20, 2005, or under the Decentralized, Mutual Recognition and national procedures, after October 30, 2005) enjoy eight years of data exclusivity during which a follow-on product or biosimilar marketing authorization applicant cannot rely on the preclinical and clinical data included in the reference product’s dossier, and 10 years of marketing exclusivity during which a follow-on product or biosimilar of the reference product cannot be placed in the EEA market. The marketing exclusivity period can be extended one additional year (to 11 years) if one or more new therapeutic indications of the reference product with significant clinical benefit as compared to existing therapies are approved during the eight-year data exclusivity period. The data and marketing exclusivity periods start from the date of the initial authorization, which for reference medicinal products authorized through the Centralized Procedure is the date of notification of the marketing authorization decision to the marketing authorization holder of the reference product.

We may rely on the Animal Rule in conducting trials, which could be time consuming and expensive.

To obtain FDA approval for our vaccine candidates Px563L and/or RPA563, we may obtain clinical data from trials in healthy human subjects that demonstrate adequate safety, and efficacy data from adequate and well-controlled animal studies under regulations issued by the FDA in 2002, often referred to as the “Animal Rule.” Among other requirements, the animal studies must establish that the drug or biological product is reasonably likely to produce clinical benefits in humans. If we use this approach we may not be able to sufficiently demonstrate this correlation to the satisfaction of the FDA, as these corollaries are difficult to establish and are often unclear. Because the FDA must agree that data derived from animal studies may be extrapolated to establish safety and effectiveness in humans, seeking approval under the Animal Rule may add significant time, complexity and uncertainty to the testing and approval process. The FDA may decide that our data are insufficient for approval and require additional preclinical, clinical or other studies, refuse to approve Px563L and/or RPA563, or place restrictions on our ability to commercialize the products. In addition, products approved under the Animal Rule are subject to additional requirements including post-marketing study requirements, restrictions imposed on marketing or distribution or requirements to provide information to patients. Further, regulatory authorities in other countries have not, at this time, established an Animal Rule equivalent, and consequently there can be no assurance that we will be able to make a submission for marketing approval in foreign countries based on such animal data.

Additionally, few facilities in the U.S. and internationally may have the capability to test animals involving exposure to anthrax or otherwise assist us in qualifying the requisite animal models, and we must compete with other companies for access to this limited pool of highly specialized resources. We therefore may not be able to secure contracts to conduct the testing in a predictable timeframe or at all.

If we and our collaboration partner are not able to demonstrate biosimilarity of our biosimilar product candidates to the satisfaction of regulatory authorities, we will not obtain regulatory approval for commercial sale of our biosimilar product candidates and our future results of operations would be adversely affected.

Our future results of operations depend, to a significant degree, on our and our collaboration partner’s ability to obtain regulatory approval for and commercialize our proposed biosimilar products. To obtain regulatory approval for the commercial sale of these product candidates, we will be required to demonstrate to

the satisfaction of regulatory authorities, among other things, that our proposed biosimilar products are highly similar to biological products already licensed by the FDA pursuant to Biologic License Applications (BLAs), notwithstanding minor differences in clinically inactive components, and that they have no clinically meaningful differences as compared to the marketed biological products in terms of the safety, purity and potency of the products. In the EEA, the similar nature of a biosimilar and a reference product is demonstrated by comprehensive comparability studies covering quality, biological activity, safety and efficacy.

In addition, the FDA may determine that a proposed biosimilar product is “interchangeable” with a reference product, meaning that the biosimilar product may be substituted by a pharmacist for the reference product without the intervention of the health care provider who prescribed the reference product, if the application includes sufficient information to show that the product is biosimilar to the reference product and that it can be expected to produce the same clinical result as the reference product in any given patient. If the biosimilar product may be administered more than once to a patient, the applicant must demonstrate that the risk in terms of safety or diminished efficacy of alternating or switching between the biosimilar and reference product is not greater than the risk of using the reference product without such alternation or switch. To make a final determination of biosimilarity or interchangeability, regulatory authorities may require additional confirmatory information beyond what we and our collaboration partner plan to initially submit in our applications for approval, such as more in-depth analytical characterization, animal testing, or further clinical studies. Provision of sufficient information for approval may prove difficult and expensive. We cannot predict whether any of our biosimilar product candidates will meet regulatory authority requirements for approval as a biosimilar or interchangeable product. To date, the FDA has not approved a biosimilar product as being interchangeable to the reference drug.

Analytical assessments can identify potential differences between biosimilar candidates and reference products. Differences in the analytical assessments may require clinical studies to reduce the residual uncertainties. In the event that regulatory authorities require us to conduct additional clinical trials or other lengthy processes, the commercialization of our proposed biosimilar products could be delayed or prevented. Delays in the commercialization of, or the inability to obtain regulatory approval for, these products could adversely affect our operating results by restricting or significantly delaying our introduction of new biosimilars.

If the FDA allows generic versions of Forteo to be approved under the ANDA regulatory pathway, PF708 may face additional competition.

PF708, similar to Forteo, is made recombinantly using living cells. However, the FDA may allow the approval of chemically manufactured, or synthetic, versions of Forteo under the 505(j), or Abbreviated New Drug Application (ANDA), regulatory pathway, which would not require the conduct of comparative clinical trial in patients for approval of the product. The availability of the ANDA regulatory pathway may result in additional competition for PF708. Additionally, products approved under the ANDA pathway would be considered generic drugs, which may be automatically substituted for the reference listed drug, depending on health care statutes and policies within each of the 50 states. The potential automatic substitution status of these generic products may adversely affect our ability to generate revenue with PF708 after regulatory approval.

If we do not obtain a therapeutic equivalence designation for PF708 from the FDA, our business may suffer.

We are developing PF708 under the 505(b)(2) regulatory pathway in the United States. Additionally, we have received guidance from the FDA on requirements for a therapeutic equivalence designation, which may allow automatic substitution for the reference listed drug, depending on health care statutes and policies within each of the 50 states. However, we may receive regulatory approval without obtaining therapeutic equivalence designation from the FDA, an outcome that could adversely affect our ability to generate revenue from PF708, if approved.

If other therapeutic equivalent or generic products to Forteo are approved and successfully commercialized before PF708, our business would suffer.

Other companies may seek approval to manufacture and market therapeutic equivalent or generic product versions of Forteo. If other therapeutic equivalent or generic product versions of Forteo are approved and successfully commercialized before PF708, we may never achieve significant market share for PF708, our revenue would be reduced and, as a result, our business, prospects and financial condition could suffer.

Failure to obtain regulatory approval in each regulatory jurisdiction would prevent us and our collaboration partner from marketing our products to a larger patient population and reduce our commercial opportunities.

In order to market our products in the European Union, the United States and other jurisdictions, we or our collaboration partner must obtain separate regulatory approvals and comply with numerous and varying regulatory requirements. The European Medicines Agency is responsible for the centralized procedure for human medicines. This procedure results in a single marketing authorization that is valid in all European Union countries, as well as in Iceland, Liechtenstein and Norway. The time required to obtain approval abroad may differ from that required to obtain FDA approval. The foreign regulatory approval process may include all of the risks associated with obtaining FDA approval and we may not obtain foreign regulatory approvals on a timely basis, if at all. Approval by the FDA does not ensure approval by regulatory authorities in other countries, and approval by one foreign regulatory authority does not ensure approval by regulatory authorities in other foreign countries or by the FDA. We may not be able to file for regulatory approvals and may not receive necessary approvals to commercialize our products within the United States or in any market outside the United States. Failure to obtain these approvals would materially and adversely affect our business, financial condition and results of operations.

Even if we and our collaboration partner obtain regulatory approvals for PF708, or any of our other product candidates, we will be subject to ongoing regulatory review.

Even if we and our collaboration partner obtain regulatory approval for PF708, or any of our other product candidates, any products we develop will be subject to ongoing regulatory review with respect to manufacturing, labeling, packaging, storage, advertising, promotion, sampling, record-keeping, conduct of post-marketing studies, and submission of safety, efficacy, and other post-market information, including both federal and state requirements in the United States and requirements of comparable foreign regulatory authorities. Manufacturers and manufacturers' facilities are required to comply with extensive FDA and comparable foreign regulatory authority requirements, including ensuring that quality control and manufacturing procedures conform to cGMP. As such, we and our contract manufacturers will be subject to continual and unannounced review and inspections by the regulatory authorities governing the markets in which we wish to sell our products. Accordingly, we and others with whom we work must continue to expend time, money, and effort in all areas of regulatory compliance, including manufacturing, production, and quality control.

Any regulatory approvals that we and our collaboration partner receive for PF708, or any of our other product candidates may be subject to limitations on the approved indicated uses for which the product may be marketed or to the conditions of approval, or contain requirements for potentially costly post-marketing testing, including Phase 4 trials, and surveillance to monitor the safety and efficacy or the safety, purity, and potency of the product candidate. We will be required to immediately report any serious and unexpected adverse events and certain quality or production problems with our products to regulatory authorities along with other periodic reports. Any new legislation addressing drug or biologic product safety issues could result in delays in product development or commercialization, or increased costs to assure compliance. We and our collaboration partner will have to comply with requirements concerning advertising and promotion for our products. Promotional communications with respect to prescription drug and biologic products are subject to a variety of legal and regulatory restrictions and must be consistent with the information in the product's approved label. As such, we will not be allowed to promote our products for indications or uses for which they do not have approval. The

holder of an approved NDA, BLA, 351(k) application or marketing authorization application must submit new or supplemental applications and obtain prior approval for certain changes to the approved product, product labeling, or manufacturing process. We could also be asked to conduct post-marketing clinical studies to verify the safety and efficacy of our products in general or in specific patient subsets. An unsuccessful post-marketing study or failure to complete such a study could result in the withdrawal of marketing approval.

If a regulatory agency discovers previously unknown problems with a product, such as adverse events of unanticipated severity or frequency, or problems with the facility where the product is manufactured or disagrees with the promotion, marketing or labeling of a product, or if we or our collaboration partner fail to comply with applicable continuing regulatory requirements, such regulatory agency may impose restrictions on that product or us, including requiring withdrawal of the product from the market. If we or our collaboration partner fail to comply with applicable regulatory requirements, a regulatory agency or enforcement authority may subject us to administrative or judicially imposed sanctions or other actions, including, among other things:

- adverse publicity, fines or warning letters;
- civil or criminal penalties;
- injunctions;
- suspending or withdrawing regulatory approval;
- suspending any of our ongoing clinical studies;
- refusing to approve pending applications or supplements to approved applications submitted by us;
- imposing restrictions on our operations, including closing our contract manufacturers' facilities; or
- seizing or detaining products, or requiring a product recall.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response, and could generate negative publicity. Any failure to comply with ongoing regulatory requirements may significantly and adversely affect our ability to commercialize and generate revenue from our products. If regulatory sanctions are applied or if regulatory approval is withdrawn, the value of our company and our operating results will be adversely affected.

We will also be subject to various health care fraud and abuse laws, including anti-kickback, false claims and fraud laws, and physician payment transparency laws, and any violations by us of such laws could result in fines or other penalties.

Although we currently do not have any products on the market, if PF708, or any of our other product candidates are approved and we begin commercialization, we will be subject to healthcare regulation and enforcement by the federal government and the states and EEA and other foreign governments in which we conduct our business. These laws include, without limitation, state and federal, as well as EEA and other foreign, anti-kickback, fraud and abuse, false claims, privacy and security and physician sunshine laws and regulations. The federal Anti-Kickback Statute prohibits the offer, receipt, or payment of remuneration in exchange for or to induce the referral of patients or the use of products or services that would be paid for in whole or part by Medicare, Medicaid or other federal health care programs. Remuneration has been broadly defined to include anything of value, including cash, improper discounts, and free or reduced price items and services. The government has enforced the Anti-Kickback Statute to reach large settlements with healthcare companies based on sham research or consulting and other financial arrangements with physicians. Further, the ACA, among other things, amended the intent requirement of the federal Anti-Kickback Statute and certain criminal statutes governing healthcare fraud. A person or entity no longer needs to have actual knowledge of the statute or specific intent to violate it. In addition, the ACA provided that the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the FCA or federal civil money penalties statute. Many states have similar laws that apply to their

state health care programs as well as private payors. Violations of the anti-kickback laws can result in exclusion from federal health care programs and substantial civil and criminal penalties. The FCA imposes liability on persons who, among other things, present or cause to be presented false or fraudulent claims for payment by a federal health care program. The FCA has been used to prosecute persons submitting claims for payment that are inaccurate or fraudulent, that are for services not provided as claimed, or for services that are not medically necessary. Actions under the FCA may be brought by the Attorney General or as a qui tam action by a private individual in the name of the government. Violations of the FCA can result in significant monetary penalties and treble damages. The federal government is using the FCA, and the accompanying threat of significant liability, in its investigation and prosecution of pharmaceutical and biotechnology companies throughout the country, for example, in connection with the promotion of products for unapproved uses and other sales and marketing practices. The government has obtained multi-million and multi-billion dollar settlements under the FCA in addition to individual criminal convictions under applicable criminal statutes. In addition, companies have been forced to implement extensive corrective action plans, and have often become subject to consent decrees or corporate integrity agreements, severely restricting the manner in which they conduct their business. Given the significant size of actual and potential settlements, it is expected that the government will continue to devote substantial resources to investigating healthcare providers' and manufacturers' compliance with applicable fraud and abuse laws. If our future marketing or other arrangements were determined to violate anti-kickback or related laws, including the FCA, then our revenue could be adversely affected, which would likely harm our business, financial condition, and results of operations.

In addition, there has been a recent trend of increased federal and state regulation of payments made to physicians and other healthcare providers. The ACA, among other things, imposed new reporting requirements on drug commercial manufacturers for payments and other transfers of value made by them to physicians and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members. Failure to submit required information may result in civil monetary penalties of up to an aggregate of \$150,000 per year (or up to an aggregate of \$1 million per year for "knowing failures"), for all payments, transfers of value or ownership or investment interests that are not timely, accurately and completely reported in an annual submission. Drug manufacturers must submit reports by the 90th day of each calendar year. Certain states also mandate implementation of commercial compliance programs, impose restrictions on device manufacturer marketing practices and/or require the tracking and reporting of gifts, compensation and other remuneration to physicians.

The shifting commercial compliance environment and the need to build and maintain robust and expandable systems to comply with different compliance and/or reporting requirements in multiple jurisdictions increase the possibility that a healthcare company may violate one or more of the requirements. If our operations are found to be in violation of any of such laws or any other governmental regulations that apply to us, we may be subject to penalties, including, without limitation, civil and criminal penalties, damages, fines, the curtailment or restructuring of our operations, exclusion from participation in federal and state healthcare programs and imprisonment, any of which could adversely affect our ability to operate our business and our financial results.

Also, the U.S. Foreign Corrupt Practices Act and similar worldwide anti-bribery laws generally prohibit companies and their intermediaries from making improper payments to non-U.S. officials for the purpose of obtaining or retaining business. We cannot assure investors that our internal control policies and procedures will protect us from reckless or negligent acts committed by our employees, future distributors, partners, collaborators or agents. Violations of these laws, or allegations of such violations, could result in fines, penalties or prosecution and have a negative impact on our business, results of operations and reputation.

Legislative or regulatory healthcare reforms in the United States may make it more difficult and costly for us to obtain regulatory approval of PF708, Px563L/RPA563 or any other product candidates and to produce, market, and distribute our products after approval is obtained, if any.

From time to time, legislation is drafted and introduced in Congress that could significantly change the statutory provisions governing the regulatory approval, manufacturing, and marketing of regulated products or the reimbursement thereof. In addition, FDA regulations and guidance may be revised or reinterpreted by the FDA in ways that may significantly affect our business and our products. Any new regulations or guidance, or revisions or reinterpretations of existing regulations or guidance, may impose additional costs or lengthen FDA review times for PF708, Px563L/RPA563 or any other product candidates. We cannot determine how changes in regulations, statutes, policies, or interpretations when and if issued, enacted or adopted, may affect our business in the future. Such changes could, among other things, require:

- changes to manufacturing methods;
- recalls, replacements, or discontinuance of one or more of our products; and
- additional recordkeeping.

Such changes would likely require substantial time and impose significant costs, and could materially harm our business and our financial results. In addition, delays in receipt of or failure to receive regulatory clearances or approvals for any other products would harm our business, financial condition, and results of operations.

If efforts by manufacturers of reference products to delay or limit the use of biosimilars and therapeutic equivalent products are successful, our sales of biosimilar and other therapeutic equivalent products may suffer.

Many manufacturers of reference products have increasingly used legislative, regulatory and other means in attempts to delay regulatory approval of and competition from biosimilars and therapeutic equivalent products. These efforts have included sponsoring legislation to prevent pharmacists from substituting biosimilars and therapeutic equivalent products for prescribed reference products or to make such substitutions more difficult by establishing notification, recordkeeping, and/or other requirements, as well as seeking to prevent manufacturers of biosimilars and therapeutic equivalent products from referencing the branded products in biosimilar and therapeutic equivalent product labels and marketing materials. If these or other efforts to delay or block competition are successful, we may be unable to sell our biosimilar and therapeutic equivalent product candidates, which could have a material adverse effect on our sales and profitability.

Our and our collaboration partner's future sales will be dependent on the availability and level of coverage and reimbursement from third-party payors who continue to implement cost-cutting measures and more stringent reimbursement standards.

In the United States and internationally, our and our collaboration partner's ability to generate revenue on future sales of our products will be dependent, in significant part, on the availability and level of coverage and reimbursement from third-party payors, such as state and federal governments and private insurance plans. Insurers have implemented cost-cutting measures and other initiatives to enforce more stringent reimbursement standards and likely will continue to do so in the future. These measures include the establishment of more restrictive formularies and increases in the out-of-pocket obligations of patients for such products. In addition, particularly in the U.S. and increasingly in other countries, we will be required to provide discounts and pay rebates to state and federal governments and agencies in connection with purchases of our products that are reimbursed by such entities.

In addition, in the United States, the full impact of recent healthcare reform and other changes in the healthcare industry and in healthcare spending is currently unknown. In March 2010, the ACA, as amended by the Health Care and Education Reconciliation Act, was enacted with a goal of reducing the cost of healthcare and

substantially changing the way healthcare is financed by both government and private insurers. The ACA, among other things, subjected biologic products to potential competition by lower-cost biosimilars and follow-on products, addressed a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted or injected, increased the minimum Medicaid rebates owed by manufacturers under the Medicaid Drug Rebate Program and extended the rebate program to individuals enrolled in Medicaid managed care organizations, established annual fees and taxes on manufacturers of certain prescription drugs, and created 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 reference product drugs to eligible beneficiaries during their coverage gap period as a condition for the manufacturer's outpatient drugs to be covered under Medicare Part D.

Other legislative changes have been proposed and adopted in the U.S. since the ACA was enacted. On August 2, 2011, the Budget Control Act of 2011 created measures for spending reductions by Congress. A Joint Select Committee on Deficit Reduction, tasked with recommending a targeted deficit reduction of at least \$1.2 trillion for the years 2013 through 2021, was unable to reach required goals, thereby triggering the legislation's automatic reduction to several government programs. This included aggregate reductions of Medicare payments to providers of 2% per fiscal year, which went into effect on April 1, 2013 and will stay in effect through 2024 unless additional Congressional action is taken. On January 2, 2013, the American Tax Payer Relief Act was signed into law, which, among other things, further reduced Medicare payments to several providers, including hospitals. We expect that additional healthcare reform measures will be adopted in the future, any of which could limit the amounts that federal, state and foreign governments will pay for healthcare products and services, which could result in reduced demand for our products, if approved, or additional pricing pressures. Furthermore, the current presidential administration and Congress are also expected to attempt broad sweeping changes to the current health care laws. We face uncertainties that might result from modification or repeal of any of the provisions of the ACA, including as a result of current and future executive orders and legislative actions. The impact of those changes on us and potential effect on biosimilar manufacturing industry as a whole is currently unknown. But, any changes to the ACA are likely to have an impact on our results of operations, and may have a material adverse effect on our results of operations. We cannot predict what other healthcare programs and regulations will ultimately be implemented at the federal or state level or the effect of any future legislation or regulation in the United States may have on our business.

Foreign governments tend to impose strict price controls, which may adversely affect our revenue, if any.

In some foreign countries, 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. Our existing or future collaboration partners, if any, may elect to reduce the price of our products in order to increase the likelihood of obtaining reimbursement approvals which could adversely affect our revenues and profits. To obtain reimbursement or pricing approval in some countries, we or our collaboration partner may also 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 adversely affected.

Risks Relating to Owning Our Common Stock

The market price of our stock may fluctuate significantly, and investors may have difficulty selling their shares.

Our stock is currently traded on NYSE American, but we can provide no assurance that we will be able to maintain an active trading market on NYSE American or any other exchange in the future. The trading volume of our stock tends to be low relative to our total outstanding shares, and we have several stockholders who hold substantial blocks of our stock. As of December 31, 2017, we had 23,548,280 shares of common stock outstanding, and stockholders holding at least 5% of our stock, individually or with affiliated persons or entities,

collectively beneficially owned or controlled approximately 46% of such shares. Sales of large numbers of shares by any of our large stockholders could adversely affect our trading price, particularly given our relatively small historic trading volumes. If stockholders holding shares of our common stock sell, indicate an intention to sell, or if it is perceived that they will sell, substantial amounts of their common stock in the public market, the trading price of our common stock could decline.

Since shares of our common stock were sold in our initial public offering in July 2014 at a price of \$6.00 per share, our stock price has ranged from \$2.07 to \$24.41 through December 31, 2017. In addition to the factors discussed in this “Risk Factors” section and elsewhere in this annual report on Form 10-K factors that may cause volatility in our share price include:

- actual or anticipated quarterly variation in our results of operations or the results of our competitors;
- announcements by us or our competitors of new commercial products, significant contracts, commercial relationships or capital commitments;
- issuance of new or changed securities analysts’ reports or recommendations for our stock;
- developments or disputes concerning our intellectual property or other proprietary rights;
- changes to our organization and management;
- commencement of, or our involvement in, litigation;
- market conditions in the relevant market;
- reimbursement or legislative changes in the relevant market;
- failure to complete significant sales;
- regulatory developments that may impact our product candidates;
- any future sales of our common stock or other securities;
- any major change to the composition of our board of directors or management; and
- general economic conditions and slow or negative growth of our markets.

The stock market in general and market prices for the securities of biopharmaceutical companies like ours in particular, have from time to time experienced volatility that often has been unrelated to the operating performance of the underlying companies. These broad market and industry fluctuations may adversely affect the market price of our common stock, regardless of our operating performance.

We may be subject to securities litigation, which is expensive and could divert management attention.

The market price of our common stock has been and will likely continue to be volatile, and in the past companies that have experienced volatility in the market price of their stock have been subject to securities class action litigation. We may be the target of this type of litigation in the future. Securities litigation against us could result in substantial costs and divert our management’s attention from other business concerns, which could seriously harm our business.

If securities or industry analysts publish unfavorable research about our business or cease to cover our business, our stock price and/or trading volume could decline.

The trading market for our common stock may rely, in part, on the research and reports that equity research analysts publish about us and our business. We do not have any control of 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 cease 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 we sell shares of our common stock in future financings, stockholders may experience immediate dilution and, as a result, the market price of our common stock may decline.

We may from time to time issue additional shares of common stock at a discount from the current trading price of our common stock. As a result, our stockholders would experience immediate dilution upon the purchase of any shares of our common stock sold at such discount. In addition, as opportunities present themselves, we may enter into financing or similar arrangements in the future, including the issuance of debt securities, preferred stock or common stock. If we issue common stock or securities convertible into common stock, our common stockholders would experience additional dilution and, as a result, the market price of our common stock may decline.

Sales of substantial amounts of our common stock in the public markets, or the perception that such sales might occur, could reduce the price that our common stock might otherwise attain and may dilute your voting power and your ownership interest in us.

Sales of a substantial number of shares of our common stock in the public market, or the perception that these sales might occur, could depress the market price of our common stock and could impair our ability to raise capital through the sale of additional equity securities. We are unable to predict the effect that sales may have on the prevailing market price of our common stock. We also register the offer and sale of all shares of common stock that we may issue under our equity compensation plans.

Furthermore, certain of our executive officers have adopted, and other directors and executive officers may in the future adopt, written plans, known as “Rule 10b5-1 Plans,” under which they have contracted, or may in the future contract, with a broker to sell shares of our common stock on a periodic basis to diversify their assets and investments. Sales of substantial amounts of our common stock in the public markets, including, but not limited to, sales made by our executive officers and directors pursuant to Rule 10b5-1 Plans, or the perception that these sales could occur, could cause the market price of our common stock to decline.

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

We are an “emerging growth company,” as defined in the Jumpstart Our Business Startups Act (JOBS Act) enacted in April 2012, and may remain an “emerging growth company” for up to five years following the completion of our initial public offering, although, if we have more than \$1.0 billion in annual revenue, if the market value of our common stock that is held by non-affiliates exceeds \$700 million as of December 31 of any year, or we issue more than \$1.0 billion of non-convertible debt over a three-year period before the end of that five-year period, we would cease to be an “emerging growth company” as of the following December 31. For as long as we remain an “emerging growth company,” we are permitted and intend to rely on exemptions from certain disclosure requirements that are applicable to other public companies that are not “emerging growth companies.” These exemptions include:

- not being required to comply with the auditor attestation requirements 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 have taken advantage of reduced reporting burdens in our reports filed with the Securities and Exchange Commission (SEC). 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, delaying the adoption of these accounting standards until they would apply to private companies. We have elected to avail ourselves of this exemption and, as a result, our financial statements may not be comparable to the financial statements of reporting companies who are required to comply with the effective dates for new or revised accounting standards that are applicable to public companies. We cannot predict whether investors will find our common stock less attractive as a result of our reliance 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 the market price of our common stock may be reduced or more volatile.

If we fail to maintain effective internal control over financial reporting in the future, the accuracy and timing of our financial reporting may be adversely affected.

In connection with our audit committee investigation, which concluded in the first quarter of 2017, we identified a material weakness in our internal control over financial reporting. A material weakness is a significant deficiency, or a combination of significant deficiencies, in internal control over financial reporting such that it is reasonably possible that a material misstatement of the annual or interim financial statements will not be prevented or detected on a timely basis. The material weakness that we previously identified related to a failure to maintain an effective control environment as our former Chief Executive Officer failed to set an appropriate “Tone at the Top.” The material weakness was identified in connection with our Audit Committee Investigation, which found violations of our Board Approval Process Policy and related violations of our Code of Ethics and Conduct by our former Chief Executive Officer. The investigation determined that our former Chief Executive Officer had not acted in accordance with our Board Approval Process Policy and Code of Ethics and Conduct as a result of his failure to comply with certain board approval procedures for third-party contracts.

In response to this reported material weakness, we undertook the following steps in the first and second quarter of 2017: a change in our Chief Executive Officer following the resignation of our former Chief Executive Officer on January 23, 2017; requiring documentation of approvals for contracts that are within the scope of the Board Approval Process Policy; increasing the frequency of our internal audit testwork to assess the design, implementation, and operating effectiveness of our entity level and process level controls; and increasing communication with, and training of, employees regarding our commitment to ethical standards and the integrity of our business practices, requirements for compliance with our Board Approval Process Policy and Code of Ethics and Conduct, including training of new hires and re-training of existing employees, and availability of and processes for reporting suspected violations of our Code of Ethics and Conduct. The remediation was completed as of June 30, 2017. However, completion of remediation does not provide assurance that our controls will operate properly or that our financial statements will be free from error. There may be undetected material weaknesses in our internal control over financial reporting, as a result of which we may not detect financial statement errors on a timely basis.

If we identify new material weaknesses in our internal control over financial reporting or we are unable to successfully remediate any future material weaknesses in our internal control over financial reporting, the accuracy and timing of our financial reporting may be adversely affected, we may be unable to maintain compliance with securities laws and NYSE American listing requirements regarding the timely filing of periodic reports, investors may lose confidence in our financial reporting, and our stock price may decline.

Additionally, our independent registered public accounting firm is not required to and did not perform an evaluation of our internal control over financial reporting during any period in accordance with the provisions of the Sarbanes-Oxley Act due to a transition period established by the rules of the Securities and Exchange Commission (SEC) for newly public companies that have not lost their “emerging growth company” status as defined in the JOBS Act. Had our independent registered public accounting firm performed an evaluation of our internal control over financial reporting in accordance with the provisions of the Sarbanes-Oxley Act, additional control deficiencies amounting to significant deficiencies or material weaknesses may have been identified. We cannot be certain as to when we will be able to implement the requirements of Section 404 of the Sarbanes-Oxley

Act. If we fail to implement the requirements of Section 404 in a timely manner, we might be subject to sanctions or investigation by regulatory agencies such as the SEC. In addition, failure to comply with Section 404 or the report by us of a significant deficiency or material weakness may cause investors to lose confidence in our financial statements, and the trading price of our common stock may decline. If we fail to remedy any significant deficiency or material weakness, our financial statements may be inaccurate, our access to the capital markets may be restricted and the trading price of our common stock may decline.

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

We generated a tax net operating loss for 2017. The 2017 net operating loss carryforwards (NOLs) are available to offset future taxable income, if any, until such unused losses expire. Under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, if a corporation undergoes an “ownership change,” generally defined as a greater than 50 percentage point change (by value) in its equity ownership by certain stockholders over a three-year period, the corporation’s ability to use its pre-change NOLs and other pre-change tax attributes (such as research tax credits) to offset its post-change income or taxes may be limited. We performed a formal Section 382 study through December 31, 2014 but have not updated such study through December 31, 2017. Upon update of our Section 382 study, we may have experienced an ownership change as a result of shifts in our stock ownership. As a result, our ability to use pre-change NOLs and tax credits may be subject to limitations. Similar provisions of state tax law may also apply to limit our use of accumulated state tax attributes. In addition, changes in law, including legislation commonly known as the Tax Cuts and Jobs Act of 2017, may further limit our ability to use our NOLs. As a result, even if we attain profitability, we may be unable to use a material portion of our NOLs and other tax attributes, which could adversely affect our future cash flows.

We are incurring increased costs as a result of operating as a public company and our management is required to devote substantial time to new compliance initiatives and corporate governance practices including maintaining an effective system of internal control over financial reporting.

As a public company, and increasingly after we are no longer an “emerging growth company,” we are incurring significant legal, accounting and other expenses that we did not incur as a private company. In addition, the Sarbanes-Oxley Act and rules subsequently implemented by the SEC, and the NYSE American impose numerous requirements on public companies, including establishment and maintenance of effective disclosure and financial controls and corporate governance practices. Also, the Securities Exchange Act of 1934 (Exchange Act), as amended, requires, among other things, that we file annual, quarterly and current reports with respect to our business and operating results. Our management and other personnel devote a substantial amount of time to comply with these laws and regulations. These requirements have increased and will continue to increase our legal, accounting, and financial compliance costs and have made and will continue to make some activities more time consuming and costly. For example, we expect these rules and regulations to make it more difficult and more expensive for us to obtain director and officer liability insurance, and we may be required to incur substantial costs to maintain the same or similar coverage. These rules and regulations could also make it more difficult for us to attract and retain qualified persons to serve on our board of directors or our board committees or as executive officers. These rules and regulations are often subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and changing governance practices.

The Sarbanes-Oxley Act requires, among other things, that we assess the effectiveness of our internal control over financial reporting annually and the effectiveness of our disclosure controls and procedures quarterly. In particular, Section 404(a) of the Sarbanes-Oxley Act requires us to perform system and process evaluation and testing of our internal control over financial reporting to allow management to report on the effectiveness of our internal control over financial reporting. Section 404(b) of Sarbanes-Oxley Act (Section 404(b)) also requires our independent registered public accounting firm to attest to the effectiveness of our internal control over financial reporting. As an “emerging growth company,” we are availing ourselves of the

exemption from the requirement that our independent registered public accounting firm attest to the effectiveness of our internal control over financial reporting under Section 404(b). However, we may no longer avail ourselves of this exemption when we are no longer an “emerging growth company.” When our independent registered public accounting firm is required to undertake an assessment of our internal control over financial reporting, the cost of our compliance with Section 404(b) will correspondingly increase. Our compliance with applicable provisions of Section 404 requires us and will continue to require us to incur substantial accounting expense and expend significant management time on compliance-related issues as we implement additional corporate governance practices and comply with reporting requirements.

Furthermore, investor perceptions of our company may suffer if deficiencies are found, and this could cause a decline in the market price of our stock. Irrespective of any required compliance with Section 404, any failure of our internal control over financial reporting could have a material adverse effect on our stated operating results and harm our reputation. If we are unable to implement these requirements effectively or efficiently, it could harm our operations, financial reporting, or financial results and could result in an adverse opinion on our internal controls from our independent registered public accounting firm.

Our directors, executive officers and principal stockholders will continue to have substantial control over us and could limit investors’ ability to influence the outcome of key transactions, including transactions that would cause a change of control.

As of December 31, 2017, our executive officers, directors and stockholders who owned more than 5% of our outstanding common stock and their respective affiliates beneficially owned or controlled approximately 48% of the outstanding shares of our common stock. Accordingly, these executive officers, directors and stockholders and their respective affiliates, acting as a group, have substantial influence over the outcome of corporate actions requiring stockholder approval, including the election of directors, any merger, consolidation or sale of all or substantially all of our assets or any other significant corporate transactions. These stockholders may therefore delay or prevent a change of control of us, even if such a change of control would benefit our other stockholders. The significant concentration of stock ownership may adversely affect the trading price of our common stock due to investors’ perception that conflicts of interest may exist or arise.

Claims for indemnification by our directors and officers may reduce our available funds to satisfy successful third-party claims against us and may reduce the amount of money available to us.

Our amended and restated certificate of incorporation and amended and restated bylaws provide that we will indemnify our directors and officers, in each case to the fullest extent permitted by Delaware law. In addition, as permitted by Section 145 of the Delaware General Corporation Law, our amended and restated bylaws and our indemnification agreements that we have entered into with our directors and officers provide that:

- We will indemnify our directors and officers for serving us in those capacities, or for serving other business enterprises at our request, to the fullest extent permitted by Delaware law. Delaware law provides that a corporation may indemnify such person if such person acted in good faith and in a manner such person reasonably believed to be in or not opposed to the best interests of the registrant and, with respect to any criminal proceeding, had no reasonable cause to believe such person’s conduct was unlawful.
- We may, in our discretion, indemnify employees and agents in those circumstances where indemnification is permitted by applicable law.
- We are required to advance expenses, as incurred, to our directors and officers in connection with defending a proceeding, except that such directors or officers shall undertake to repay such advances if it is ultimately determined that such person is not entitled to indemnification.
- We will not be obligated pursuant to our amended and restated bylaws to indemnify a person with respect to proceedings initiated by that person against us or our other indemnitees, except with respect to proceedings authorized by our board of directors or brought to enforce a right to indemnification.

- The rights conferred in our amended and restated bylaws are not exclusive, and we are authorized to enter into indemnification agreements with our directors, officers, employees and agents and to obtain insurance to indemnify such persons.
- We may not retroactively amend our amended and restated bylaw provisions to reduce our indemnification obligations to directors, officers, employees and agents.

To the extent that a claim for indemnification is brought by any of our directors or officers, it would reduce the amount of funds available for use in our business.

Anti-takeover provisions in our charter documents and under Delaware law could make an acquisition of us, which may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management and limit the market price of our common stock.

Provisions in our certificate of incorporation and bylaws may have the effect of delaying or preventing a change of control or changes in our management. Our amended and restated certificate of incorporation and amended and restated bylaws include provisions that:

- authorize our board of directors to issue, without further action by the stockholders, up to 10,000,000 shares of undesignated preferred stock;
- require that any action to be taken by our stockholders be effected at a duly called annual or special meeting and not by written consent;
- specify that special meetings of our stockholders can be called only by our board of directors, the chairman of the board of directors, or the chief executive officer;
- establish an advance notice procedure for stockholder approvals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to our board of directors;
- establish that our board of directors is divided into three classes, Class I, Class II and Class III, with each class serving staggered three-year terms;
- provide that our directors may be removed only for cause;
- provide that vacancies on our board of directors may be filled only by a majority of directors then in office, even though less than a quorum;
- specify that no stockholder is permitted to cumulate votes at any election of directors; and
- require a super-majority of votes to amend certain of the above-mentioned provisions.

These provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors, which is responsible for appointing the members of our management. In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which limits the ability of stockholders owning in excess of 15% of our outstanding voting stock to merge or combine with us.

We have broad discretion in the use of the net proceeds from our public offerings and may not use them effectively.

We have broad discretion as to how to spend and invest the proceeds from our public offerings, and we may spend or invest these proceeds in a way with which our stockholders disagree. Accordingly, investors will need to rely on our judgment with respect to the use of these proceeds and these uses may not yield a favorable return to our stockholders. In addition, until the net proceeds are used, they may be placed in investments that do not produce significant income or that may lose value.

With the exception of the issuance of shares of common stock to our preferred stockholders in connection with the payment of all accrued and unpaid dividends in connection with our initial public offering, we do not anticipate paying any cash dividends in the foreseeable future.

At the closing of our initial public offering, our board of directors issued shares of common stock to pay all accrued but unpaid dividends on our convertible preferred stock. With the exception of this dividend, we do not anticipate paying cash dividends on any classes of our capital stock in the foreseeable future. We currently intend to retain our future earnings for the foreseeable future to fund the development and growth of our business. As a result, capital appreciation, if any, of our common stock will be the sole source of gain on an investment in our common stock for the foreseeable future.

Item 1B. *Unresolved Staff Comments*

None.

Item 2. *Properties*

As of December 31, 2017, we leased a total of approximately 46,959 square feet of office and laboratory space located at 10790 and 10788 Roselle Street, San Diego, CA 92121. The lease expires on March 31, 2024. We believe that our existing facilities are adequate to meet our business requirements for the foreseeable future and that additional space will be available on commercially reasonable terms, if required.

Item 3. *Legal Proceedings*

In the normal course of business, we are from time to time involved in legal proceedings or potential legal proceedings, including matters involving employment, intellectual property, or others. Although the results of litigation and claims cannot be predicted with certainty, we currently believe that the final outcome of any currently pending matters would not have a material adverse effect on our business, operating results, financial condition, or cash flows. Regardless of the outcome, litigation can have an adverse impact on us because of defense and settlement costs, diversion of management resources, and other factors.

Item 4. *Mine Safety Disclosures.*

Not applicable.

PART II

Item 5. *Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities*

Market Information and Holders of Record

Our common stock has been listed on the NYSE American under the symbol “PFNX” since July 24, 2014. Prior to that date, there was no public trading market for our common stock. The following table sets forth the high and low sales price per share of our common stock as reported on the NYSE American for the periods indicated:

	<u>High</u>	<u>Low</u>
Year Ended December 31, 2016:		
First Quarter	\$12.37	\$6.50
Second Quarter	11.35	5.79
Third Quarter	10.82	7.06
Fourth Quarter	11.35	7.18
Year Ended December 31, 2017:		
First Quarter	\$ 9.67	\$5.52
Second Quarter	5.83	3.81
Third Quarter	5.08	2.94
Fourth Quarter	3.59	2.07

As of March 1, 2018, we had 25 holders of record of our common stock. The actual number of stockholders is greater than this number of record holders and includes stockholders who are beneficial owners but whose shares are held in street name by brokers and other nominees. This number of holders of record also does not include stockholders whose shares may be held in trust by other entities.

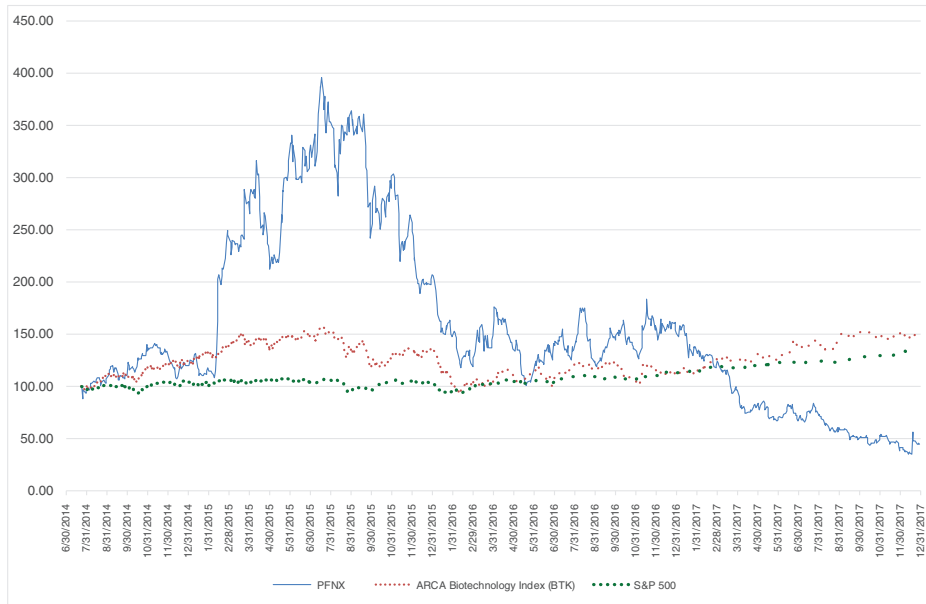
Dividends

With the exception of common stock issued in connection with the payment of all accrued but unpaid dividends upon the conversion of all preferred stock upon the completion of our initial public offering, we have not made any distributions on our common stock and do not intend to make any distributions on our common stock for the foreseeable future. Instead, we anticipate that all of our earnings in the foreseeable future will be used for the operation and growth of our business.

Stock Performance Graph

This performance graph shall not be deemed “filed” for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or the Exchange Act, or incorporated by reference into any filing of Pfenex Inc. under the Securities Act of 1933, as amended, or the Exchange Act.

The graph below shows the cumulative total stockholder return assuming the investment of \$100 as of the close on July 24, 2014, the first day of trading for Pfenex Inc.'s common stock, (and the reinvestment of dividends thereafter) in each of (i) Pfenex Inc.'s common stock, (ii) the ARCA Biotechnology Index and, (iii) the S&P 500 Index. The comparisons in the graph below are based upon historical data and are not indicative of, or intended to forecast, future performance of our common stock or the index. The prices are as of the close of PFNX's first trading day to the close at December 31, 2017.



Securities Authorized for Issuance Under Equity Compensation Plans

The information required by this Item regarding equity compensation plans is incorporated by reference to the information set forth in PART III Item 12 of this Annual Report on Form 10-K.

Recent Sales of Unregistered Securities and Issuer Purchases of Equity Securities

(a) Sales of Unregistered Securities

None.

(b) Issuer Purchases of Equity Securities

None.

Item 6. Selected Financial Data

The following selected historical financial data below should be read in conjunction with Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations," our financial statements, and the related notes appearing in Item 8, "Financial Statements and Supplementary Data", of this Annual Report on Form 10-K to fully understand factors that may affect the comparability of the information presented below.

The consolidated statements of operations data for the years ended December 31, 2017, 2016 and 2015 and the consolidated balance sheet data as of December 31, 2017 and 2016 are derived from our audited financial statements appearing in Item 8, “*Financial Statements and Supplementary Data*,” of this Annual Report on Form 10-K. The consolidated statements of operations data for the years ended December 31, 2014 and 2013 and the consolidated balance sheet data as of December 31, 2015, 2014 and 2013 are derived from audited financial statements not included in this Annual Report on Form 10-K. Our historical results are not necessarily indicative of the results to be expected in the future.

	Years Ended December 31,				
	2017	2016	2015	2014	2013
	<i>(in thousands, except for per share data)</i>				
Revenues	\$ 28,780	\$ 60,194	\$ 9,583	\$ 10,644	\$ 11,914
Expense:					
Cost of revenues ⁽¹⁾	5,156	5,313	4,640	7,233	6,423
Selling, general and administrative	17,674	17,340	14,598	9,003	6,698
Research and development ⁽¹⁾	31,925	32,418	18,183	4,125	5,490
Total expense	<u>54,755</u>	<u>55,071</u>	<u>37,421</u>	<u>20,361</u>	<u>18,611</u>
(Loss) income from operations	(25,975)	5,123	(27,838)	(9,717)	(6,697)
Other income (expense), net	119	149	74	(77)	(36)
(Loss) income before income taxes	(25,856)	5,272	(27,764)	(9,794)	(6,733)
Income tax benefit (expense)	172	209	(452)	—	2,671
Net (loss) income	<u>\$ (25,684)</u>	<u>\$ 5,481</u>	<u>\$ (28,216)</u>	<u>\$ (9,794)</u>	<u>\$ (4,062)</u>
Effective preferred stock dividends ⁽²⁾	\$ —	\$ —	\$ —	\$ —	\$ (1,695)
Net (loss) income attributable to common stockholders ...	<u>\$ (25,684)</u>	<u>\$ 5,481</u>	<u>\$ (28,216)</u>	<u>\$ (9,794)</u>	<u>\$ (5,757)</u>
Basic and diluted net (loss) income per share attributable to common stockholders ⁽³⁾	<u>\$ (1.09)</u>	<u>\$ (0.23)</u>	<u>\$ (1.26)</u>	<u>\$ (1.04)</u>	<u>\$ (3.76)</u>
Basic weighted-average shares used to compute net (loss) income per share attributable to common stockholders	23,503	23,389	22,376	9,441	1,531
Diluted weighted-average shares used to compute net (loss) income per share attributable to common stockholders	23,503	23,688	22,376	9,441	1,531

- (1) Please refer to Note 1 of our consolidated financial statements for an explanation of the method used to recognize cost of revenues and research and development expense.
- (2) The holders of our convertible preferred stock were entitled to cumulative dividends prior and in preference to our common stock. Because the holders of our convertible preferred stock were entitled to participate in dividends, net loss attributable to common stockholders was equal to net loss adjusted for convertible preferred stock dividends for the period. Immediately upon the closing of our IPO, all outstanding shares of our redeemable convertible preferred stock, or our convertible preferred stock, were automatically converted into an aggregate of 8,634,857 shares of common stock and these holders were issued 1,217,784 shares of common stock for the payment of all accrued and unpaid dividends through July 28, 2014 in connection with such conversion based on the initial public offering price of \$6.00 per share and the offering closing on July 29, 2014. See Note 11 to our financial statements for a description of the method used to compute basic and diluted net loss per share attributable to common stockholders and for a description of convertible preferred stock, respectively.
- (3) All share, per-share and related information have been retroactively adjusted, where applicable, to reflect the impact of a 2.812-for-1 reverse stock split, which was effected on June 27, 2014.

Other Financial Data

	As of December 31,				
	2017	2016	2015	2014	2013
	(in thousands)				
Balance Sheet Data:					
Cash and cash equivalents and short-term investments	\$57,664	\$ 81,501	\$106,162	\$45,722	\$ 5,204
Accounts and unbilled receivables, net	1,306	2,822	2,683	1,584	3,461
Inventory	—	—	24	23	26
Restricted cash	200	—	3,959	3,955	4,029
Property and equipment, net	7,397	5,246	3,179	2,310	2,329
Goodwill and intangibles	10,348	10,878	11,409	11,940	12,470
Other	2,476	2,675	4,278	5,489	4,294
Total assets	\$79,391	\$103,122	\$131,694	\$71,023	\$ 31,813
Current liabilities, excluding debt	\$11,046	\$ 10,696	\$ 6,883	\$ 3,762	\$ 4,757
Deferred revenue	10,163	12,255	48,095	201	1,253
Debt	—	—	3,813	3,813	3,590
Other	419	26	1,722	3,373	3,484
Total liabilities	21,628	22,977	60,513	11,149	13,084
Redeemable convertible preferred stock	—	—	—	—	113,180
Stockholders' equity (deficit)	57,763	80,145	71,181	59,874	(94,451)
Total liabilities, redeemable convertible preferred stock and stockholders' equity	\$79,391	\$103,122	\$131,694	\$71,023	\$ 31,813

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our financial statements and related notes appearing elsewhere in this Annual Report on Form 10-K. In addition to historical financial information, the following discussion contains forward-looking statements that reflect our plans, estimates and beliefs. Statements containing words such as "may," "believe," "anticipate," "expect," "intend," "plan," "project," "projections," "business outlook," "estimate," or similar expressions constitute forward-looking statements. Our actual results could differ materially from those contained in or implied by any forward-looking statements. Factors that could cause or contribute to these differences include those discussed below, in the section captioned "Risk Factors," and elsewhere in this Annual Report on Form 10-K.

Overview

We are a clinical-stage development and licensing biotechnology company focused on leveraging our Pfenex Expression Technology to improve protein therapies for unmet patient needs. Using the patented Pfenex Expression Technology® platform, we have created an advanced pipeline of therapeutic equivalents, vaccines, biologics and biosimilars. Our lead product candidates are PF708, a therapeutic equivalent candidate to Forteo® (teriparatide) for the treatment of osteoporosis, and our novel anthrax vaccine candidates, Px563L and RPA563, funded through an advanced development contract with the U.S. government. In addition, we are developing hematology/oncology products in collaboration with Jazz Pharmaceuticals Ireland Limited (Jazz). Furthermore, our pipeline includes biosimilar candidates to Lucentis® and Neulasta®.

Our lead product candidates and collaboration include the following:

- **PF708 – our teriparatide (Forteo) therapeutic equivalent candidate.** PF708 is our therapeutic equivalent candidate to Forteo, which is marketed by Eli Lilly and Company for the treatment of

osteoporosis. Forteo achieved \$1.7 billion in global product sales in 2017. In November 2017, we announced the interim pharmacokinetic (PK) results from ongoing Study PF708-301, which compares the effects of PF708 and Forteo in osteoporosis patients. PF708 is being developed pursuant to the 505(b)(2) regulatory pathway in the U.S. and references Forteo®, which is marketed for the treatment of osteoporosis patients at a high risk of fracture, as the Reference Listed Drug. Study PF708-301 completed enrollment in the third quarter of 2017 with a total of 181 patients – 90 randomized to PF708 and 91 to Forteo. We completed the last patient visit in mid-February 2018. The primary study endpoint is anti-drug antibody formation after 24 weeks of drug treatment. The secondary study endpoints are changes in bone mineral density and bone turnover markers after 24 weeks of drug treatment, as well as PK parameters for up to 4 hours after the first dose. The PF708 and Forteo PK profiles are comparable, and there are no statistically significant differences in key PK parameters. We expect top-line immunogenicity data readout in the second quarter of 2018. We believe that results from Study PF708-301, if positive, along with the previously-announced bioequivalence findings from Study PF708-101 in healthy subjects, should satisfy the clinical filing requirements for PF708 in the United States and we expect to submit an NDA to the FDA in the third quarter of 2018, with a potential commercial launch possible in the US as early as the third quarter of 2019 upon expiration of the relevant patents and subject to receipt of US FDA marketing authorization. We believe we have sufficient cash resources to fund all necessary activities leading up to and including the submission of the NDA to the FDA expected in the third quarter of 2018. We believe that the clinical program in the U.S. may be leveraged for regulatory filings in other geographies, such as the European Union (EU).

- **Px563L and RPA563 – our two novel anthrax vaccine candidates funded by the Biomedical Advanced Research and Development Authority (BARDA).** Both vaccine candidates are prepared using the identical antigen. However, while Px563L contains an adjuvant and RPA563 does not contain an adjuvant, both candidates are being evaluated in parallel. In August 2016, we announced positive immunogenicity and safety data from Day 70 analysis of the Px563L/RPA563 anthrax vaccine study. The Px563L results indicated that the vaccine was well-tolerated and afforded immunogenicity protection with fewer doses than the currently licensed product. On Day 70, 100% of Px563L subjects at the 10 mcg and 80 mcg dose levels achieved a TNA NF₅₀ ≥ 0.56, and 87.5% at the 50 mcg dose level achieved the target threshold. An additional success criterion for assessing anthrax vaccine immunogenicity is for the lower confidence limit (LCL), or the lower bound of 95% confidence interval, of the percentage of subjects who met or exceeded the TNA NF₅₀ threshold of 0.56, to be greater than or equal to 40%. On Day 70, all doses of Px563L exceeded this threshold, which was established by the currently licensed anthrax vaccine for the indication of post-exposure prophylaxis. We announced positive interim results from a Phase 1a study in healthy subjects in the second half of 2016 and the study was completed in the first half of 2017. In January 2017, BARDA granted additional options under its existing contract, allowing for the continued development of Px563L and RPA563. To date, we have generated stability data on the 2016 manufactured lot for up to 9 months, demonstrating the maintenance of high purity at 5°C, the expected storage temperature, and accelerated stability data at 25°C. We have also generated long-term stability data from our toxicology lot, showing the maintenance of high purity at 5°C at 40 months. Over the course of 2017, we continued to collect favorable stability data for both products. In October 2017, we completed a meeting with the FDA in which the Agency provided guidance for the proposed clinical development and licensure plans for post-exposure prophylaxis indication. Potential next milestones in 2018 are the triggering of analytical and non-clinical animal study options, leading to potential Phase 2 study in 2019, subject in each case to continued funding by BARDA.
- **Jazz Collaboration – multiple early stage hematology/oncology product candidates with Jazz.** In July 2016, we entered into a license and option agreement with Jazz (Jazz Agreement), pursuant to which we and Jazz are collaboratively developing hematology/oncology products, including PF743, a recombinant crisantaspase, and PF745, a recombinant crisantaspase with half-life extension technology, and Jazz will have the exclusive right to manufacture and commercialize such products throughout the world. In addition, pursuant to the agreement, we have granted Jazz certain other rights

to negotiate the exclusive right to develop, manufacture and commercialize throughout the world other hematology/oncology products that are currently or in the future may be developed by us. In the third quarter of 2017, we completed a process and development milestone associated with this collaboration. In December 2017, we and Jazz signed an amended and restated agreement under which we will be eligible to receive an additional \$43.5 million in amendment fee and development milestone payments as compared to the 2016 agreement, increasing the total value of upfront, option and amendment fee payments and potential payments for the achievement of development, regulatory and sales-related milestones associated with the collaboration to an aggregate of \$224.5 million. We will also continue to be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement. In December 2017, as part of the amended and restated agreement, we received a total payment of \$18.5 million, consisting of an upfront payment of \$5.0 million and a payment of \$13.5 million for development achievement.

- **Additional Biosimilar Pipeline Products** – Our pipeline includes biosimilar candidates to certain reference products, including biosimilar candidates to Lucentis[®] and Neulasta[®]. Following our strategic review in November 2017, we decided to pause development activities on PF582, our biosimilar candidate to Lucentis[®] and PF529, our biosimilar to Neulasta[®], and focus development efforts elsewhere within the product portfolio while we continue to engage potential strategic partners to advance the program and maximize value. Following the consummation of the Jazz collaboration in July 2016, we decided to advance the hematology/oncology assets that are part of the Jazz collaboration and pause development activities on PF530, our biosimilar candidate to Betaseron.

To date, none of our product candidates have completed clinical development, been submitted for regulatory review or received marketing authorization from any regulatory agency. Therefore, we have not received revenue from the sale of any of our product candidates. Our product candidates are enabled by our patented protein production platform, P/ēnex Expression Technology[®], which we believe confers several important competitive advantages compared to traditional techniques for protein production, including the ability to produce complex proteins with higher accuracy and greater degree of protein purity, as well as speed and cost advantages. The development of proteins, such as biosimilars, requires several competencies which represent both challenges and barriers to entry. Due to their inherent complexity, proteins require the use of living organisms to efficiently produce them at a large scale. Traditional techniques for protein production employ a trial and error approach to production organism, or strain, selection and process optimization, which is inherently inefficient and typically produces suboptimal results. This historically inefficient process provides barriers to create or replicate complex proteins, adds significant time to market and results in the high cost of goods typical of biologic therapeutics. Together, these limitations pose significant hurdles for companies interested in entering the market with biosimilar and therapeutic equivalents to branded products. Our platform utilizes a proprietary high throughput robotically-enabled parallel approach, which allows the construction and testing of thousands of unique protein production variables in parallel, thereby allowing us to produce and characterize complex proteins while reducing the time and cost of development and long-term production.

The market opportunities for our most advanced product candidate, PF708, are substantial. PF708 is our therapeutic equivalent candidate to Forteo, which achieved product sales of approximately \$1.7 billion in 2017. More than half of these product sales came from the U.S. alone, followed by Japan. In 2019, Forteo is expected to lose patent protection with respect to claims of patents listed in the Orange Book related to compounds, methods of treatment, and formulations in the U.S.

Px563L/RPA563 are our novel anthrax vaccine candidates. We believe the successful completion of the Phase 2 study and activities under our development contract with BARDA could lead to a procurement contract for supply of Px563L or RPA563 to the Strategic National Stockpile, if such product candidates receive regulatory approval.

Our revenue for the years ended December 31, 2017, 2016, and 2015 was \$28.8 million, \$60.2 million, and \$9.6 million, respectively. Our historical revenue has been primarily derived from monetizing our P/ēnex

Expression Technology® through collaboration agreements, service agreements, government contracts and reagent protein product sales, which provide for various types of payments, including upfront payments, funding of research and development, milestone payments, intellectual property access fees and licensing fees. Currently, various government agencies are funding costs associated with our proprietary novel vaccine programs.

As of December 31, 2017, we had an accumulated deficit of \$161.7 million, of which \$89.8 million was attributable to recognizing the accretion in the redemption value of our convertible preferred stock. We recognized a net loss of \$25.7 million for the year ended December 31, 2017, net income of \$5.5 million for the year ended December 31, 2016 and a net loss of \$28.2 million for the year ended December 31, 2015. As we continue to develop and invest more resources into the development and commercialization of our product candidates, our net operating losses will increase over the next several years. As a result, our research and development expenses will increase materially as we incur further costs of development. We currently utilize third-party clinical research organizations (CROs) to carry out our clinical development and we do not yet have an extensive sales organization. We will need substantial additional funding to support our operating activities, especially as we approach anticipated regulatory approval in the United States, Europe and other territories, and begin to establish our commercialization capabilities. Adequate funding may not be available to us on commercially reasonable terms, or at all. Since our inception, we have funded our operations primarily through the sale and issuance of common stock in our public offerings, revenue from our collaboration agreements, government contracts, service agreements, and reagent protein product sales, our prior credit facility and the private placement of equity securities. We have devoted substantially all of our capital resources to the research and development of our product candidates and working capital requirements.

Critical Accounting Policies, Significant Judgments and Use of Estimates

Our management's discussion and analysis of financial condition and results of operations is based on our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States (GAAP). The preparation of these financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements, as well as the reported revenue and expenses during the reporting periods. These items are monitored and analyzed by us for changes in facts and circumstances, and material changes in these estimates could occur in the future. We base our estimates on historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Changes in estimates are reflected in reported results for the period in which they become known. Actual results may differ materially from these estimates under different assumptions or conditions. Historical results are not necessarily indicative of future results.

We believe the following critical accounting policies involve significant judgements and estimates used in the preparation of our consolidated financial statements (see also Note 1 to our consolidated financial statements included in Item 8 of this Annual Report on Form 10-K).

Revenues

In accordance with GAAP, we recognize revenue when all of the following criteria are met: (1) persuasive evidence of an arrangement exists; (2) delivery has occurred or services have been rendered; (3) the seller's price to the buyer is fixed or determinable; and (4) collectability is reasonably assured.

We consider a variety of factors in determining the appropriate method of accounting for our licensing and collaboration agreements, including whether multiple deliverables can be separated and accounted for individually as separate units of accounting. Where there are multiple deliverables within a collaboration agreement that cannot be separated and therefore are combined into a single unit of accounting, revenues are deferred and recognized over the estimated period of performance. If the deliverables can be separated, we apply

the relevant revenue recognition guidance to each individual deliverable. The specific methodology for the recognition of the underlying revenue is determined on a case-by-case basis according to the facts and circumstances applicable to each agreement.

Upfront, nonrefundable licensing payments are assessed to determine whether or not the licensee is able to obtain standalone value from the license apart from the other deliverables in the arrangement. Where the license does not have standalone value, non-refundable license fees are recorded as deferred revenue and recognized as revenue as we perform under the applicable agreement. Where the level of effort is relatively consistent over the performance period, we recognize fixed or determinable revenue on a straight-line basis over the estimated period of performance. Where the license has standalone value, we recognize total license revenue at the time all revenue recognition criteria have been met.

Nonrefundable payments for research funding are recognized as revenue over the period the underlying research activities are performed.

Upfront, nonrefundable payments for license fees, exclusivity and services received in excess of amounts earned are classified as deferred revenue and recognized as income over the contract term or period of performance based on the nature of the related agreement.

Revenue for our cost plus fixed fee government contracts is recognized in accordance with the authoritative guidance for revenue recognition including the authoritative guidance specific to federal government contractors. Reimbursable costs under our government contracts primarily include direct labor, materials, subcontracts, accountable property and indirect costs. In addition, we receive a fixed fee under our government contracts, which is unconditionally earned as allowable costs are incurred and is not contingent on success factors. Reimbursable costs under our government contracts, including the fixed fee, are recognized as revenue in the period the reimbursable costs are incurred and become billable.

We assess milestone fees on an individual basis and recognize revenue from nonrefundable milestone fees when the earnings process is complete and the payment is reasonably assured. Nonrefundable milestone fees related to arrangements under which we have continuing performance obligations are recognized as revenue upon achievement of the associated milestone, provided that (i) the milestone event is substantive and its achievability was not reasonably assured at the inception of the agreement, and (ii) the amount of the milestone payment is reasonable in relation to the effort expended or the risk associated with the milestone event.

Preclinical and Clinical Trial Accruals

Our clinical trial accruals are based on estimates of patient enrollment and related costs at clinical investigator sites as well as estimates for the services received and efforts expended pursuant to contracts with multiple research institutions and CROs that conduct and manage clinical trials on our behalf.

We estimate preclinical and clinical trial expenses based on the services performed, pursuant to contracts with research institutions and clinical research organizations that conduct and manage preclinical studies and clinical trials on our behalf. In accruing service fees, we estimate the time period over which services will be performed and the level of patient enrollment and activity expended in each period. If the actual timing of the performance of services or the level of effort varies from the estimate, we will adjust the accrual accordingly. Payments made to third parties under these arrangements in advance of the receipt of the related series are recorded as prepaid expenses until the services are rendered.

Other Information

Income Tax Matters

On December 22, 2017, the U.S. government enacted comprehensive tax legislation referred to as the Tax Cuts and Jobs Act (the "Tax Act"). Shortly after the Tax Act was enacted, the SEC staff issued Staff Accounting

Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (SAB 118), which provides guidance on accounting for the Tax Act's impact. SAB 118 provides a measurement period, which should not extend beyond one year from the Tax Act enactment date, during which a company acting in good faith may complete the accounting for the impacts of the Tax Act under ASC Topic 740. In accordance with SAB 118, we must reflect the income tax effects of the Tax Act in the reporting period in which the accounting under ASC Topic 740 is complete.

To the extent that our accounting for certain income tax effects of the Tax Act is incomplete, we can determine a reasonable estimate for those effects and record a provisional estimate in the consolidated financial statements in the first reporting period in which a reasonable estimate can be determined. If we cannot determine a provisional estimate to be included in the consolidated financial statements, we should continue to apply ASC 740 based on the provisions of the tax laws that were in effect immediately prior to the Tax Act being enacted. If we are unable to provide a reasonable estimate of the impacts of the Tax Act in a reporting period, a provisional amount must be recorded in the first reporting period in which a reasonable estimate can be determined. For further information, see Note 10 to our consolidated financial statements included in Item 8 of this Annual Report on Form 10-K.

We file U.S. federal income and California state tax returns. We are currently under audit by the Internal Revenue Service for tax years ending December 31, 2015 and 2016. To date, we have not been audited by any state tax authority; however, tax years from and including 2009 remain open for examination by state income tax authorities. We utilize the asset and liability method of accounting for income taxes. Under this method, deferred tax assets and liabilities are determined based on the difference between the financial statement carrying amounts and tax basis of assets and liabilities using enacted tax rates in effect for years in which the temporary differences are expected to reverse. A deferred income tax asset or liability is computed for the expected future impact of differences between the financial reporting and income tax bases of assets and liabilities and for the expected future tax benefit, if any, to be derived from tax credits and loss carryforwards. Deferred income tax expense or benefit would represent the net change during the year in the deferred income tax asset or liability. Deferred tax assets, if any, are reduced by a valuation allowance when, in the opinion of management, it is more likely than not that some portion or all of the deferred tax assets will not be realized.

During the years ended December 31, 2017 and 2016, we recorded an income tax benefit of \$0.2 million each year, which is principally attributable to U.S. federal alternative minimum refundable tax credits and state income taxes. Our practice is to recognize interest and/or penalties related to income tax matters in income tax expense. We had no accrual for interest or penalties on our consolidated balance sheets at December 31, 2017 and 2016.

As of December 31, 2017, we had federal and state research and development credits carryforwards of approximately \$4.1 million and \$2.7 million, respectively, to offset potential tax liabilities. The federal research and development credits have a 20-year carryforward period and begin to expire in 2030 unless utilized. California research and development tax credits have no expiration. We have \$43.6 million federal net operating loss carryforwards and \$25.9 million of state net operating loss carryforwards as of December 31, 2017. The federal and state net operating losses can be carried forward until 2037 unless utilized.

We completed an IRC Section 382/383 analysis through December 31, 2014. We have not updated such Section 382 study through December 31, 2017. Future and current utilization of federal and state tax attribute carry-forwards may be limited, if, upon completion of our Section 382 study through December 31, 2017, we determine ownership changes within the meaning of Section 382 have occurred.

Results of Operations

Comparison of the years ended December 31, 2017, 2016 and 2015

The following table summarizes our net income (loss) during the periods indicated.

	Years Ended December 31,			% change from 2016 to 2017	% change from 2015 to 2016
	2017	2016	2015		
	<i>(in thousands)</i>				
Revenues	\$ 28,780	\$ 60,194	\$ 9,583	(52)%	528%
Cost of revenues	5,156	5,313	4,640	(3)%	15%
Gross profit	23,624	54,881	4,943	(57)%	1010%
Operating expenses					
Selling, general and administrative	17,674	17,340	14,598	2 %	19%
Research and development	31,925	32,418	18,183	(2)%	78%
Total operating expense	49,599	49,758	32,781	0 %	52%
(Loss) income from operations	(25,975)	5,123	(27,838)	(607)%	118%
Other income (expense)	119	149	74	(20)%	101%
Net (loss) income before income taxes	(25,856)	5,272	(27,764)	(590)%	119%
Income tax (expense) benefit	172	209	(452)	(18)%	146%
Net (loss) income	<u>\$ (25,684)</u>	<u>\$ 5,481</u>	<u>\$ (28,216)</u>	<u>(569)%</u>	<u>119%</u>

Revenues

Revenue decreased by \$31.4 million, or 52%, from \$60.2 million in 2016 to \$28.8 million in 2017. The decrease in revenue was primarily due to the termination of our development and license agreement with Pfizer. In the third quarter of 2016, acceleration of the estimated performance period under the Pfizer contract resulted in the recognition of \$45.8 million of revenue that had been previously deferred. In addition, in 2016 we recognized revenue of \$4.9 million attributable to amortization of a development and license fee. The decrease in revenue was partially offset by \$21.5 million of revenue recognized in 2017 from Jazz for development achievement and achievement of certain development milestones, development services and amortization of license fees.

Revenue increased by \$50.6 million, or 528%, from \$9.6 million in 2015 to \$60.2 million in 2016. The increase in revenue was primarily due to the termination of our development and license agreement with Pfizer. As a result of the termination in 2016, the estimated performance period was accelerated resulting in the recognition of \$45.8 million of revenue that had been previously deferred. As a result of the termination, we will not recognize any additional future revenue under the Pfizer development and license agreement. In addition, we recognized revenue of \$4.9 million attributable to amortization of a development and license fee. We had a net increase in revenue of \$0.9 million attributable to our Px563L product candidate under our government contracts, as the project moved into clinical trials in 2016, as well as a \$0.6 million reduction in protein services revenue.

Given the nature of the development process, revenue will fluctuate depending on stage of development.

Cost of Revenues

Cost of revenue decreased by \$0.1 million, or 3%, to \$5.2 million in 2017 compared to \$5.3 million in 2016. The change was due primarily to a net decrease in costs for our proprietary novel vaccine program Px563L, which is funded by a government agency.

Cost of revenue increased by \$0.7 million, or 15%, to \$5.3 million in 2016 compared to \$4.6 million in 2015. The change was due primarily to a net increase of \$0.7 million in costs for our proprietary novel vaccine program Px563L, which is funded by a government agency. Given the nature of the novel vaccine development process, these costs will fluctuate depending on stage of development.

Selling, General and Administrative

Selling, general and administrative expenses increased by \$0.3 million, or 2% to \$17.7 million in 2017 compared to \$17.3 million in 2016. The increase in selling, general and administrative was primarily due to costs incurred in connection with the separation of former officers.

Selling, general and administrative expenses increased by \$2.7 million, or 19% to \$17.3 million in 2016 compared to \$14.6 million in 2015. The increase in selling, general and administrative was primarily due to higher personnel-related expenses.

To the extent that we retain commercial rights to product candidates, we intend to use an internal sales force to commercialize products for which we may receive marketing approvals. This would result in increased selling, general and administrative expenses.

Research and Development

Research and development expenses decreased by approximately \$0.5 million, or 2%, to \$31.9 million in 2017 compared to \$32.4 million in 2016. The decrease in research and development expenses was primarily due to our decision to pause our development activities on certain product candidates. The decrease was partially offset by increased costs related to clinical trials for PF708, which began in the first quarter of 2017, and research and development expenses of PF743 and PF745, related to our collaboration with Jazz, as well as other biosimilar product candidates.

Research and development expenses increased by approximately \$14.2 million, or 78%, to \$32.4 million in 2016 compared to \$18.2 million in 2015. The increase in research and development expenses was due to manufacturing and development activities of PF708 and expenses related to our other biosimilar product candidates. The bioequivalence study for PF708 was completed in 2016 and additional expenses were incurred to support upcoming clinical trials and US regulatory submissions.

Our clinical trial accruals are based on estimates of patient enrollment and related costs at clinical investigator sites as well as estimates for the services received and efforts expended pursuant to contracts with multiple research institutions and clinical research organizations that conduct and manage clinical trials on our behalf.

We estimate preclinical and clinical trial expenses based on the services performed, pursuant to contracts with research institutions and clinical research organizations that conduct and manage preclinical studies and clinical trials on its behalf. In accruing service fees, we estimate the time period over which services will be performed and the level of patient enrollment and activity expended in each period. If the actual timing of the performance of services or the level of effort varies from the estimate, we adjust the accrual accordingly. Payments made to third parties under these arrangements in advance of the receipt of the related series are recorded as prepaid expenses until the services are rendered.

We expect research and development expenses to increase as we advance our lead candidates and pipeline product candidates. The funding necessary to bring a drug candidate to market is subject to numerous uncertainties. Once a drug candidate is identified, the further development of that drug candidate can be halted or abandoned at any time due to a number of factors. These factors include, but are not limited to, funding constraints, safety or a change in market demand. For each of our drug candidate programs, we periodically assess the scientific progress and merits of the programs to determine if continued research and development is economically viable. Certain of our programs may be terminated due to the lack of scientific progress and lack of prospects for ultimate commercialization.

Liquidity and Capital Resources

To date, we have funded our operations primarily through the sale and issuance of common stock in our public offerings, revenue from our collaboration agreements, government contracts, service agreements, and reagent protein product sales, our prior credit facility and the private placement of equity securities. At December 31, 2017, we had \$57.7 million in cash and cash equivalents and \$0.2 million in restricted cash as bank collateral for our commercial card program compared to \$81.5 million in cash and cash equivalents as of December 31, 2016. We believe we have sufficient cash resources to fund all necessary activities leading up to and including the submission of a new drug application (NDA) for PF708 to the FDA.

In July 2016, we entered into a development and license agreement with Jazz Pharmaceuticals for the development and commercialization of multiple early stage hematology/oncology product candidates, including PF743, a recombinant crisantaspase, and PF745, a recombinant crisantaspase with half-life extension technology, and in the third quarter of 2017, achieved a process development milestone. The agreement also includes an option for Jazz to negotiate a license for a recombinant pegaspargase product candidate with us. Under the terms of the agreement, we received an upfront and option payment totaling \$15.0 million in July 2016, and may be eligible to receive additional payments based on the achievement of certain research and development, regulatory, and sales-related milestones.

In December 2017, we and Jazz entered into an amended and restated agreement, bringing the total value of payments and potential payments associated with the collaboration to \$224.5 million. In addition, we may be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement.

We believe that our existing cash and cash equivalents and our cash inflow from operations will be sufficient to meet our anticipated cash needs for at least the next 12 months. We also believe we have sufficient cash resources to fund all necessary activities leading up to and including the submission of a new drug application (NDA) for PF708 to the FDA. We have based this estimate on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we currently expect. Further, our operating plan may change, and we may need additional funds to meet operational needs and capital requirements for product development and commercialization sooner than planned. We currently have no credit facility or committed sources of capital although we may receive milestone and other contingent payments under our current license and collaboration agreements. Because of the numerous risks and uncertainties associated with the development and commercialization of our product candidates and the extent to which we may enter into additional agreements with third parties to participate in their development and commercialization, we are unable to estimate the amounts of increased capital outlays and operating expenditures associated with our current and anticipated clinical trials. Our future capital requirements will depend on many factors, including:

- the timing and extent of spending on our research and development efforts, including with respect to PF708 and our other product candidates;
- our ability to enter into and maintain collaboration, licensing, commercialization and other arrangements and the terms and timing of such arrangements;
- the timing of the NDA submission and marketing approval for PF708, if any;
- the cost of manufacturing and commercialization activities for PF708 and our other product candidates, if any;
- the cost of preparing, filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights;
- the receipt of any collaboration or milestone payments;
- the scope, rate of progress, results and cost of our clinical trials, preclinical testing and other related activities;

- the emergence of competing technologies or other adverse market developments;
- the time and costs involved in seeking and obtaining regulatory and marketing approvals in multiple jurisdictions for our product candidates that successfully complete clinical trials;
- the introduction of new product candidates and the number and characteristics of product candidates that we pursue;
- the timing, receipt and amount of sales, profit sharing or royalties, if any, from our potential products;
- the degree and rate of market acceptance of any products launched by us or our collaboration partner;
- the expansion of our sales and marketing activities; and
- the potential acquisition and in-licensing of other technologies, products or assets.

We will need to raise additional capital to fund our operations in the near future. Funding may not be available to us on acceptable terms, or at all. If we are unable to obtain adequate financing when needed, we may have to delay, reduce the scope of or suspend one or more of our clinical trials, research and development programs or commercialization efforts. We may seek to raise any necessary additional capital through a combination of public or private equity offerings, debt financings, collaborations, strategic alliances, licensing arrangements and other marketing and distribution arrangements. To the extent that we raise additional capital through marketing and distribution arrangements or other collaborations, strategic alliances or licensing arrangements with third parties, we may have to relinquish valuable rights to our product candidates, future revenue streams, research programs or product candidates or to grant licenses on terms that may not be favorable to us. If we do raise additional capital through public or private equity offerings, the ownership interest of our existing stockholders will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect our stockholders' rights. If we raise additional capital through debt financing, we may be subject to covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends.

Cash Flows

The following table sets forth the primary sources and uses of cash and cash equivalents for each of the periods presented below.

	Years Ended December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
Net cash (used in) provided by:			
Operating activities	\$(21,510)	\$(22,274)	\$24,230
Investing activities	(2,197)	(2,860)	(1,470)
Financing activities	(130)	473	37,680
Net (decrease) increase in cash and cash equivalents . . .	<u>\$(23,837)</u>	<u>\$(24,661)</u>	<u>\$60,440</u>

Net cash used in operating activities

Net cash used in operating activities was \$21.5 million for the year ended December 31, 2017. Net cash used was primarily attributable to our research and development activities associated with PF708 and our other product candidates, partially offset by \$18.5 million of payments received pursuant to our agreement with Jazz.

Net cash used in operating activities was \$22.3 million for the year ended December 31, 2016, which was primarily attributable to our research and development activities associated with PF708 and our other product candidates. This was partially offset by \$15.0 million of upfront and option payments received pursuant to our license and option agreement with Jazz. In addition, our general and administrative costs increased due to higher headcount and marketing and legal expenses.

Net cash provided by operating activities was \$24.2 million for the year ended December 31, 2015. Cash was provided mainly by the \$51.0 million received from Pfizer in March 2015. This was offset by net losses associated with our research and development activities and increased general and administrative costs as a result of activities associated with operating as a publicly-traded company.

We anticipate using cash in operating activities for our research and development efforts for the foreseeable future.

Net cash used in investing activities

Net cash used in investing activities was \$2.2 million, \$2.9 million and \$1.5 million for the years ended December 31, 2017, 2016 and 2015, respectively, and was due primarily to the purchase of property and equipment.

Net cash (used in) provided by financing activities

Net cash used in financing activities was \$0.1 million for the year ended December 31, 2017, which was primarily due to payment of \$0.2 million of restricted cash provided as security for our commercial credit card arrangement and \$0.1 million used to repay capital lease obligations. This was offset by \$0.2 million in proceeds from the issuance of common stock in connection with our Employee Stock Purchase Plan and exercises of stock options.

Net cash provided by financing activities was \$0.5 million for the year ended December 31, 2016. This resulted primarily from the issuance of common stock in connection with our Employee Stock Purchase Plan and exercises of stock options and a refund of the residual restricted cash resulting from the \$3.8 million repayment of the Amended Credit Facility upon termination in February 2016.

Net cash provided by financing activities in 2015 was primarily related to the net proceeds of \$37.3 million from the issuance of our common stock in connection with our follow-on offering after deducting offering expenses.

Off-Balance Sheet Arrangements

In the normal course of business, we enter into contracts and agreements that contain a variety of representations and warranties and provide for general indemnifications. Our exposure under these agreements is unknown because it involves claims that may be made against us in the future, but have not yet been made. As of December 31, 2017, we have not paid any claims or been required to defend any action related to our indemnification obligations. However, we may record charges in the future as a result of these indemnification obligations.

Contractual Obligations and Commitments

The following summarizes our contractual obligations and commitments as of December 31, 2017:

<u>Contractual Obligations (in thousands)</u>	<u>Payments due by period</u>				
	<u>Total</u>	<u>Less than 1 year</u>	<u>1 - 3 years</u>	<u>3 - 5 years</u>	<u>More than 5 years</u>
Purchase obligations	\$ 9,988	\$ 9,988	\$ —	\$ —	\$—
Operating lease obligations (1)	5,807	984	2,683	2,140	—
Capital lease obligations (2)	720	260	460	—	—
	<u>\$16,515</u>	<u>\$11,232</u>	<u>\$3,143</u>	<u>\$2,140</u>	<u>\$—</u>

- (1) Operating lease obligations are primarily rent payments on our facility leases.
- (2) Capital lease obligations consist mainly of capital leases on lab equipment.

In June 2010, we entered into a lease agreement (Lease) with a landlord for an initial term of 10 years, for our corporate headquarters comprised of one building located in San Diego, California. Occupation of the premises under the Lease began in April 2011. Under the terms of the Lease, we pay annual base rent, subject to an annual fixed percentage increase, plus our share of common operating expenses. The annual base rent was subject to abatement of 50% for the first year of the lease. We recognize rent expense on a straight-line basis over the term of the Lease. Total rent payments over the life of the Lease was estimated to be \$3.6 million.

In September 2014, we amended the Lease to extend the term for an additional three years through June 30, 2024 and to lease additional facilities consisting of 7,315 square feet, resulting in a total increase in the estimated rent payments over the life of the Lease by approximately \$2.9 million. Base rent payments for the new space commenced in December 2014 and increased total estimated rent payments over the life of the Lease by approximately \$1.5 million. The extended term on the existing space increased total estimated rent payments by approximately \$1.4 million. In addition to the base rent, we are obligated to pay certain customary amounts for our share of operating expenses and tax obligations. In November 2015, we amended the Lease to add facilities consisting of 16,811 square feet. Base rent payments for a portion of the new space commenced in March 2016, which increased total estimated rent payments over the life of the lease by approximately \$2.3 million. In January 2017, a sublease agreement was executed with a tenant to lease a portion of leased space from us for eight months. The amounts received were offset against rent expense.

In March 2016, we entered into an operating lease for lab equipment with estimated total payments of \$0.7 million over the two-year term.

In June 2017, we signed master lease agreements for the purchase of specialized equipment totaling approximately \$0.8 million. The capital leases each have a term of 36 months and commenced during the quarter ending September 30, 2017.

We enter into contracts in the normal course of business with contract research organizations and subcontractors to further develop our products. The contracts are cancellable, with varying provisions regarding termination. If a contract with a specific vendor were to be terminated, we would only be obligated for products or services that we had received as of the effective date of the termination and any applicable cancellation fees.

Recently Issued Accounting Pronouncements

In May 2014, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) No. 2014-09 Revenue from Contracts with Customers (Topic 606), which supersedes the revenue recognition requirements in ASC 605, Revenue Recognition. This ASU is based on the principle that revenue is recognized to depict the transfer of goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. The ASU also requires additional disclosure about the nature, amount, timing and uncertainty of revenue and cash flows arising from customer contracts, including significant judgments and changes in judgments and assets recognized from costs incurred to obtain or fulfill a contract. Numerous updates were issued in 2016 that provide clarification on a number of specific issues as well as requiring additional disclosures. The effective date will be the first quarter of fiscal year 2019 using one of two retrospective application methods: the full retrospective method or the modified retrospective method. We plan to adopt the standard in the first quarter of fiscal year 2019 using the modified retrospective method. We do not expect the new standard to have a material impact on the recognition of revenue from our reagent protein product sales. However, we continue to evaluate the impact that this guidance will have on our consolidated financial statements as it relates to our government, collaboration, and license agreements.

In February 2016, the FASB issued ASU No. 2016-02 Leases (Topic 842), which requires lessees to recognize “right of use” assets and liabilities for all leases with lease terms of more than 12 months. The ASU requires additional quantitative and qualitative financial statement footnote disclosures about the leases, significant judgments made in accounting for those leases and amounts recognized in the financial statements

about those leases. The effective date will be the first quarter of fiscal year 2020. We are currently evaluating the impact of the adoption of this accounting standard update on our financial statements.

In November 2016, the FASB issued ASU 2016-18, Statement of Cash Flows (Topic 230): Restricted Cash, which clarifies the presentation of restricted cash and restricted cash equivalents in the statements of cash flows. Under the ASU, restricted cash and restricted cash equivalents are included with cash and cash equivalents when reconciling the beginning-of-period and end-of-period total amounts presented on the statements of cash flows. The ASU is intended to reduce diversity in practice in the classification and presentation of changes in restricted cash on the Consolidated Statement of Cash Flows. The ASU requires that the Consolidated Statement of Cash Flows explain the change in total cash and equivalents and amounts generally described as restricted cash or restricted cash equivalents when reconciling the beginning-of-period and end-of-period total amounts. The ASU also requires a reconciliation between the total of cash and equivalents and restricted cash presented on the Consolidated Statement of Cash Flows and the cash and equivalents balance presented on the Consolidated Balance Sheet. The ASU is effective retrospectively on January 1, 2018, with early adoption permitted. We do not expect the adoption of the ASU to have a material effect on our results of operations, financial condition or cash flows.

In January 2017, the FASB issued ASU No. 2017-04, Intangibles – Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment. This updated guidance eliminates Step 2 from the current two-step quantitative model for goodwill impairment tests. Step 2 required an entity to calculate an implied fair value, which included a hypothetical purchase price allocation requirement, for reporting units that failed Step 1. Per this updated guidance, a goodwill impairment will instead be measured as the amount by which a reporting unit's carrying value exceeds its fair value as identified in Step 1. This guidance is effective for fiscal years beginning after December 15, 2019, including interim periods within that reporting period. Early adoption is permitted for interim or annual goodwill impairment tests performed on testing dates after January 1, 2017. The adoption of this guidance is not expected to have a material impact on our consolidated financial statements.

In May 2017, the FASB issued ASU 2017-09, Compensation – Stock Compensation (Topic 718), Scope of Modification Accounting. The new standard clarifies when to account for a change to the terms or conditions of a share-based payment award as a modification. ASU 2017-09 is effective in the first quarter of 2018, with early adoption permitted. The adoption of this guidance is not expected to have a material impact on our consolidated financial statements.

Segment Information

We operate in one segment. Management uses one measurement of profitability and does not segregate its business for internal reporting. During 2017, 2016 and 2015, substantially all of our long-lived assets were located within the United States.

Item 7A. *Quantitative and Qualitative Disclosures about Market Risk*

We are exposed to market risk in the ordinary course of our business. Market risk represents the risk of loss that may impact our financial position due to adverse changes in financial market prices and rates. Our market risk exposure is primarily a result of fluctuations in interest rates and foreign currency exchange rates. As of December 31, 2017, we did not hold or issue financial instruments for trading purposes.

Interest rate fluctuation risk

The primary objective of our investment activities is to preserve our capital to fund our operations. We also seek to maximize income from our cash and cash equivalents without assuming significant risk. To achieve our objectives, we invest our cash and cash equivalents in money market funds, treasury obligations, short term certificates of deposit and high-grade corporate securities, directly or through managed funds, with maturities of

six months or less. As of December 31, 2017, we had cash and cash equivalents of \$57.7 million consisting of cash of \$23.7 million and investments of \$34.0 million in highly liquid U.S. money market funds. A portion of our investments may be subject to interest rate risk and could fall in value if market interest rates increase. However, because our investments are primarily short-term in duration, we believe that our exposure to interest rate risk is not significant and a 100 basis point movement in market interest rates would not have a significant impact on the total value of our portfolio. We actively monitor changes in interest rates.

Foreign currency exchange risk

We contract with clinical research organizations, investigational sites and suppliers in foreign countries. We are therefore subject to fluctuations in foreign currency rates in connection with these agreements. We have not entered into any material foreign currency hedging contracts although we may do so in the future. To date we have not incurred any material effects from foreign currency changes on these contracts. The effect of a 10% adverse change in exchange rates on foreign currency denominated cash and payables as of December 31, 2017 would not have been material. However, fluctuations in currency exchange rates could harm our business in the future.

Inflation risk

Inflation may affect us by increasing our cost of labor and clinical trial costs. We do not believe that inflation has had a material effect on our business, financial condition or results of operations for any period presented herein.

Item 8. *Financial Statements and Supplementary Data*

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Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
Pfenex Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Pfenex Inc. and subsidiaries (the Company) as of December 31, 2017 and 2016, the related consolidated statements of operations, changes in stockholders' equity, and cash flows for each of the years in the two-year period ended December 31, 2017, and the related notes and financial statement schedule II (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2017 and 2016, and the results of its operations and its cash flows for each of the years in the two-year period ended December 31, 2017, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits, we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We have served as the Company's auditor since 2016.

San Diego, CA
March 15, 2018

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders
Pfenex Inc.:

We have audited the accompanying consolidated financial statements of Pfenex, Inc. (the “Company”) which include the consolidated statements of operations, changes in stockholders’ equity, and cash flows for the year ended December 31, 2015. In connection with our audit of the consolidated financial statements, we have also audited the financial statement schedule for the year ended December 31, 2015. These financial statements are the responsibility of the Company’s management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. The company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. Our audit included consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the company’s internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the consolidated results of its operations and its cash flows for the year ended December 31, 2015, in conformity with accounting principles generally accepted in the United States of America. Also, in our opinion, the related financial statement schedule for the year ended December 31, 2015, when considered in relation to the basic consolidated financial statements taken as a whole, presents fairly, in all material respects, the information set forth therein.

/s/ Haskell & White, LLP

San Diego, California
March 10, 2016

PFENEX INC.

Consolidated Balance Sheets

	December 31,	
	2017	2016
	<i>(in thousands)</i>	
Assets		
Current assets		
Cash and cash equivalents	\$ 57,664	\$ 81,501
Restricted cash	200	—
Accounts and unbilled receivables, net	1,306	2,822
Income tax receivable	638	717
Other current assets	1,705	1,878
Total current assets	61,513	86,918
Property and equipment, net	7,397	5,246
Other long term assets	133	80
Intangible assets, net	4,771	5,301
Goodwill	5,577	5,577
Total assets	\$ 79,391	\$ 103,122
Liabilities and Stockholders' Equity		
Current liabilities		
Accounts payable	\$ 1,905	\$ 1,284
Accrued liabilities	8,913	9,358
Current portion of deferred revenue	7,421	6,516
Current portion of capital lease obligations	228	54
Total current liabilities	18,467	17,212
Deferred revenue, less current portion	2,742	5,739
Capital lease obligations, less current portion	419	26
Total liabilities	21,628	22,977
Commitments and contingencies		
Stockholders' equity		
Preferred stock, \$0.001 par value, 10,000,000 shares authorized; no shares issued and outstanding	—	—
Common stock, par value \$0.001, 200,000,000 shares authorized at December 31, 2017 and 2016, respectively, 23,548,280 and 23,429,501 shares issued and outstanding at December 31, 2017 and 2016, respectively	24	24
Additional paid-in capital	219,446	216,144
Accumulated deficit	(161,707)	(136,023)
Total stockholders' equity	57,763	80,145
Total liabilities and stockholders' equity	\$ 79,391	\$ 103,122

The accompanying notes are an integral part of these consolidated financial statements.

PFENEX INC.

Consolidated Statements of Operations

	Years Ended December 31,		
	2017	2016	2015
	<i>(in thousands except for per share data)</i>		
Revenue	\$ 28,780	\$60,194	\$ 9,583
Cost of revenue	5,156	5,313	4,640
Gross profit	23,624	54,881	4,943
Operating expense			
Selling, general and administrative	17,674	17,340	14,598
Research and development	31,925	32,418	18,183
Total operating expense	49,599	49,758	32,781
(Loss) income from operations	(25,975)	5,123	(27,838)
Other income, net	119	149	74
Net (loss) income before income taxes	(25,856)	5,272	(27,764)
Income tax benefit (expense)	172	209	(452)
Net (loss) income	\$(25,684)	\$ 5,481	\$(28,216)
Net (loss) income per common share, basic and diluted	\$ (1.09)	\$ 0.23	\$ (1.26)
Weighted-average common shares used to compute net (loss) income per share			
Basic	23,503	23,389	22,376
Diluted	23,503	23,688	22,376

The accompanying notes are an integral part of these consolidated financial statements

PFENEX INC.

Consolidated Statements of Changes Stockholders' Equity
(in thousands)

	<u>Common Stock</u>		<u>Additional Paid in Capital</u>	<u>Accumulated Deficit</u>	<u>Total Stockholders' Equity</u>
	<u>Shares</u>	<u>Amount</u>			
Balance at December 31, 2014	20,405	\$ 21	\$173,141	\$(113,288)	\$ 59,874
Exercise of stock options	277	—	201	—	201
Issuance of common stock under employee stock purchase plan	24	—	140	—	140
Stock-based compensation expense	—	—	1,840	—	1,840
Issuance of common stock, net of discount	2,610	3	38,025	—	38,028
Offering costs	—	—	(686)	—	(686)
Net loss	—	—	—	(28,216)	(28,216)
Balance at December 31, 2015	<u>23,316</u>	<u>\$ 24</u>	<u>\$212,661</u>	<u>\$(141,504)</u>	<u>\$ 71,181</u>
Exercise of stock options	78	—	123	—	123
Issuance of common stock under employee stock purchase plan	36	—	204	—	204
Stock-based compensation expense	—	—	3,156	—	3,156
Net income	—	—	—	5,481	5,481
Balance at December 31, 2016	<u>23,430</u>	<u>\$ 24</u>	<u>\$216,144</u>	<u>\$(136,023)</u>	<u>\$ 80,145</u>
Exercise of stock options	85	—	26	—	26
Issuance of common stock under employee stock purchase plan	33	—	153	—	153
Stock-based compensation expense	—	—	3,123	—	3,123
Net loss	—	—	—	(25,684)	(25,684)
Balance at December 31, 2017	<u><u>23,548</u></u>	<u><u>\$ 24</u></u>	<u><u>\$219,446</u></u>	<u><u>\$(161,707)</u></u>	<u><u>\$ 57,763</u></u>

The accompanying notes are an integral part of these consolidated financial statements

PFENEX INC.

Consolidated Statements of Cash Flows

	Years Ended December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
Cash flows from operating activities			
Net (loss) income	\$(25,684)	\$ 5,481	\$(28,216)
Adjustments to reconcile net (loss) income to net cash provided by (used in) operating activities			
Depreciation and amortization	876	670	541
Amortization of intangible assets	530	531	531
Deferred income taxes	—	1,955	(1,955)
Stock-based compensation expense	3,123	3,156	1,840
(Gain)/Loss on disposal of property and equipment	(20)	250	59
Changes in operating assets and liabilities			
Accounts and unbilled receivables	1,516	(139)	(1,099)
Other current assets	173	(160)	58
Other long term assets	(53)	25	(68)
Accounts payable	628	431	(243)
Accrued liabilities	(585)	3,250	3,318
Deferred revenue	(2,092)	(35,840)	47,894
Income tax receivable	78	(1,884)	1,570
Net cash (used in) provided by operating activities	(21,510)	(22,274)	24,230
Cash flows from investing activities			
Acquisitions of property and equipment	(2,242)	(2,868)	(1,470)
Proceeds from sales of equipment	45	8	—
Net cash used in investing activities	(2,197)	(2,860)	(1,470)
Cash flows from financing activities			
Repayments of borrowings under line of credit agreement	—	(3,813)	—
Restricted cash	(200)	3,959	(4)
Repayments of capital lease obligations	(109)	—	—
Proceeds from exercise of stock options and other stock issuances	179	327	342
Proceeds from issuance of common shares from secondary offering	—	—	37,342
Net cash (used in) provided by financing activities	(130)	473	37,680
Net (decrease) increase in cash and cash equivalents	(23,837)	(24,661)	60,440
Cash and cash equivalents			
Beginning of year	81,501	106,162	45,722
End of year	\$ 57,664	\$ 81,501	\$106,162
Supplemental schedule of cash flow information			
Cash paid for interest	\$ 22	\$ 30	\$ 104
Cash paid for taxes	\$ —	\$ 32	\$ 942
Non-cash financing and investing transactions			
Capital lease obligation	\$ 676	\$ 42	\$ 89
Purchases of property and equipment included in accounts payable and accrued liabilities	\$ 361	\$ 248	\$ —

The accompanying notes are an integral part of these consolidated financial statements

PFENEX INC.

Notes to Consolidated Financial Statements

1. Organization and Summary of Significant Accounting Policies

Business Activities and Organization

Pfenex Inc. (the Company or Pfenex) is a clinical-stage development and licensing biotechnology company focused on leveraging its Pfenex Expression Technology to improve protein therapies for unmet patient needs. Using the patented Pfenex Expression Technology® platform, the Company has created an advanced pipeline of therapeutic equivalents, vaccines, biologics and biosimilars. The Company's lead product candidates are PF708, a therapeutic equivalent candidate to Forteo® (teriparatide) for the treatment of osteoporosis, and its novel anthrax vaccine candidates, Px563L and RPA563, funded through an advanced development contract with the U.S. government. In addition, Pfenex is developing hematology/oncology products in collaboration with Jazz Pharmaceuticals Ireland Limited (Jazz). Furthermore, the Company's pipeline includes biosimilar candidates to Lucentis® and Neulasta®.

PF708 is a therapeutic equivalent candidate to Forteo, marketed by Eli Lilly and Company. The Company completed enrollment in its Study PF708-301 in the third quarter of 2017, with the last patient visit occurring in mid-February 2018. In November 2017, the Company announced interim pharmacokinetic (PK) data from the study. The PF708 and Forteo PK profiles are comparable, and there are no statistically significant differences in key PK parameters. Top-line immunogenicity data results are expected in the second quarter of 2018. The Company expects to submit a new drug application (NDA) to the U.S. Food and Drug Administration (FDA) in the third quarter of 2018, with a potential commercial launch possible in the US as early as the third quarter of 2019 upon expiration of the relevant patents and subject to receipt of US FDA marketing authorization.

The Company is also developing Px563L/RPA563, novel anthrax vaccine candidates, in response to the United States government's unmet demand for increased quantity, stability and dose-sparing regimens of anthrax vaccine. The government contract is funded by the Biomedical Advanced Research and Development Authority (BARDA). Subject to continued funding from BARDA, Pfenex expects to continue to advance the program with the potential to initiate a Phase 2 trial in 2019. The Company had initially entered into a development contract with BARDA in 2010. The \$25.2 million fully-funded contract was completed in 2015, at which time BARDA awarded the Company a cost plus fixed fee advanced development contract valued at up to approximately \$143.5 million. In January 2017, BARDA exercised two options under its existing contract for further development of Px563L/RPA563.

In July 2016, Pfenex and Jazz announced an agreement under which Pfenex granted Jazz worldwide rights to develop and commercialize multiple early stage hematology/oncology product candidates, including PF743, a recombinant crisantaspase, and PF745, a recombinant crisantaspase with half-life extension technology. In December 2017, the parties amended the Jazz agreement, bringing the total value of payments and potential payments associated with the collaboration to \$224.5 million. In addition, the Company may be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement.

In addition to the Company's lead product candidates, its pipeline includes various other biosimilar candidates, including PF582, the Company's biosimilar candidate to Lucentis®, and PF529, the Company's biosimilar candidate to Neulasta®, as well as vaccines and next generation biologic candidates. Following its strategic review in November 2017, Pfenex decided to pause its development activities for PF582 and PF529 and focus the Company's efforts and resources elsewhere in its product portfolio. While the Company is seeking a new collaboration partner for the development and commercialization of PF582 and PF529, there are no assurances that it will find a new collaboration partner or that the terms and timing of any such arrangements would be acceptable to us.

The Company's revenue in the near term is primarily related to monetizing its protein production platform through collaboration agreements, service agreements, government contracts and reagent protein product sales which may provide for various types of payments, including upfront payments, funding of research and development, milestone payments, intellectual property access fees and licensing fees.

Subsidiary—Pfenex India Development Private Limited (“Pfenex India”)

In July 2016, to assist with the continued research and development of its pipeline products, the Company formed a new entity in India. An application for incorporation with the Government of India Ministry of Corporate Affairs was filed and approved for the Company's subsidiary, Pfenex India Development Private Limited. There has been limited activity in the subsidiary, and all intercompany transactions have been eliminated in the consolidated financial statements. In early 2018, this subsidiary was legally dissolved.

Basis of Presentation

The accompanying consolidated financial statements have been prepared in accordance with United States generally accepted accounting principles (U.S. GAAP), and reflect all of the Company's activities, including those of its wholly-owned subsidiary. All material intercompany accounts and transactions have been eliminated in consolidation. In the opinion of management, all adjustments considered necessary for a fair presentation have been included. These adjustments consist of normal and recurring accruals, as well as non-recurring charges.

Segments

The Company operates in one segment. Management uses one measurement of profitability and does not segregate its business for internal reporting. During 2017, 2016 and 2015, substantially all of the Company's long-lived assets were located within the United States.

Use of Estimates

The preparation of the accompanying consolidated financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts (including assets, liabilities, revenues and expenses) and related disclosures. Estimates have been prepared on the basis of the most current and best available information. However, actual results could differ from those estimates.

Risk and Uncertainties

The Company's future results of operations involve a number of risks and uncertainties. Factors that could affect the Company's future operating results and cause actual results to vary materially from expectations include, but are not limited to, uncertainty of results of clinical trials and reaching milestones, uncertainty of regulatory approval of the Company's product candidates, uncertainty of market acceptance of the Company's products if approved for sale, competition from substitute products and larger companies, securing and protecting proprietary technology, strategic relationships and dependence on key individuals.

Products developed by the Company require clearances from international and domestic regulatory agencies prior to commercial sales in such jurisdictions. There can be no assurance that the products will receive the necessary clearances. If the Company was denied clearance, clearance was delayed or the Company was unable to maintain clearance, it could have a materially adverse impact on the Company.

As of December 31, 2017, the Company had an accumulated deficit of \$161.7 million and expects to incur substantial operating losses for the next several years. Although the Company believes it has sufficient cash resources to fund all necessary activities leading up to and including submission of an NDA for PF708 to the FDA, the Company may need to obtain additional financing in order to complete clinical studies, launch and

commercialize any product candidates for which the Company receives regulatory approval. If Pfenex is unable to obtain adequate financing when needed, it may have to delay, reduce the scope of or suspend one or more of its clinical trials, research and development programs or commercialization efforts. There can be no assurance that such financing will be available or will be at terms acceptable by the Company.

Cash and Cash Equivalents

The Company considers all highly liquid investments that are readily convertible into cash and have an original maturity of six months or less at the time of purchase to be cash equivalents. Cash amounts that are restricted as to withdrawal or usage are presented as restricted cash. In January 2017, the Company entered into a Borrower's Pledge Agreement with U.S. Bank which required \$0.2 million in restricted cash to be provided as security for the Company's commercial credit card arrangement with this bank.

Concentrations

Financial instruments that potentially subject the Company to concentrations of credit risk consist primarily of cash, cash equivalents, investments and accounts and unbilled receivables. The Company has established guidelines intended to limit its exposure to credit risk by placing investments with high credit quality financial institutions, diversifying its investment portfolio and placing investments with maturities that help maintain safety and liquidity. All cash and cash equivalents were held at three major financial institutions as of December 31, 2017. For the Company's cash position of \$57.9 million as of December 31, 2017, which included restricted cash of \$0.2 million, the Company has exposure to credit loss for amounts in excess of insured limits in the event of non-performance by the institutions; however, the Company does not anticipate non-performance.

Additional credit risk is related to the Company's concentration of receivables. As of December 31, 2017 and 2016, receivables were concentrated among three customers representing 89% of total net receivables for both years. The Company recorded an allowance for doubtful accounts of \$0.1 million at December 31, 2016. No allowance for doubtful accounts was recorded at December 31, 2017. For the year ended December 31, 2017, revenue was concentrated among two customers and/or collaboration partners representing 94% of total revenues. Revenue from one collaboration partner represented 80% of total revenue for the year ended December 31, 2016. Two customers and/or collaboration partners represented 70% of total revenue for the year ended December 31, 2015.

A portion of revenue is earned from sales outside the United States. Non-U.S. revenue is denominated in U.S. dollars. A breakdown of the Company's revenue from U.S. and non-U.S. sources for the years ended December 31, 2017, 2016 and 2015 is as follows:

	Years Ended December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
US Revenue	\$ 6,477	\$54,641	\$8,399
Non-US Revenue	<u>22,303</u>	<u>5,553</u>	<u>1,184</u>
	<u>\$28,780</u>	<u>\$60,194</u>	<u>\$9,583</u>

During the year ended December 31, 2017, Ireland accounted for more than 10% of the Company's revenue. For the years ended December 31, 2016 and 2015, no single foreign country accounted for more than 10% of the Company's revenues.

Fair Value of Financial Instruments

Financial instruments, including cash, cash equivalents, restricted cash and the lines of credit, are carried at cost, which management believes approximates fair value because of the short-term maturity of these instruments.

Fair value is an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability. As a basis for considering such assumptions, a three-tier fair value hierarchy has been established, which prioritizes the inputs used in measuring fair value as follows:

- Level 1—Observable inputs such as quoted prices in active markets for identical assets or liabilities. Level 1 assets at December 31, 2017 and December 31, 2016 included the Company's cash and cash equivalents. There were no Level 1 liabilities;
- Level 2—Inputs, other than the quoted prices in active markets, that are observable either directly or indirectly. The Company had no Level 2 assets or liabilities at December 31, 2017 or December 31, 2016; and
- Level 3—Unobservable inputs to the valuation methodology that are significant to the measurement of the fair value of assets or liabilities in which there is little or no market data. The Company had no Level 3 assets or liabilities at December 31, 2017 or December 31, 2016.

Accounts and Unbilled Receivables

Accounts receivable represent primarily commercial receivables associated with the Company's service fees, license fees, product sales and receivables from U.S. government contracts. Accounts receivable amounted to \$1.1 million and \$1.9 million as of December 31, 2017 and 2016, respectively. Unbilled receivables represent reimbursable costs in excess of billings and, where applicable, accrued profit related to long-term government contracts for which revenue has been recognized, but the customer has not yet been billed. Unbilled receivables amounted to \$0.2 million and \$1.0 million as of December 31, 2017 and 2016, respectively.

The Company evaluates the collectability of its receivables based on a variety of factors, including the length of time the receivables are past due, the financial health of its customers and historical experience. Based upon the review of these factors, the Company recorded no allowance for doubtful accounts at December 31, 2017 and \$0.1 million at December 31, 2016.

Property and Equipment

Property and equipment are stated at cost and depreciated using the straight-line method over the estimated useful lives of the assets ranging from five to ten years with the exception of leasehold improvements which are amortized over the shorter of the lease term or their estimated useful life.

Intangible Assets

Intangible assets include customer relationships, developed technology and trade names related to the Company's asset acquisition and have been capitalized and amortized over the estimated useful life of 15 years, 20 years and 15 years, respectively.

Impairment of Long-Lived Assets Other Than Goodwill

The Company assesses potential impairments to its long-lived assets whenever events or changes in circumstances indicate that the carrying value of an asset may not be recoverable. If indicators of impairment exist, the Company assesses the recoverability of the affected long-lived assets by determining whether the carrying value of such assets can be recovered through undiscounted future operating cash flow expected to result from the use of the assets. If the carrying amount is not recoverable, the Company measures the amount of any impairment by comparing the carrying value of the asset to the present value of the expected future cash flows associated with the use of the asset. No impairment was noted as of the years ended December 31, 2017 or 2016.

Goodwill

Goodwill is the excess of purchase price over the aggregate fair values of tangible and intangible assets acquired, less liabilities assumed, in a business combination. The Company does not amortize goodwill. Instead, goodwill is tested for impairment annually and between annual tests if the Company becomes aware of an event or a change in circumstances that would indicate the carrying amount may be impaired. The Company performs its annual impairment testing as of December 31st of each year. The Company will first assess qualitative factors to determine whether the existence of events or circumstances suggests that it is more likely than not that goodwill is impaired. Unless it is more likely than not that goodwill is impaired, the Company does not perform the two-step impairment test. The Company's determination as to whether, and, if so, the extent to which, goodwill becomes impaired is highly judgmental and based on changes in the manner of its use of the acquired assets or its overall business strategy and regulatory, market and economic environment and trends. No impairment was noted as of December 31, 2017 or 2016.

Preclinical and Clinical Trial Accruals

The Company's clinical trial accruals are based on estimates of patient enrollment and related costs at clinical investigator sites, as well as estimates for the services received and efforts expended pursuant to contracts with multiple research institutions and clinical research organizations that conduct and manage clinical trials on the Company's behalf.

The Company estimates preclinical and clinical trial expenses based on the services performed, pursuant to contracts with research institutions and clinical research organizations that conduct and manage preclinical studies and clinical trials on its behalf. In accruing service fees, the Company estimates the time period over which services will be performed and the level of patient enrollment and activity expended in each period. If the actual timing of the performance of series or the level of effort varies from the estimate, the Company will adjust the accrual accordingly. Payments made to third parties under these arrangements in advance of the receipt of the related series are recorded as prepaid expenses until the services are rendered.

Revenue

The Company's revenue is related to the monetization of its protein production platform through collaboration agreements, service agreements, license agreements, government contracts and sales of reagent protein products, which may provide for various types of payments, including upfront payments, funding of research and development, milestone payments, intellectual property access fees and licensing fees. The Company's revenue generating agreements also include potential revenues for achieving milestones and for product royalties. The specifics of the Company's significant agreements are detailed in Note 6—Significant Research and Development Agreements.

The Company considers a variety of factors in determining the appropriate method of accounting for its collaboration agreements, including whether multiple deliverables can be separated and accounted for individually as separate units of accounting. Where there are multiple deliverables within a collaboration agreement that cannot be separated and therefore are combined into a single unit of accounting, revenues are deferred and recognized using the relevant guidance over the estimated period of performance. If the deliverables can be separated, the Company applies the relevant revenue recognition guidance to each individual deliverable. The specific methodology for the recognition of the underlying revenue is determined on a case-by-case basis according to the facts and circumstances applicable to each agreement.

Upfront, nonrefundable licensing payments are assessed to determine whether or not the licensee is able to obtain standalone value from the license. Where the license does not have standalone value, non-refundable license fees are recorded as deferred revenue and recognized as revenue as the Company performs under the applicable agreement. Where the level of effort is relatively consistent over the performance period, the

Company recognizes fixed or determined revenue on a straight-line basis over the estimated period of performance. Where the license has standalone value, the Company recognizes total license revenue at the time all revenue recognition criteria have been met.

Nonrefundable payments for research funding are generally recognized as revenue over the period the underlying research activities are performed.

Revenue under service agreements are recorded as services are performed. These agreements do not require development achievement as a performance obligation and provide for payment when services are rendered. All such revenue is nonrefundable. Upfront, nonrefundable payments for license fees, exclusivity and feasibility services received in excess of amounts earned are classified as deferred revenue and recognized as income over the contract term or period of performance based on the nature of the related agreement.

The Company recognizes revenue for its cost plus fixed fee government contracts in accordance with the authoritative guidance for revenue recognition including the authoritative guidance specific to federal government contractors. Reimbursable costs under the Company's government contracts primarily include direct labor, materials, subcontracts, accountable property and indirect costs. In addition, the Company receives a fixed fee under its government contracts, which is unconditionally earned as allowable costs are incurred and is not contingent on success factors. Reimbursable costs under the Company's government contracts, including the fixed fee, are generally recognized as revenue in the period the reimbursable costs are incurred and become billable.

The Company assesses milestone payments on an individual basis and recognizes revenue from nonrefundable milestone payments when the earnings process is complete and the payment is reasonably assured. Nonrefundable milestone payments related to arrangements under which the Company has continuing performance obligations are recognized as revenue upon achievement of the associated milestone, provided that (i) the milestone event is substantive and its achievability was not reasonably assured at the inception of the agreement, and (ii) the amount of the milestone payment is reasonable in relation to the effort expended or the risk associated with the milestone event. For the year ended December 31, 2017, revenue was recognized in connection with the achievement of development milestones associated with the Jazz collaboration. The Company recognized \$1.0 million and \$0.8 million in connection with the achievement of certain milestones for the years ended December 31, 2017 and 2016, respectively.

The Company's reagent protein products are comprised of internally developed reagent protein products and those purchased from original manufacturers for resale. Revenues for reagent product sales are reflected net of attributable sales tax. The Company generally offers a 30 day return policy. The Company recognizes reagent product revenue from product sales when it is realized or realizable and earned. As of December 31, 2017 and 2016, the Company has had minimal product returns related to reagent protein product sales. No reserve for warranty and return rights was recorded as of December 31, 2017 and 2016.

Revenue under arrangements where the Company outsources the cost of fulfillment to third parties is evaluated as to whether the related amounts should be recorded gross or net. The Company records amounts collected from the customer as revenue, and the amounts paid to suppliers as cost of revenue when it holds all or substantially all of the risks and benefits related to the product or service. For transactions where the Company does not hold all or substantially all the risk, the Company uses net reporting and therefore records the transaction as if the end-user made a purchase from the supplier with the Company acting as a sales agent.

Cost of Revenue

Cost of revenue includes costs incurred in connection with the execution of service contracts. These are primarily reimbursable costs under the Company's government contracts and include costs for third-party manufacturing, materials and internal labor. Costs related to government contract activities are generally

recognized as incurred. Cost of revenue also includes costs to manufacture or purchase, package and ship the Company's reagent products; these costs are recognized upon shipment to the customer.

Research and Development Expenses

Research and development expenses are recognized as incurred and amounted to \$31.9 million, \$32.4 million and \$18.2 million for the years ending December 31, 2017, 2016 and 2015, respectively.

Stock-Based Compensation

Employee stock-based compensation expense is measured at the grant date, based on the estimated fair value of the award, and is recognized as an expense, net of estimated forfeitures, over the requisite service period. Stock-based compensation expense is amortized on a straight-line basis over the requisite service period for the entire award, which is generally the vesting period of the award.

The Company estimates the fair value of stock options and other equity-based compensation using a Black-Scholes option pricing model on the date of grant. The Black-Scholes valuation model requires multiple subjective inputs, which are discussed further in Note 8 — Stock-Based Compensation. The fair value of equity instruments expected to vest are recognized and amortized on a straight-line basis over the requisite service period of the award, which is generally four years; however, certain provisions in the Company's equity compensation plan provides for shorter and longer vesting periods under certain circumstances.

Comprehensive Income (Loss)

Comprehensive loss is defined as a change in equity of a business enterprise during a period, resulting from transactions from non-owner sources. There have been no items qualifying as other comprehensive loss and, therefore, for all periods presented, the Company's comprehensive income (loss) was the same as its reported net income (loss).

Income Taxes

The Company utilizes the asset and liability method of accounting for income taxes. Under this method, deferred tax assets and liabilities are determined based on the difference between the financial statement carrying amounts and tax basis of assets and liabilities using enacted tax rates in effect for years in which the temporary differences are expected to reverse. A deferred income tax asset or liability is computed for the expected future impact of differences between the financial reporting and income tax bases of assets and liabilities and for the expected future tax benefit, if any, to be derived from tax credits and loss carryforwards. Deferred income tax expense or benefit would represent the net change during the year in the deferred income tax asset or liability. Deferred tax assets, if any, are reduced by a valuation allowance when, in the opinion of management, it is more likely than not that some portion or all of the deferred tax assets will not be realized.

Net (Loss) Income per Share of Common Stock

Basic net (loss) income per common share is calculated by dividing the net (loss) income attributable to common stockholders by the weighted-average number of common shares outstanding during the period, without consideration for potentially dilutive securities. Diluted net (loss) income per share is computed by dividing net (loss) income by the weighted-average number of common shares outstanding and potentially dilutive securities during the period under the treasury stock method. For purposes of the diluted net (loss) income per share calculation, stock options and employee purchase plan shares are considered to be potentially dilutive securities. Securities are excluded from the computation of diluted net (loss) income per share if their effect would be anti-dilutive to earnings per share. Because the Company has reported a net loss for the years ended December 31, 2017 and 2015, diluted net loss per common share is the same as basic net loss per common share for those

periods. There were no accumulated dividends related to preferred stock at December 31, 2017, 2016 or 2015. Immediately prior to the IPO, the Company issued shares of common stock in connection with the payment of all accrued and unpaid dividends on the preferred stock upon the conversion of the convertible preferred stock to common stock.

Recently Issued Accounting Pronouncements

In May 2014, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) No. 2014-09 Revenue from Contracts with Customers (Topic 606), which supersedes the revenue recognition requirements in ASC 605, Revenue Recognition. This ASU is based on the principle that revenue is recognized to depict the transfer of goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. The ASU also requires additional disclosure about the nature, amount, timing and uncertainty of revenue and cash flows arising from customer contracts, including significant judgments and changes in judgments and assets recognized from costs incurred to obtain or fulfill a contract. Numerous updates were issued in 2016 that provide clarification on a number of specific issues as well as requiring additional disclosures. The effective date will be the first quarter of fiscal year 2019 using one of two retrospective application methods: the full retrospective method or the modified retrospective method. The Company plans to adopt the standard in the first quarter of fiscal year 2019 using the modified retrospective method. The Company does not expect the new standard to have a material impact on the recognition of revenue from its reagent protein product sales. However, the Company continues to evaluate the impact that this guidance will have on its consolidated financial statements in connection with its government, collaboration, and license agreements. The Company has not yet determined the potential impact on revenue recognition for its government, collaboration and license agreement as a result of adopting this new standard.

In February 2016, the FASB issued ASU No. 2016-02 Leases (Topic 842), which requires lessees to recognize “right of use” assets and liabilities for all leases with lease terms of more than 12 months. The ASU requires additional quantitative and qualitative financial statement footnote disclosures about the leases, significant judgments made in accounting for those leases and amounts recognized in the financial statements about those leases. The effective date will be the first quarter of fiscal year 2020. The Company is currently evaluating the impact of the adoption of this accounting standard update on its financial statements.

In November 2016, the FASB issued ASU 2016-18, Statement of Cash Flows (Topic 230): Restricted Cash, which clarifies the presentation of restricted cash and restricted cash equivalents in the statements of cash flows. Under the ASU, restricted cash and restricted cash equivalents are included with cash and cash equivalents when reconciling the beginning-of-period and end-of-period total amounts presented on the statements of cash flows. The ASU is intended to reduce diversity in practice in the classification and presentation of changes in restricted cash on the Consolidated Statement of Cash Flows. The ASU requires that the Consolidated Statement of Cash Flows explain the change in total cash and equivalents and amounts generally described as restricted cash or restricted cash equivalents when reconciling the beginning-of-period and end-of-period total amounts. The ASU also requires a reconciliation between the total of cash and equivalents and restricted cash presented on the Consolidated Statement of Cash Flows and the cash and equivalents balance presented on the Consolidated Balance Sheet. The ASU is effective retrospectively on January 1, 2018, with early adoption permitted. The Company does not expect the adoption of the ASU to have a material effect on its results of operations, financial condition or cash flows.

In January 2017, the FASB issued ASU No. 2017-04, Intangibles – Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment. This updated guidance eliminates Step 2 from the current two-step quantitative model for goodwill impairment tests. Step 2 required an entity to calculate an implied fair value, which included a hypothetical purchase price allocation requirement, for reporting units that failed Step 1. Per this updated guidance, a goodwill impairment will instead be measured as the amount by which a reporting unit’s carrying value exceeds its fair value as identified in Step 1. This guidance is effective for fiscal years beginning after December 15, 2019, including interim periods within that reporting period. Early adoption is

permitted for interim or annual goodwill impairment tests performed on testing dates after January 1, 2017. The adoption of this guidance is not expected to have a material impact on the consolidated financial statements.

In May 2017, the FASB issued ASU 2017-09, Compensation – Stock Compensation (Topic 718), Scope of Modification Accounting. The new standard clarifies when to account for a change to the terms or conditions of a share-based payment award as a modification. ASU 2017-09 is effective for the Company in the first quarter of 2018, with early adoption permitted. The adoption of this guidance is not expected to have a material impact on the consolidated financial statements.

2. Fair Value Measurements

The fair value measurements of the Company’s cash equivalents and investments, which are measured at fair value on a recurring basis as of December 31, 2017 and 2016, were determined using the inputs described above and are as follows:

	<u>Total</u>	<u>Fair Value Measurements at Reporting Data Using</u>		
		<u>Quoted Prices in Active Markets for Identical Assets (Level 1)</u>	<u>Significant Other Observable Inputs (Level 2)</u>	<u>Significant Unobservable Inputs (Level 3)</u>
		<i>(in thousands)</i>		
December 31, 2017				
Cash and money market funds	\$57,864	\$57,864	\$—	\$—
Total assets measured at fair value	<u>\$57,864</u>	<u>\$57,864</u>	<u>\$—</u>	<u>\$—</u>
December 31, 2016				
Cash and money market funds	\$81,501	\$81,501	\$—	\$—
Total assets measured at fair value	<u>\$81,501</u>	<u>\$81,501</u>	<u>\$—</u>	<u>\$—</u>

Cash and money market funds at December 31, 2017 include restricted cash, which is included in current assets on the balance sheet.

The Company’s policy is to recognize transfers between levels of the fair value hierarchy on the date of the event or change in circumstances that caused the transfer. There were no significant transfers into or out of Level 1, 2, or 3 during the periods presented.

3. Property and Equipment

Property and equipment consisted of the following:

	<u>December 31,</u>	
	<u>2017</u>	<u>2016</u>
	<i>(in thousands)</i>	
Furniture and equipment	\$ 355	\$ 350
Computers and IT equipment	368	290
Purchased software	931	869
Lab and research equipment	8,131	5,022
Leasehold improvements	865	739
Construction-in-progress	162	575
Other fixed assets	64	64
Total property and equipment, gross	10,876	7,909
Less: accumulated depreciation and amortization	(3,479)	(2,663)
Property and equipment, net	<u>\$ 7,397</u>	<u>\$ 5,246</u>

Total property and equipment assets under capital lease were \$1.1 million and \$0.2 million as of December 31, 2017 and 2016. Accumulated depreciation related to assets under capital lease as of these dates were \$94 thousand and \$40 thousand, respectively. For the years ended December 31, 2017, 2016 and 2015, total depreciation and amortization expense was \$0.9 million, \$0.7 million and \$0.5 million, respectively, and is included in selling, general and administrative expenses and research and development in the accompanying consolidated statements of operations as follows:

	Years ended December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
Selling, general and administrative	\$327	\$254	\$267
Research and development	549	416	274
Total depreciation and amortization expense	<u>\$876</u>	<u>\$670</u>	<u>\$541</u>

4. Intangible Assets

Intangible assets consisted of the following:

	December 31,	
	2017	2016
	<i>(in thousands)</i>	
Customer relationships	\$ 3,750	\$ 3,750
Developed technology	4,400	4,400
Trade names	910	910
Gross intangible assets	9,060	9,060
Less: Accumulated amortization	(4,289)	(3,759)
Total intangible assets, net	<u>\$ 4,771</u>	<u>\$ 5,301</u>

Amortization expense related to intangible assets was \$0.5 million for each of the years ended December 31, 2017, 2016 and 2015. Amortization expense is included within selling, general and administrative expense in the accompanying consolidated statements of operations. As of December 31, 2017, estimated amortization expense for the next five years amounts to approximately \$0.5 million per year.

5. Accrued Liabilities

Accrued liabilities consisted of the following:

	December 31,	
	2017	2016
	<i>(in thousands)</i>	
Accrued vacation	\$ 477	\$ 553
Deferred rent	620	627
Accrued bonuses	1,672	1,385
Other accrued employee-related liabilities	462	293
Accrued professional fees	575	266
Accrued supplier liability	690	428
Accrued subcontractor costs	2,681	4,901
Accrued clinical trial costs	866	73
Other accrued liabilities	870	832
Total accrued liabilities	<u>\$ 8,913</u>	<u>\$ 9,358</u>

6. Significant Research and Development Agreements

The Company has two types of research and development agreements (i) those for which the Company co-develops or assists customers in developing their products (Collaboration Agreements), and (ii) those for which the Company receives funding to advance its own products (Funding Agreements).

Collaboration and License Agreements

Jazz

In July 2016, the Company entered into a development and license agreement with Jazz Pharmaceuticals for the development and commercialization of multiple early stage hematology/oncology product candidates, including PF743, a recombinant crisantaspase, and PF745, a recombinant crisantaspase with half-life extension technology, and in the third quarter of 2017, achieved a process development milestone. The agreement also includes an option for Jazz to negotiate a license for a recombinant pegaspargase product candidate with the Company. Under the agreement, Pfenex received an upfront and option payment totaling \$15.0 million in July 2016 and may be eligible to receive additional payments based on achievement of certain research and development, regulatory and sales-related milestones.

In December 2017, the Company and Jazz entered into an amended and restated agreement. In connection with the amendment and restatement of the Jazz Agreement (as amended, the Amended Jazz Agreement), Pfenex received a total of \$18.5 million, consisting of an upfront payment of \$5.0 million and a payment of \$13.5 million for development achievement. Pfenex may be eligible to receive additional payments under the Amended Jazz Agreement of up to \$189.3 million based on achievement of certain research and development, regulatory and sales-related milestones. The total milestones are categorized as follows: \$30.3 million based on achievement of certain research and development milestones; \$34.0 million for certain regulatory milestones; and \$125.0 million for sales milestones. For the non-sales-related milestones totaling \$64.3 million, the Company conducted an evaluation as to whether they will be recorded using the milestone method and, as a result of this evaluation, estimates approximately \$30.3 million of these non-sales-related milestones are deemed to be substantive. The Company may also be eligible to receive tiered royalties on worldwide sales of any products resulting from the collaboration at rates reduced from those under the 2016 agreement. Both Jazz and the Company will be contributing to the development efforts. Unless terminated earlier, the Amended Jazz Agreement will continue on a product-by-product basis for as long as Jazz is commercializing or having commercialized the products under the Amended Jazz Agreement.

In accordance with ASC 605-25, the Company identified all of the deliverables at the inception of the Jazz Agreement and again upon entering into the Amended Jazz Agreement. The deliverables have not changed under the amendment. The significant deliverables were determined to be the research and development services related to the pegaspargase product candidate option and for license and research and development activities of the other hematology/oncology products. The Company has determined that the license, together with the research and development activities, represent one unit of accounting for each product under license, as the license does not have standalone value from the respective development activities. The research and development activities related to the pegaspargase option were determined to have standalone value apart from the license and development activities for the other hematology/oncology products. The estimated selling price for the Pegaspargase product candidate and the hematology/oncology products was determined using an income approach. In determining the estimated selling price, the Company considered costs expected to be incurred for internal labor, burden rates, internal margins, and subcontractors. Based on Pfenex's considerations of estimated selling price, the Company allocated the original \$15.0 million upfront and option payment as follows: \$10.0 million to the Pegaspargase product candidate and \$2.5 million to each of the hematology/oncology products. For the \$18.5 million received under the terms of the Amended Jazz Agreement, the Company determined that \$14.3 million was recognizable as revenue in the fourth quarter of 2017, as \$13.5 million represented revenue associated with a development achievement and \$0.8 million of the \$5.0 million upfront payment represented development services performed prior to the amendment, which had been reimbursable

under the original agreement. The remaining \$4.2 million of the upfront payment was allocated to the remaining hematology product; the amount is deferred and will be recognized over the 18 month period of performance. The Amended Jazz Agreement provisions allow for Jazz to halt the advancement of one of the products under development and replace with others wherein the Company could potentially earn milestone revenue on those products. However, the Company believes it is unlikely Jazz would halt the advancement of the product under development and replace with other products. Therefore, none of the upfront payments were allocated to this option.

The upfront and option payment for the original Jazz agreement and the amendment are being deferred and will be recognized as revenue ratably over the period in which the Company expects services to be rendered for each respective unit of accounting. As previously disclosed, the estimated period of revenue recognition approximates a range of 15 to 32 months. Based on changes to this estimate that occurred during the quarter ended June 30, 2017, the Company has modified the period of revenue recognition to range from 15 to 35 months. During the year ended December 31, 2017, the Company completed the service period related to one of the hematology products. During the years ended December 31, 2017 and 2016, the Company recorded revenue of approximately \$21.6 million and \$3.6 million related to the Jazz Collaboration, respectively. As of December 31, 2017 and 2016, deferred revenue associated with the Jazz collaboration was \$10.1 million and \$12.1 million, respectively. This deferred revenue will be recognized over the period of performance from 15 to 18 months, subsequent to December 31, 2017.

Pfizer

In February 2015, the Company entered into a development and license agreement with Pfizer (Pfizer Agreement) for the development and commercialization of PF582. Under the terms of the Pfizer Agreement, in March of 2015 the Company received a non-refundable license payment of \$51.0 million on receipt of antitrust approval. Following Pfizer's strategic review of the current therapeutic focus of its biosimilar pipeline, the Company and Pfizer entered into a termination agreement in August 2016, pursuant to which the Pfizer Agreement was terminated and all rights to PF582 were returned to the Company. Upon termination, \$45.8 million of previously deferred revenue was recognized. For the years ended December 31, 2016 and 2015, the Company recognized \$48.0 million and \$3.0 million, respectively, as license revenue related to the Pfizer Agreement.

Funding Agreements

The U.S. Department of Health and Human Services

In July 2010, the Company entered into a contract with BARDA within the Office of the Assistant Secretary for Preparedness and Response in the U.S. Department of Health and Human Services to develop a production strain and process for the production of bulk recombinant protective antigen (rPA) from anthrax. The arrangement is a cost plus fixed fee contract comprised of a base program and follow on options at BARDA's election. At the inception of the contract, both BARDA and the Company entered into the arrangement with the expectation that BARDA would fund all costs of development and no costs in excess of the arrangement would be incurred by the Company. In December 2014, the Company filed the investigational new drug (IND) application for Px563L. BARDA extended the contract in December 2014 and provided additional funding, increasing the total contract to \$25.2 million. The development contract was completed in August 2015.

In August 2015, the Company entered into a contract with BARDA for the advanced development of Px563L/RPA563 as a novel vaccine candidate for the prevention of anthrax infection (BARDA Advanced Development Agreement). The BARDA Advanced Development Agreement is a cost plus fixed fee development contract valued at up to approximately \$143.5 million, including a 30 month base period of performance of approximately \$15.9 million, and eight option periods valued at a total of approximately \$127.6 million. The base period of performance was initially from August 2015 through February 2018 and later extended through

September 2018. In addition to the base period, BARDA exercised additional phases of the development contract effective January 2017, totaling \$4.9 million and allowing for the continuing development of Px563L/RPA563. The period of performance for the two option periods was extended through September 2018 and December 2019. Over the course of 2017, the Company continued to collect favorable stability data for both products. Potential next milestones in 2018 are the triggering of analytical and non-clinical animal study options, leading to potential Phase 2 study in 2019, subject in each case to continued funding by BARDA.

Revenue is recognized in accordance with the authoritative guidance for revenue recognition including the authoritative guidance specific to federal government contractors. Reimbursable costs under this government contract primarily include direct labor, materials, subcontracts, accountable property and indirect costs. In addition, the Company receives a fixed fee under the BARDA contract, which is unconditionally earned as allowable costs are incurred and is not contingent on success factors. Reimbursable costs under this BARDA contract, including the fixed fee, are generally recognized as revenue in the period the reimbursable costs are incurred and become billable. The Company recorded revenues of \$5.5 million, \$5.0 million and \$3.7 million for services performed in the years ended December 31, 2017, 2016 and 2015, respectively. Reimbursable costs related to fulfilling on this contract amounted to \$3.5 million, \$3.9 million and \$2.9 million for the years ended December 31, 2017, 2016 and 2015, respectively, and are reflected in cost of revenue in the accompanying consolidated statements of operations. The billing of any overage in indirect cost rates over the approved provisional rates in the contract is not allowed. Any such overage is expensed as incurred. When and if final rates with Defense Contract Audit Agency are approved, the Company will recognize any change in revenue resulting from the rate change in the period such revised rates are approved and as such this would be considered a change in estimate. This agreement is subject to early termination and stop-work order in conformance with Federal Acquisition Regulations 52.249-6 and 52.242-15 whereupon BARDA may immediately terminate the agreement early for convenience, or request the Company to stop all or any part of the work for a period of at least 90 days. If BARDA is not adequately funded, there is a potential that some or all of the follow on options could be delayed or never elected.

The National Institute of Allergy and Infectious Diseases

In September 2012, the Company entered into a contract with the National Institute of Allergy and Infectious Diseases (NIAID) to provide services to advance vaccine components and technologies that accelerate the immune response for use in post-event settings following the intentional release of the NIAID Category A Priority Pathogen Bacillus anthracis or in response to naturally occurring outbreaks of infectious diseases caused by NIAID Category A Priority Pathogen B. anthracis. The arrangement was a cost plus fixed fee contract comprised of a base program and 13 follow-on options at NIAID's election. At the inception of the contract, both NIAID and the Company entered into the arrangement with the expectation that NIAID would fund all costs of development and no costs in excess of the arrangement would be incurred by the Company. The total amount of the contract including options was \$22.9 million, with \$2.2 million eligible for payment during the base program of approximately 14 months. The fixed fee was paid as specific activities were completed. NIAID exercised the first option period effective in January 2015, increasing the funding to \$3.0 million. NIAID exercised the second option period effective May 2016, increasing the funding to approximately \$4.1 million. The contract was extended through the end of December 31, 2017, when the development contract was completed in accordance with its terms.

Revenue was recognized in accordance with the authoritative guidance for revenue recognition including the authoritative guidance specific to federal government contractors. Reimbursable costs under this government contract primarily included direct labor, subcontracts and indirect costs. In addition, the Company received a fixed fee under the NIAID contract, which was unconditionally earned as allowable costs were incurred and was not contingent on success factors. Reimbursable costs under this NIAID contract, including the fixed fee, were generally recognized as revenue in the period the reimbursable costs were incurred and became billable. The Company recorded revenues of \$0.3 million, \$0.5 million and \$0.9 million for services performed in the years ended December 31, 2017, 2016 and 2015, respectively. Reimbursable costs related to fulfilling this contract

amounted to \$0.3 million, \$0.4 million and \$0.5 million for the years ended December 31, 2017, 2016 and 2015, respectively, and are reflected in cost of revenues in the accompanying consolidated statements of operations. The billing of any overage in indirect cost rates over the approved provisional rates in the contract is not allowed. Such overage was expensed as incurred. When and if final rates with Defense Contract Audit Agency are approved, the Company will recognize any change in revenue resulting from the rate change in the period such revised rates are approved and as such this would be considered a change in estimate.

Strides Arcolab Limited

In March 2013, the Company and Strides Arcolab entered into a joint venture agreement (JVA) to provide a vehicle for the advancement of certain biosimilars. In August of 2017, the Company and Strides Arcolab entered into a termination agreement pursuant to which the JVA was terminated. There had been no activity under the JVA.

7. Commitments and Contingencies

Lease Agreements

In June 2010, the Company entered into an operating lease agreement (Lease) with a landlord for an initial term of 10 years, for its corporate headquarters comprised of one building located in San Diego, California. Occupation of the premises under the Lease began in April 2011. Under the terms of the Lease, the Company pays annual base rent, subject to an annual fixed percentage increase, plus its share of common operating expenses and tax obligations. The annual base rent was subject to abatement of 50% for the first year of the Lease. The Company recognizes rent expense on a straight-line basis over the lease term.

In September 2014, the Company amended the Lease to extend the term for an additional three years through March 31, 2024 and to an additional 7,315 square feet of leased space. The extended term on the existing space increased total estimated rent payments by approximately \$1.4 million. Base rent payments for the new space commenced in December 2014 and increased total estimated rent payments over the life of the Lease by approximately \$1.5 million. In November 2015, the Company further amended the Lease to add facilities consisting of 16,811 square feet. Base rent payments for the new space commenced in March 2016 and June 2016 and increased total estimated rent payments over the life of the Lease by approximately \$2.3 million. In January 2017, a sublease agreement was executed with a tenant to lease a portion of leased space from the Company for eight months. The amounts received are offset against rent expense.

Rent expense was \$0.7 million, \$0.7 million, and \$0.5 million for the years ended December 31, 2017, 2016 and 2015, respectively, which is included in selling, general and administrative and research and development expenses in the accompanying consolidated statements of operations as follows:

	Years Ended December 31,		
	<u>2017</u>	<u>2016</u>	<u>2015</u>
	<i>(in thousands)</i>		
Selling, general and administrative	\$407	\$375	\$290
Research and development	326	364	248
Total rent expense	<u>\$733</u>	<u>\$739</u>	<u>\$538</u>

In addition to the Lease, the Company has entered into operating and capital lease agreements for office and lab equipment that expire at various dates through December 2021.

As of December 31, 2017, the total estimated future annual minimum lease payment obligations under the Company's non-cancelable leasing arrangements, including the facilities lease described above, are as follows:

	Payment Amounts		
	Operating Leases	Capital Leases	Total
	<i>(in thousands)</i>		
2018	\$ 984	\$260	\$1,244
2019	884	260	1,144
2020	891	199	1,090
2021	908	1	909
2022 and thereafter	<u>2,140</u>	<u>—</u>	<u>2,140</u>
Total future minimum lease payments	<u>\$5,807</u>	<u>\$720</u>	<u>\$6,527</u>

Clinical Study and Development Activity Commitments

The Company has entered into agreements with contract research organizations and subcontractors to further develop its product candidates. The total contracted costs under these arrangements totaled approximately \$25.9 million as of December 31, 2017, of which \$15.9 million has been incurred to date. These contracts can be cancelled at any time, with some having certain cancellation fees associated with the termination of the contract, and others that only obligate the Company through the termination date.

Contingencies

From time to time, the Company may be involved in legal proceedings, claims, and litigation in the ordinary course of business. At December 31, 2017 and 2016 there were no material legal proceedings.

8. Stock-Based Compensation

Summary Stock-Based Compensation Information

The following table summarizes stock-based compensation expense:

	Years Ended December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
Cost of revenues	\$ 265	\$ 225	\$ 124
Research and development	1,028	822	371
Selling, general and administrative	<u>1,830</u>	<u>2,109</u>	<u>1,345</u>
Total	<u>\$ 3,123</u>	<u>\$ 3,156</u>	<u>\$ 1,840</u>
	<i>(in thousands)</i>		
Stock-based compensation from:			
Stock options	\$ 2,993	\$ 2,983	\$ 1,761
Employee stock purchase plan	<u>130</u>	<u>173</u>	<u>79</u>
Total	<u>\$ 3,123</u>	<u>\$ 3,156</u>	<u>\$ 1,840</u>

Stock Option Plan

The Company's board of directors adopted, and the Company's stockholders approved, the Company's 2009 Equity Incentive Plan (2009 Plan) in 2009. The 2009 Plan terminated in connection with the Company's

IPO in 2014 and, accordingly, no awards will be granted under the 2009 Plan following the IPO. However, the 2009 Plan will continue to govern outstanding awards granted thereunder. An aggregate of 1.1 million shares of common stock was reserved for issuance under the 2009 Plan. The 2009 Plan provided for the grant of incentive stock options and for the grant of nonstatutory stock options, restricted stock, restricted stock units, and stock appreciation rights to the Company's employees, directors and consultants. As of December 31, 2017, awards covering 0.4 million shares of common stock were outstanding under the 2009 Plan.

In July 2014, the board of directors adopted a 2014 Equity Incentive Plan (2014 Plan) and the Company's stockholders approved it. In May 2017, the Company's stockholders approved an amendment to the 2014 Equity Incentive Plan (2014 Amended Plan), to, among other things, increase the available shares by 2.5 million. The 2014 Amended Plan provides for the grant of incentive stock options, within the meaning of Section 422 of the Internal Revenue Code, to employees and any parent and subsidiary corporations' employees, and for the grant of nonstatutory stock options, restricted stock, restricted stock units, stock appreciation rights, performance units and performance shares to employees, directors and consultants and parent and subsidiary corporations' employees and consultants. The shares available for issuance under the 2014 Amended Plan include shares returned to the 2009 Plan as the result of expiration or termination of awards (provided that the maximum number of shares that may be added to the 2014 Amended Plan pursuant to such previously granted awards under the 2009 Plan is 961,755 shares). The maximum number of shares that may be issued under the 2014 Amended Plan is 5.5 million plus shares added from 2009 Plan, if any. As of December 31, 2017, a total of 3.1 million shares of common stock were available for issuance pursuant to the 2014 Amended Plan. As of December 31, 2017, awards covering 2.4 million shares of common stock were outstanding under the 2014 Amended Plan.

In September 2016, the board of directors adopted the 2016 Inducement Equity Incentive Plan (2016 Plan). The 2016 Plan provides for the grant of nonstatutory stock options, restricted stock, restricted stock units, stock appreciation rights, performance units and performance shares to new employees. Stock options granted under the 2016 Plan have a term of ten years from the date of grant, the exercise price for the shares to be issued will be no less than 100% of the fair market value per share on the date of grant and generally vest over a four-year period. The maximum aggregate number of shares that may be issued under the 2016 Plan is 500,000 shares. As of December 31, 2017, a total of 0.1 million shares of common stock were available for issuance pursuant to the 2016 Plan. As of December 31, 2017, awards covering 0.4 million shares of common stock were outstanding under the 2016 Plan.

Stock options granted to date under the 2009 Plan and the 2014 Plan have a term of ten years from the date of grant, and generally vest over a four-year period. However, in the event that an incentive stock option (ISO) granted to a participant who, at the time the ISO is granted, owns stock representing more than ten percent (10%) of the total combined voting power of all classes of stock of the Company, the term of the ISO shall be five years from the grant date or such shorter term as may be provided in the award agreement.

In July 2014, the board of directors adopted the 2014 Employee Stock Purchase Plan (ESPP) and the stockholders approved it. As of December 31, 2017, a total of 1,270,388 shares of common stock were available for issuance under the ESPP. In addition, the ESPP provides for annual increases in the number of shares available for sale under the ESPP on the first day of each fiscal year beginning in 2015, equal to the least of: (i) 355,618 shares; (ii) 1.5% of the outstanding shares of the common stock on the last day of the immediately preceding fiscal year; or (iii) such other amount as may be determined by the administrator. As of December 31, 2017, 92,493 shares have been purchased under the ESPP.

Stock Options

The exercise price of all options granted during the years ended December 31, 2017, 2016 and 2015 was equal to the estimated fair value of the underlying common stock on the date of grant. The fair value of each stock option granted is estimated on the grant date under the fair value method using the Black-Scholes model. The estimated fair values of the stock option, including the effect of estimated forfeitures, are then expensed over

the requisite service period which is generally the vesting period. The following assumptions were used to estimate the fair value of stock options:

	Years Ended December 31,		
	2017	2016	2015
Risk-free interest rate	1.5 – 2.4%	1.1 – 2.0%	1.3 – 1.9%
Expected volatility	64.0 – 68.0%	63.1 – 68.6%	49.8 – 68.2%
Expected dividend yield	0.0%	0.0%	0.0%
Expected life of options in years	2.2 - 9.3	5.1 - 6.3	6.0

The fair value of equity instruments that are ultimately expected to vest, net of estimated forfeitures, are recognized and amortized on a straight-line basis over the requisite service period. The Black-Scholes option-pricing model requires multiple subjective inputs, including a measure of expected future volatility. Prior to the Company's IPO, the Company's stock did not have a readily available market. Consequently, the expected future volatility was based on the historical volatility for comparable publically traded companies over the most recent period commensurate with the estimated expected term of the Company's stock options. Beginning in the fourth quarter of 2016, the expected future volatility was based on the historical volatility for the Company's common stock. Following the completion of the Company's IPO in July 2014, the fair value of options granted is based on the closing price of the Company's common stock on the date of grant as quoted on the NYSE American.

The risk-free interest rate assumption is based upon observed interest rates during the period appropriate for the expected term of the options. The expected term of the options has been estimated using the simplified method to determine the expected life of the Company's options due to insufficient activity as a basis from which to estimate future exercise patterns. With the exception of 1,217,784 shares of common stock issued in connection with the payment of all accrued and unpaid dividends on the preferred stock immediately prior to the completion of the Company's IPO, the Company had never declared or paid dividends and has no plans to do so in the foreseeable future. Accordingly, the dividend yield assumption is based on the expectation that the Company will not pay dividends on its common stock in the future. Authoritative guidance requires forfeitures to be estimated at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. The weighted-average grant date fair value of options granted during the year ended December 31, 2017, 2016 and 2015 was \$2.92, \$5.47 and \$5.91 respectively. Total fair value of shares vested during the years ended December 31, 2017, 2016 and 2015 was \$3.9 million, \$972 thousand and \$971 thousand, respectively.

Stock option transactions under the 2009, 2014 and 2016 Plans during the year ended December 31, 2017 were as follows:

	Number of Options (in thousands)	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value (in thousands)
Outstanding at January 1, 2017	2,571	\$8.62		
Granted	1,583	6.51		
Exercised	(85)	0.31		
Cancelled (forfeited)	(832)	9.81		
Outstanding at December 31, 2017	<u>3,237</u>	\$7.50	7.40	\$392
Vested and expected to vest at December 31, 2017	2,921	\$7.64	7.21	\$392
Vested and exercisable at December 31, 2017	1,512	\$8.44	5.91	\$392

The Company received \$26 thousand, \$123 thousand and \$201 thousand for the years ended December 31, 2017, 2016 and 2015, respectively, for options exercised.

As of December 31, 2017, there was approximately \$4.3 million of unrecognized compensation cost related to unvested stock option awards, and the weighted-average period over which this cost is expected to be recognized is 2.54 years.

The total aggregate intrinsic value, which is the amount, if any, by which the exercise price was exceeded by the estimated fair value of the Company's common stock, of options exercised, was \$0.3 million, \$0.6 million and \$4.7 million for the years ended December 31, 2017, 2016 and 2015, respectively.

9. Retirement Plan

The Company has a 401(k) Savings Plan (401(k)). The 401(k) is for the benefit of all qualifying employees and permits voluntary contributions by employees up to a maximum percentage allowable by current IRS regulations. During the years ended December 31, 2017 and 2016, the Company made matching contributions to the 401(k) of \$226 thousand and \$197 thousand, respectively. During the year ended December 31, 2015, the Company did not match employee contributions.

10. Income Taxes

The components of the income tax (benefit) expense are as follows:

	<u>Years Ended December 31,</u>		
	<u>2017</u>	<u>2016</u>	<u>2015</u>
	<i>(in thousands)</i>		
Current	\$(172)	\$(2,164)	\$ (680)
Deferred	<u>—</u>	<u>1,955</u>	<u>1,132</u>
Total (benefit) expense	<u><u>\$(172)</u></u>	<u><u>\$ (209)</u></u>	<u><u>\$ 452</u></u>

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the "Tax Act"). The Tax Act makes broad and complex changes to the U.S. tax code, including, but not limited to, reducing the U.S. federal corporate tax rate from 35 percent to 21 percent for tax years beginning after December 31, 2017.

Pursuant to the SEC Staff Accounting Bulletin ("SAB") No. 118, "Income Tax Accounting Implications of the Tax Cuts and Jobs Act" ("SAB 118"), a company may select between one of three scenarios to determine a reasonable estimate arising from the Tax Act. Those scenarios are (i) a final estimate which effectively closes the measurement window; (ii) a reasonable estimate leaving the measurement window open for future revisions; and (iii) no estimate as the law is still being analyzed. The Company was able to provide a reasonable estimate for the revaluation of deferred taxes by recording a net tax provision of \$6.4 million in the period ending December 31, 2017 which is offset by a full valuation allowance. This tax expense is primarily due to the corporate rate reduction. The Company has also recorded a tax benefit of \$0.2 million for the AMT credits which are refundable in tax year 2018 through 2022.

As of December 31, 2017, the Company had federal and state research and development credits carryforwards of approximately \$4.1 million and \$2.7 million, respectively, to offset potential tax liabilities. The federal research and development credits have a 20-year carryforward period and begin to expire in 2030 unless utilized. California research and development tax credits have no expiration. The Company has \$43.6 million federal net operating loss carryforwards and \$25.9 million of state net operating loss carryforwards as of December 31, 2017. The federal and state net operating losses can be carried forward until 2037 unless utilized.

The Company completed an IRC Section 382/383 analysis through December 31, 2014. The Company has not updated such Section 382 study through December 31, 2017. Future and current utilization of federal and state tax attribute carry-forwards may be limited, if, upon completion of our Section 382 study through December 31, 2017, it determines ownership changes within the meaning of Section 382 have occurred.

Significant components of the Company's deferred tax assets as of December 31, 2017 and 2016 are shown below. A valuation allowance of \$19.2 million and \$14.5 million for the years ended December 31, 2017 and 2016, respectively, has been established to offset deferred tax assets as realization of such assets is uncertain.

	December 31,	
	2017	2016
	<i>(in thousands)</i>	
Deferred tax assets		
Net operating losses	\$ 10,968	\$ 7,442
Stock-based compensation	1,196	1,069
Research and development credits	5,473	3,456
Deferred revenue	2,581	4,166
Accruals and other	696	846
Total deferred tax assets	<u>20,914</u>	<u>16,979</u>
Deferred tax liabilities		
Depreciation and amortization	(436)	(629)
Intangible assets	(1,267)	(1,867)
Total deferred tax liabilities	<u>(1,703)</u>	<u>(2,496)</u>
Valuation allowance	<u>(19,211)</u>	<u>(14,483)</u>
Net deferred tax asset	<u>\$ —</u>	<u>\$ —</u>

A reconciliation of the Company's effective tax rate and federal statutory tax rate at December 31, 2017, 2016 and 2015 is as follows:

	December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
Federal income taxes	\$ (8,791)	\$ 1,792	\$ (9,440)
State income taxes	(949)	190	(673)
State rate changes	(392)	(1,080)	743
Impact of change in federal income tax rates	6,401	—	—
Stock-based compensation	623	489	(117)
Valuation allowance	4,728	130	9,984
Research and development credits	(1,897)	(1,683)	(815)
Permanent items and other	105	(47)	770
Total income tax (benefit) expense	<u>\$ (172)</u>	<u>\$ (209)</u>	<u>\$ 452</u>

In accordance with authoritative guidance, the impact of an uncertain income tax position on the income tax return must be recognized at the largest amount that is more-likely-than-not to be sustained upon audit by the relevant taxing authority. An uncertain income tax position will not be recognized if it has less than a 50% likelihood of being sustained. The Company established an uncertain tax position with respect to its research and development credits as of December 31, 2017.

Following is a tabular reconciliation of the Company's Unrecognized Tax Benefits activity (excluding interest and penalties):

	December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
Beginning balance of unrecognized tax benefits	\$ 730	\$ 301	\$ —
Additions based on tax positions related to the current year	361	369	162
Additions based on tax positions of prior years	—	79	139
Reductions for tax positions of prior years	(59)	(19)	—
Ending balance of unrecognized tax benefits	<u>\$1,032</u>	<u>\$ 730</u>	<u>\$ 301</u>

As of December 31, 2017, if recognized, approximately \$0.9 million would affect the effective tax rate if the Company did not have a full valuation allowance.

The Company's practice is to recognize interest and/or penalties related to income tax matters in income tax expense. No accrued interest or penalties were included in its consolidated balance sheets at December 31, 2017, or 2016, and the Company did not recognize any interest and/or penalties in its consolidated statements of operations during the years ended December 31, 2017, 2016, or 2015.

The Company does not anticipate significant increases or decreases within the next 12 months with respect to its unrecognized tax benefit.

The Company is subject to income tax in the United States and California. The Company currently is under examination by the IRS for tax years December 31, 2015 and December 31, 2016. The Company's tax years 2013 and forward are subject to examination by the United States tax authorities and tax years 2009 and forward are subject to examination by California and various state tax authorities.

11. Net (Loss) Income Per Share of Common Stock

The following table summarizes the computation of basic and diluted net (loss) income per share attributable to common stockholders of the Company:

	December 31,		
	2017	2016	2015
	<i>(in thousands, except per share data)</i>		
Net (loss) income	\$ (25,684)	\$ 5,481	\$ (28,216)
Weighted average shares used to compute basic net (loss) income per share	23,503	23,389	22,376
Dilutive effect of employee stock option plans	—	299	—
Dilutive weighted-average common shares outstanding	23,503	23,688	22,376
Basic and diluted net (loss) income per common share	<u>\$ (1.09)</u>	<u>\$ 0.23</u>	<u>\$ (1.26)</u>

Basic net (loss) income per share is computed by dividing the net (loss) income by the weighted-average number of common shares outstanding for the period. Diluted net (loss) income per share is computed by dividing the net (loss) income by the weighted-average number of common shares and dilutive common stock equivalents outstanding for the period, determined using the treasury-stock method, if inclusion of these is dilutive. Because the Company reported a net loss for the years ended December 31, 2017 and 2015, diluted net loss per common share is the same as basic net loss per common share for those periods.

The following potentially dilutive securities outstanding at the end of the periods presented have been excluded from the computation of diluted shares outstanding because of their anti-dilutive impact to earnings per share:

	December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
Options to purchase common stock	3,237	1,774	1,638
ESPP	75	60	33

12. Quarterly Financial Data (unaudited)

The following is a summary of the quarterly results of the Company for the years ended December 31, 2017 and 2016:

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year Ended December 31
	<i>(in thousands, except for per share data)</i>				
2017					
Revenues	\$ 2,818	\$ 3,029	\$ 5,024	\$ 17,909	\$ 28,780
Cost of revenues	810	905	1,766	1,675	5,156
Gross profit	2,008	2,124	3,258	16,234	23,624
Operating expenses	12,084	14,486	12,111	10,918	49,599
Other income, net	44	38	35	2	119
Income tax benefit	—	—	—	172	172
Net (loss) income	<u>(10,032)</u>	<u>(12,324)</u>	<u>(8,818)</u>	<u>5,490</u>	<u>(25,684)</u>
Net (loss) income per share, basic and diluted	\$ (0.43)	\$ (0.52)	\$ (0.37)	\$ 0.23	\$ (1.09)
Shares used in the calculation of net (loss) income per share:					
Basic	23,436	23,486	23,539	23,548	23,503
Diluted	23,436	23,486	23,539	23,697	23,503
2016					
Revenues	\$ 2,764	\$ 3,135	\$48,824	\$ 5,471	\$ 60,194
Cost of revenues	1,276	1,440	1,285	1,312	5,313
Gross profit	1,488	1,695	47,539	4,159	54,881
Operating expenses	9,696	11,907	13,095	15,060	49,758
Other income, net	—	46	52	51	149
Income tax benefit (expense)	(1)	—	—	210	209
Net income (loss)	<u>(8,209)</u>	<u>(10,166)</u>	<u>34,496</u>	<u>(10,640)</u>	<u>5,481</u>
Net income (loss) per share:					
Basic	\$ (0.35)	\$ (0.43)	\$ 1.47	\$ (0.45)	\$ 0.23
Diluted	\$ (0.35)	\$ (0.43)	\$ 1.46	\$ (0.45)	\$ 0.23
Shares used in the calculation of net income (loss) per share:					
Basic	23,353	23,379	23,400	23,424	23,389
Diluted	23,353	23,379	23,689	23,424	23,688

Item 9. *Changes in and Disagreements with Accountants on Accounting and Financial Disclosure*

None.

Item 9A. *Controls and Procedures*

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Principal Executive Officer and Principal Financial Officer, has evaluated the effectiveness of our disclosure controls and procedures as of the end of the period covered by this Annual Report on Form 10-K. The term “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (Exchange Act), means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the Securities and Exchange Commission’s (SEC) rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to management, including its principal executive and principal financial officers, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based upon that evaluation, our Principal Executive Officer and Principal Financial Officer concluded that our disclosure controls and procedures were effective at the reasonable assurance level as of December 31, 2017 to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements in accordance with GAAP.

Management’s Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act). Management conducted an assessment of the effectiveness of our internal control over financial reporting based on the criteria set forth in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Based on this assessment, management has concluded that its internal control over financial reporting was effective as of December 31, 2017.

Our independent registered public accounting firm, KPMG LLP, is not required to and has not issued an attestation report as of December 31, 2017 due to a transition period established by the rules of the SEC for newly public companies that have not lost their “emerging growth company” status as defined in the JOBS Act.

Changes in Internal Control Over Financial Reporting

There were no changes in our internal control over financial reporting identified in connection with the evaluation required by Rule 13a-15(d) and 15d-15(d) of the Exchange Act that occurred during the quarter ended December 31, 2017 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Inherent Limitations on Effectiveness of Controls

Management recognizes that a control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Further, the design of a control system must reflect the fact that there are resource constraints and that management is required to apply its judgment in evaluating the benefits of possible controls and procedures relative to their costs. Because of the

inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud or error, if any, have been detected. These inherent limitations include the realities that judgments in decision making can be faulty, and that breakdowns can occur because of a simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people, or by management override of the controls. The design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with policies or procedures may deteriorate. Because of the inherent limitations in a cost-effective control system, misstatements due to error or fraud may occur and not be detected.

Item 9B. *Other Information*

Not applicable.

PART III

Item 10. *Directors, Executive Officers and Corporate Governance*

The information required by this item is incorporated herein by reference from our definitive proxy statement relating to our 2018 annual meeting of shareholders. The definitive proxy statement will be filed with the Securities and Exchange Commission within 120 days after the end of the 2017 fiscal year.

Codes of Ethics and Conduct

Our board of directors has adopted a code of business conduct and ethics that applies to all of our employees, officers, and directors, including our Chief Executive Officer, Chief Financial Officer, and other executive and senior financial officers. The full text of our Code of Ethics and Conduct is posted on the Investors portion of our website at <http://pfenex.investorroom.com/>. We will post amendments to our Code of Ethics and Conduct or waivers of our Code of Ethics and Conduct for directors and executive officers on the same website.

Item 11. *Executive Compensation*

The information required by this item is incorporated herein by reference from our definitive proxy statement relating to our 2018 annual meeting of shareholders. The definitive proxy statement will be filed with the Securities and Exchange Commission within 120 days after the end of the 2017 fiscal year.

Item 12. *Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters*

The information required by this item is incorporated herein by reference from our definitive proxy statement relating to our 2018 annual meeting of shareholders. The definitive proxy statement will be filed with the Securities and Exchange Commission within 120 days after the end of the 2017 fiscal year.

Item 13. *Certain Relationships and Related Transactions and Director Independence*

The information required by this item is incorporated herein by reference from our definitive proxy statement relating to our 2018 annual meeting of shareholders. The definitive proxy statement will be filed with the Securities and Exchange Commission within 120 days after the end of the 2017 fiscal year.

Item 14. *Principal Accounting Fees and Services*

The information required by this item is incorporated herein by reference from our definitive proxy statement relating to our 2018 annual meeting of shareholders. The definitive proxy statement will be filed with the Securities and Exchange Commission within 120 days after the end of the 2017 fiscal year.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(a) The following documents are filed as part of this report:

1. Financial Statements

See Index to Financial Statements at Item 8 herein.

2. Financial Statement Schedules

SCHEDULE II—VALUATION AND QUALIFYING ACCOUNTS

	Years Ended December 31,		
	2017	2016	2015
	<i>(in thousands)</i>		
Allowance for Doubtful Accounts:			
Beginning balance	\$ 50	\$ 408	\$ 585
Reductions and write-offs	<u>(50)</u>	<u>(358)</u>	<u>(177)</u>
Ending balance	<u>\$—</u>	<u>\$ 50</u>	<u>\$ 408</u>

All other schedules have been omitted because they are not required, not applicable, or the required information is otherwise included.

3. Exhibits

The documents listed in the Exhibit Index of this Annual Report on Form 10-K are incorporated by reference or are filed with this report, in each case as indicated therein (numbered in accordance with Item 601 of Regulation S-K).

EXHIBIT INDEX

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
3.1	Amended and Restated Certificate of Incorporation of the Registrant.	8-K	001-36540	3.2	July 29, 2014
3.2	Amended and Restated Bylaws of the Registrant.	S-1	333-196539	3.3	June 5, 2014
4.1	Specimen Stock Certificate.	S-1/A	333-196539	4.1	June 23, 2014
4.2	Investors' Rights Agreement, dated December 1, 2009, as amended, by and among the Registrant and the investors named therein.	S-1/A	333-196539	4.2	July 7, 2014
4.3	Amended and Restated Subscription Agreement, dated May 2, 2014.	S-1	333-196539	4.3	June 5, 2014
10.1+	2009 Equity Incentive Plan and form of award thereunder.	S-1	333-196539	10.1	June 5, 2014

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
10.2+	Amended and Restated 2014 Equity Incentive Plan and form of award thereunder.	8-K	001-36540	10.1	May 8, 2017
10.3+	2014 Employee Stock Purchase Plan.	S-1/A	333-196539	10.3	July 7, 2014
10.4+	2016 Inducement Equity Incentive Plan and forms of award thereunder.	10-Q	001-36540	10.4	November 9, 2016
10.5	Form of Indemnification Agreement.	S-1	333-196539	10.4	June 5, 2014
10.6	Lease Agreement, dated June 22, 2010, between the Registrant and BRS-Tustin Safeguard Associates II, LLC.	S-1	333-196539	10.5	June 5, 2014
10.7	First Amendment to Multi-Tenant Industrial/Commercial Lease dated September 4, 2014 between the Registrant and BRS-Tustin Safeguard Associates II, LLC.	8-K	001-36540	10.1	September 25, 2014
10.8	Second Amendment to Multi-Tenant Industrial/Commercial Lease dated November 19, 2015 between the Registrant and BRS-Tustin Safeguard Associates II, LLC.	10-K	001-36540	10.7	March 10, 2016
10.9	Third Amendment to Multi-Tenant Industrial/Commercial Lease dated February 24, 2016 between the Registrant and BRS-Tustin Safeguard Associates II, LLC.	10-Q	001-36540	10.2	May 9, 2016
10.10†	Joint Development & License Agreement, dated December 31, 2012, between the Registrant and Agila Biotech Private Limited.	S-1/A	333-196539	10.6	June 25, 2014
10.11†	Joint Venture Agreement, dated March 7, 2013, between the Registrant and Agila Biotech Private Limited.	S-1/A	333-196539	10.7	June 25, 2014
10.12	Termination Agreement by and between the Registrant and Stelis Biopharma Private Limited, dated August 8, 2017.	10-Q	001-36540	10.3	August 9, 2017
10.13†	Technology License Agreement, dated November 30, 2009, between the Registrant and The Dow Chemical Company.	S-1/A	333-196539	10.8	June 25, 2014
10.14	Grant Back License Agreement, dated November 30, 2009, between the Registrant and The Dow Chemical Company.	S-1	333-196539	10.9	June 5, 2014
10.15	Technology Assignment Agreement, dated November 30, 2009, between the Registrant and The Dow Chemical Company.	S-1	333-196539	10.10	June 5, 2014
10.16	Contribution Assignment and Assumption Agreement, dated November 30, 2009, between the Registrant and The Dow Chemical Company.	S-1	333-196539	10.11	June 5, 2014

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
10.17†	Subcontract Agreement, effective September 11, 2009, between the Registrant, as assignee of The Dow Chemical Company, and Science Applications International Corporation.	S-1/A	333-196539	10.12	June 25, 2014
10.18†	Subcontract Agreement, Modification 21, effective September 12, 2014, between the Registrant, as assignee of The Dow Chemical Company, and Science Applications International Corporation.	10-Q	001-36540	10.4	November 14, 2014
10.19†	Cost Plus Fixed Fee Agreement, dated July 30, 2010, as amended December 18, 2014, between the Registrant and the United States Department of Health and Human Services.	10-K	001-36540	10.15	March 16, 2015
10.20	Modification No. 11, effective January 5, 2015, to Contract Agreement dated July 30, 2010, between the Registrant and the United States Department of Health and Human Services	10-Q	001-36540	10.6	May 14, 2015
10.21	Modification No. 12, effective May 5, 2015, to Contract Agreement dated July 30, 2010, between the Registrant and the United States Department of Health and Human Services.	10-Q	001-36540	10.1	August 13, 2015
10.22	Modification No. 13, effective July 23, 2015, to Contract Agreement dated July 30, 2010, between the Registrant and the United States Department of Health and Human Services.	10-Q	001-36540	10.2	November 13, 2015
10.23†	Modification No. 14, effective October 20, 2015, to Contract Agreement dated July 30, 2010, between the Registrant and the United States Department of Health and Human Services.	10-K	001-36540	10.20	March 10, 2016
10.24†	Modification No. 15, effective March 14, 2016, to Contract Agreement dated July 30, 2010, between the Registrant and the United States Department of Health and Human Services.	10-Q	001-36540	10.4	May 9, 2016
10.25	Credit Agreement, dated May 1, 2012, as amended, between the Registrant and Wells Fargo Bank, National Association.	S-1	333-203418	10.16	April 15, 2015
10.26	Third Amendment to Credit Agreement, dated December 11, 2014, between the Registrant and Wells Fargo Bank, National Association.	10-K	001-36540	10.17	March 16, 2015

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
10.27	Amended and Restated Credit Agreement, dated July 1, 2015, between the Registrant and Wells Fargo Bank, National Association.	8-K	001-36540	10.1	July 6, 2015
10.28	First Amendment to Amended and Restated Credit Agreement, dated September 28, 2015, between the Registrant and the Wells Fargo Bank, National Association.	10-Q	001-36540	10.3	November 13, 2015
10.29	Security Agreement, dated May 1, 2012, between the Registrant and Wells Fargo Bank, National Association.	S-1	333-196539	10.15	June 5, 2014
10.30	Security Agreement, dated June 24, 2013, between the Registrant and Wells Fargo Bank, National Association.	S-1	333-196539	10.17	June 5, 2014
10.31	Security Agreement dated June 24, 2014 between the Registrant and Wells Fargo Bank, National Association.	S-1/A	333-196539	10.28	July 7, 2014
10.32	Revolving Line of Credit Note, dated May 1, 2012, between the Registrant and Wells Fargo Bank, National Association.	S-1	333-203418	10.19	April 15, 2015
10.33	Revolving Line of Credit Note, dated June 24, 2013, between the Registrant and Wells Fargo Bank, National Association.	S-1	333-203418	10.21	April 15, 2015
10.34	Amended and Restated Revolving Line of Credit Note, dated July 1, 2015, between the Registrant and Wells Fargo Bank, National Association.	8-K	001-36540	10.2	July 6, 2015
10.35	Securities Account Control Agreement, dated June 24, 2013, between the Registrant and Wells Fargo Bank, National Association.	S-1	333-196539	10.19	June 5, 2014
10.36+	Executive Employment Agreement, dated June 20, 2014, between the Registrant and Bertrand C. Liang.	S-1/A	333-196539	10.20	June 23, 2014
10.37+	Executive Employment Agreement, dated June 20, 2014, between the Registrant and Paul A. Wagner.	S-1/A	333-196539	10.21	June 23, 2014
10.38+	Executive Employment Agreement, dated June 20, 2014, between the Registrant and Patricia Lady.	S-1/A	333-196539	10.22	June 23, 2014
10.39+	Executive Employment Agreement, dated June 20, 2014, between the Registrant and Patrick K. Lucy.	S-1/A	333-196539	10.23	June 23, 2014
10.40+	Executive Employment Agreement, dated June 20, 2014, between the Registrant and Henry W. Talbot.	S-1/A	333-196539	10.24	June 23, 2014

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
10.41+	Executive Employment Agreement, dated November 3, 2014, between the Registrant and Hubert C. Chen.	10-K	001-36540	10.29	March 16, 2015
10.42+	Executive Employment Agreement, dated September 26, 2016, between the Registrant and Steven Sandoval, Sr.	10-Q	001-36540	10.3	November 9, 2016
10.43+	Executive Employment Agreement, dated August 3, 2017, between the Registrant and Evert B. Schimmelpennink.	8-K	001-36540	10.1	August 3, 2017
10.44+	Executive Employment Agreement, effective February 1, 2018, between the Registrant and Susan A. Knudson.	8-K	001-36540	10.1	January 4, 2018
10.45+	Separation Agreement and Release by and between the Company and Bertrand C. Liang effective January 23, 2017.	8-K	001-36540	10.1	January 24, 2017
10.46+	Consulting Agreement by and between the Company and Bertrand C. Liang effective January 23, 2017.	8-K	001-36540	10.1	January 24, 2017
10.47+	Mutual Separation Agreement and Mutual Release by and between the Company and Paul Wagner dated September 7, 2017.	8-K	001-36540	10.1	September 7, 2017
10.48+	Consulting Agreement by and between the Company and Paul Wagner effective September 7, 2017.	8-K	001-36540	10.1	September 7, 2017
10.49+	Mutual Separation Agreement and Mutual Release by and between the Company and Steven S. Sandoval, Sr. dated September 7, 2017.	8-K	001-36540	10.3	September 7, 2017
10.50+	Executive Incentive Compensation Plan.	S-1/A	333-196539	10.27	June 23, 2014
10.51†	Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	S-1/A	333-196539	10.25	June 25, 2014
10.52	Modification No. 3, dated October 31, 2014, to Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	10-K	001-36540	10.32	March 16, 2015
10.53†	Modification No. 4, dated January 5, 2015, to Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	10-K	001-36540	10.33	March 16, 2015
10.54†	Modification No. 5, dated April 5, 2015, to Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	S-1	333-203418	10.34	April 15, 2015

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
10.55†	Modification No. 6, dated November 2, 2015, to Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	10-K	001-36540	10.43	March 10, 2016
10.56†	Modification No. 7, dated February 22, 2016, to Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	10-Q	001-36540	10.3	May 9, 2016
10.57†	Modification No. 8, dated May 16, 2016, to Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	10-Q	001-36540	10.1	August 8, 2016
10.58†	Modification No. 9, effective September 28, 2016, to Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	10-Q	001-36540	10.2	November 9, 2016
10.59†	Modification No. 10, effective October 31, 2016, to Contract Agreement, dated September 27, 2012, between the Registrant and the National Institutes of Health.	10-K	001-36540	10.53	March 15, 2017
10.60†	Development and License Agreement, dated February 9, 2015, between the Registrant and Hospira Bahamas Biologics Ltd.	S-1/A	333-203418	10.35	April 23, 2015
10.61†	Cost Plus Fixed Fee Agreement, dated August 14, 2015 between the Registrant and the United States Department of Health and Human Services.	10-Q/A	001-36540	10.1	February 23, 2016
10.62†	Modification No. 1, effective October 15, 2015, to Cost Plus Fixed Fee Agreement, dated August 14, 2015, between the Registrant and the United States Department of Health and Human Services.	10-K	001-36540	10.46	March 10, 2016
10.63†	Modification No. 2, effective February 17, 2016, to Cost Plus Fixed Fee Agreement, dated August 14, 2015, between the Registrant and the United States Department of Health and Human Services.	10-Q	001-36540	10.1	May 9, 2016
10.64†	Modification No. 3, effective November 29, 2016, to Cost Plus Fixed Fee Agreement, dated August 14, 2015, between the Registrant and the United States Department of Health and Human Services.	10-K	001-36540	10.58	March 15, 2017

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
10.65†	Modification No. 4, effective January 9, 2017, to Cost Plus Fixed Fee Agreement, dated August 14, 2015, between the Registrant and the United States Department of Health and Human Services.	10-K	001-36540	10.59	March 15, 2017
10.66†	Modification No. 5, effective August 2, 2017, to Cost Plus Fixed Fee Agreement, dated August 14, 2015, between the Registrant and the United States Department of Health and Human Services.	10-Q	001-36540	10.6	November 9, 2017
10.67†	License and Option Agreement, dated July 27, 2016, by and between the Registrant and Jazz Pharmaceuticals Ireland Limited.	10-Q	001-36540	10.1	November 9, 2016
10.68#*	Amended License and Option Agreement, dated December 19, 2017, by and between the Registrant and Jazz Pharmaceuticals Ireland Limited.				
23.1*	Consent of KPMG LLP, Independent Registered Public Accounting Firm.				
23.2*	Consent of Haskell & White, LLP, Independent Registered Public Accounting Firm.				
24.1*	Power of Attorney (contained on signature page).				
31.1*	Certification of Chief Executive Officer pursuant to Exchange Act Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.				
31.2*	Certification of Chief Financial Officer pursuant to Exchange Act Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.				
32.1^	Certifications of Chief Executive Officer and Chief Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.				
101.INS*	XBRL Instance Document.				
101.SCH*	XBRL Taxonomy Extension Schema Document.				
101.CAL*	XBRL Taxonomy Extension Calculation Linkbase Document.				
101.DEF*	XBRL Taxonomy Extension Definition Linkbase Document				

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
101.LAB*	XBRL Taxonomy Extension Label Linkbase Document				
101.PRE*	XBRL Taxonomy Extension Presentation Linkbase Document				

* Filed herewith.

^ The information in this exhibit is furnished and deemed not filed with the Securities and Exchange Commission for purposes of section 18 of the Exchange Act of 1934, as amended (Exchange Act), and is not to be incorporated by reference into any filing of Pfenex Inc. under the Securities Act of 1933, as amended (Securities Act), or the Exchange Act, whether made before or after the date hereof, regardless of any general incorporation language in such filing.

† Portions of the exhibit have been omitted pursuant to an order granted by the Securities and Exchange Commission for confidential treatment.

Portions of this exhibit have been omitted pursuant to a request for confidential treatment and the non-public information has been filed separately with the SEC.

+ Indicates a management contract or compensatory plan.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this Annual Report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized.

Date: March 15, 2018

Pfenex Inc.

By: /s/ Evert B. Schimmelpennink

Evert B. Schimmelpennink
Chief Executive Officer, President, Secretary,
and Director
(Principal Executive Officer)

POWER OF ATTORNEY

Each person whose signature appears below constitutes and appoints Evert B. Schimmelpennink and Susan A. Knudson, and each of them, as his or her true and lawful attorney-in-fact and agent to act, with full power of substitution and resubstitution, for him or her and in his or her name, place and stead, in any and all capacities, and to sign any and all amendments to this Annual Report on Form 10-K, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he or she might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or any of them, or their and his or her substitutes, may lawfully do or cause to be done by virtue thereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated:

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Evert B. Schimmelpennink</u> Evert B. Schimmelpennink	Chief Executive Officer, President, Secretary, and Director <i>(Principal Executive Officer)</i>	March 15, 2018
<u>/s/ Susan A. Knudson</u> Susan A. Knudson	Chief Financial Officer <i>(Principal Financial Officer)</i>	March 15, 2018
<u>/s/ Patricia Lady</u> Patricia Lady	Chief Accounting Officer <i>(Principal Accounting Officer)</i>	March 15, 2018
<u>/s/ Jason Grenfell-Gardner</u> Jason Grenfell-Gardner	Chairman and Director	March 15, 2018
<u>/s/ Robin D. Campbell</u> Robin D. Campbell	Director	March 15, 2018
<u>/s/ Dennis Fenton</u> Dennis Fenton	Director	March 15, 2018

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Phillip M. Schneider</u> Phillip M. Schneider	Director	March 15, 2018
<u>/s/ John Taylor</u> John Taylor	Director	March 15, 2018
<u>/s/ Sigurdur Olafsson</u> Sigurdur Olafsson	Director	March 15, 2018

BOARD OF DIRECTORS

Jason Grenfell-Gardner
Chairman
President, Chief Executive Officer and
Director of Teligent, Inc.

Evert B. Schimmelpennink
Chief Executive Officer, President and
Secretary of Pfenex Inc.

Robin D. Campbell
Technology Management Program Lecturer at
the University of California, Santa Barbara

Dennis M. Fenton
Former Executive Vice President at Amgen,
Inc.

Sigurdur Olafsson
Former President and Chief Executive Officer,
Global Generic Medicines Group of Teva
Pharmaceuticals, Ltd.

Phillip M. Schneider
Former Senior Vice President and Chief
Financial Officer at IDEC Pharmaceuticals
Corporation

John M. Taylor
President and Principal of Compliance and
Regulatory Affairs at Greenleaf Health LLC

CORPORATE OFFICERS

Evert B. Schimmelpennink
Chief Executive Officer, President and
Secretary

Hubert C. Chen
Chief Medical and Scientific Officer

Patrick K. Lucy
Chief Business Officer

Susan A. Knudson
Chief Financial Officer

Patricia Lady
Chief Accounting Officer

CORPORATE HEADQUARTERS

Pfenex Inc.
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San Diego, CA 92121
T: (858) 352-4400
F: (858) 352-4602
www.pfenex.com

COMMON STOCK LISTING

NYSE MKT
Ticker Symbol: PFXN

ANNUAL MEETING OF STOCKHOLDERS

May 9, 2018 at 12:00 p.m. Pacific Time
Offices of Wilson Sonsini Goodrich & Rosati,
P.C.
12235 El Camino Real, Suite 200
San Diego, CA 92130

REGISTRAR AND TRANSFER AGENT

For questions regarding your account,
changes of address or the consolidation of
accounts, please contact the Company's
transfer agent:

American Stock Transfer & Trust Company,
LLC
6201 15th Avenue
Brooklyn, NY 11219
T: 800-937-5449
www.amstock.com

LEGAL COUNSEL

Wilson Sonsini Goodrich & Rosati,
Professional Corporation
San Diego, California

INDEPENDENT AUDITORS

KPMG LLP
San Diego, California

INVESTOR RELATIONS

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PFE*nex*