William Blair

Pfenex Inc.

Initiating Coverage With an Outperform Rating

We are initiating coverage of Pfenex Inc. with an Outperform rating. Our bullish outlook is based on our view that the combination of the company's lead product candidate, technology platform, advancing pipeline, and potential for additional strategic collaborations offers investors significant upside to current share prices.

We believe Pfenex shares represent an attractive value. Recognizing development risks that are common to the biotechnology industry, such as clinical, regulatory and capital risks, we view PFNX shares as an attractive value at current price levels. Trading at $6.50, with $50 million in cash, the current enterprise value is roughly $75 million. We believe current cash should sustain operations for at least an additional 18-24 months.

Proprietary and differentiated technology platform targeting biosimilar markets. Pfenex has assembled its development pipeline of drugs and vaccines around a highly efficient and proprietary cell expression system. Nearly a dozen of the world's largest biopharmaceutical companies have collaborated with Pfenex to access its expertise and systems. The primary focus of the company's development initiatives is biosimilars, and we believe that Pfenex's public market debut comes at a time of increasing investor interest in this area, with clarifying regulatory pathways and numerous biologic drug patent expirations by the end of this decade. We estimate that $45 billion in current biologic sales worldwide are generated by drugs whose patents are set to expire by 2020.

Pfenex's lead product candidate PF582 is a biosimilar form of the $4.3 billion drug Lucentis and has an expanding development pipeline. PF582 is the wholly owned, lead candidate at Pfenex. We expect Phase Ib/IIa data later this year and project the company to advance into a registration-enabling trial in 2015. We estimate that by 2018, roughly $530 million in current sales volume of Lucentis will come off patent, and by 2020 we estimate that figure will increase by an additional $2.0 billion with patent expiry in the United States. Behind PF582 is a portfolio of wholly owned and partnered development initiatives, which we outline in exhibit 1, on page 2. We view the coming 12-18 months as extremely formative for Pfenex, with the potential for clinical data from multiple products and additional corporate collaborations, which could infuse nondilutive capital into the company as well as material increases in the level of awareness of the biosimilar commercial opportunity.

Pfenex is a San Diego–based biotechnology company focused on biosimilars and difficult-to-manufacture protein-based therapeutics. The lead product candidate, PF582, a biosimilar to Lucentis (ranibizumab), is in Phase I/II study with data expected later this year.

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August 18, 2014
Basic Report (14-104)

Stock Rating:	**Outperform**
Company Profile:	**Aggressive Growth**
Symbol:	PFNX (NYSE)
Price:	$6.50 (52-Wk.: $5–$7)
Market Value (mil.):	$120
Fiscal Year End:	December
Dividend/Yield:	None

Estimates	2013A	2014E	2015E
EPS FY	-$0.53	-$0.70	-$0.92
Revenue (mil.)	$11.9	$8.0	$8.2

Trading Data

Shares Outstanding (mil.)	19
Average Daily Volume	280,000

Financial Data

Cash	$50 million
Book Value Per Share	$1.56
Enterprise Value (mil.)	$75

Exhibit 1
Pfenex Inc.
Product Candidates

Product Candidate	Branded Reference Drug	Collaboration Partner	Indication	Expected Status/Milestones
Biosimilars				
PF582 Ranibizumab	Lucentis	Wholly owned	Wet age-related macular degeneration	Phase Ib/IIa in progress Phase III to start in mid-2015 with data expected in 2017
PF530 Interferon beta-1b	Betaseron	Strides Arcolab	Relapsing MS	Phase I to start in 2H 2014
PF694 Pegylated interferon alpha-2a	Pegasys	Strides Arcolab	Chronic hepatitis B and C	Phase I to start in 2H 2015
PF726 Pegylated interferon beta	N/A*	Strides Arcolab	Relapsing MS	Formulation development
PF529 Pegylated filgrastim	Neulasta	Strides Arcolab	Neutropenia in cancer patients	Process development
PF444 Human growth hormone	Genotropin	Strides Arcolab	Growth disturbance	Process development
PF688 Certolizumab-pegol	Cimzia	Wholly owned	Crohn's disease (U.S only) and arthris	Process development
PF690 Pegylated aspargase	Oncaspar	Strides Arcolab	Acute lymphoblastic leukemia	Entering process development
Generic				
PF708 Teriparatide	Forteo	Wholly owned	Osteoporosis	ANDA-enabling PK study to start in 2H 2015
Novel Vaccines				
Px533 Malaria vaccine	N/A	U.S. government funded	Malaria vaccine	Phase I to start in 2H 2014
Px563L rPA-based anthrax vaccine	N/A	U.S. government funded	Anthrax vaccine	Phase I to start in 2H 2014
Px563L-SDI rPA-based anthrax vaccine second generation	N/A	U.S. government funded	Anthrax vaccine	Formulation development

*=PF726 is currently being developed as a next-generation biologic
Sources: Pfenex reports and www.clinicaltrials.gov

Portfolio Manager Summary

We believe that Pfenex offers investors the opportunity to own a stake in a well-managed company with a proprietary and disruptive platform that enables participation in a diverse array of therapeutic and vaccine markets. The technology, which we explain in detail later in this report, is focused on a highly efficient cell expression system for protein-based drug optimization and production. Nearly a dozen of the world's top biopharmaceutical companies have collaborated with Pfenex to access its in-depth expertise and protein drug optimization tools. Specifically, in roughly 100 client programs that failed using at least one other production system, Pfenex demonstrated an 81% success rate in producing active, soluble protein that matched the customer product profile.

Pfenex is principally leveraging its technology platform in the field of biosimilars, which we believe will be an important growth area within the biotechnology sector. Success of the biotechnology industry over the past two decades has given rise to numerous multibillion-dollar drugs, many of which are expected to lose patent exclusivity by 2020. Therefore, the commercial opportunity for companies that choose to participate in the biosimilar arena is significant.

Based on the profile of the Pfenex technology, management's initial focus is a portfolio of biosimilar candidates that collectively target more than $15 billion in currently marketed drugs. A biosimilar is clinically similar to a biologic product that has already been approved by regulators and is referred to as a reference product, notwithstanding minor differences in clinically inactive components and where there are no clinically meaningful differences between the reference product and the biosimilar in terms of the safety, purity, and potency of the product. We anticipate a significant increase in investor interest in biosimilars over the coming two years, driven by the patent expirations of key drugs and potential for FDA approval of the first product through the 351(k) regulatory pathway established for biosimilars in the United States. In late June 2014, the FDA accepted a regulatory filing from Sandoz (a division of Novartis) for a follow-on form of filgrastim (Neupogen). Based on the regulatory timelines associated with the review process for biosimilar drug candidates in the United States, we anticipate the potential for approval in second quarter 2015, which we believe represents a significant milestone for the sector. Moreover, we believe that the first approval through the U.S. regulatory review pathway for biosimilars stands to significantly increase investor interest in the opportunity for biosimilars. Because there are limited pure plays available in the biosimilar area, we believe that investor interest in Pfenex could markedly increase.

Over the coming two years, we expect increased investor awareness in the competitive landscape of the biosimilar arena, particularly in the United States, as the initial biosimilar candidates filed for approval advance through regulatory review and into the market. To date, the FDA has received 10 investigational new drug applications and has held 32 biosimilar product development meetings. As of May 2014, the FDA has released five draft guidance documents regarding the implementation of the 351(k) pathway designed for regulatory review of biosimilar agents.

We believe there will be several categories of biosimilar market participants, ranging from large biopharmaceutical companies, such as Amgen, Pfizer, Biogen Idec, and Novartis, to providers of technical products and services that support the manufacturing process, to companies with innovative approaches to production efficiency as well as those seeking geographical niches. Recognizing the distinctions between the various participants and roles enables a clearer understanding of small-company participation in the space. For example, we expect large organizations, such as Biogen Idec or Amgen, to leverage existing know-how in protein manufacturing, facilities, and commercial infrastructure. While this approach is strategically sensible, it is fundamentally different from the Pfenex approach, which is built on a set of processes and technologies aimed at improving drug optimization and production efficiency, leading to potential cost advantages. If successful in driving optimization speed and production efficiency, the Pfenex platform would enable greater pricing flexibility while maintaining attractive gross margins. By way of background, biosimilar pricing discounts range from the midsingle digits to over 25% in Europe, and Express Scripts estimates that the availability of biosimilars could offer cost savings of $250 billion by 2022.

PF582, Pfenex's lead candidate, is a biosimilar form of Lucentis, a drug marketed by Roche and Novartis for age-related macular degeneration (AMD), macular edema following retinal vein occlusion, and diabetic macular edema. The drug is wholly owned by Pfenex, and we expect Phase Ib/IIa clinical data later this year, followed by the initiation of Phase III clinical trials beginning in 2015. Lucentis achieved sales of $4.3 billion globally in 2013, and patent expiry in the United States and Canada by 2020 opens up a $2.5 billion opportunity, calculated from 2013 sales levels, for Pfenex. In addition, Lucentis is difficult to manufacture, rendering it unattractive to many larger companies yet highly attractive to Pfenex, due to the efficiency of its proprietary expression system. Lastly, we believe that there are inherent advantages in leading with a compound that has small injection volume and is administered in an encapsulated space.

As illustrated in exhibit 1, Pfenex alone and in collaboration has seven biosimilar candidates, as well as five vaccine, generic, and next-generation biologic candidates. Following PF582 is PF530, a biosimilar form of Betaseron for the treatment of multiple sclerosis, which is expected to advance

into clinical testing later this year, with Phase I data released in the first half of 2015. We believe the advancement of this portfolio will present significant catalysts over the coming two years; exhibit 2 provides an outline of key expected clinical and regulatory catalysts. In addition, we believe that the versatility of the Pfenex technology platform will become increasingly attractive to large biotechnology and pharmaceutical companies, and we see potential for Pfenex to execute additional strategic deals with terms that allow greater economic and development participation.

Pfenex has roughly $50 million in capital and a current enterprise value of roughly $75 million. With an underlying technology platform and multiple drug and vaccine candidates, we believe that PFNX shares are attractive at current price levels. Therefore, we are initiating coverage with an Outperform rating.

Exhibit 2
Pfenex Inc.
Timeline

Date	Product	Event
2014	PF530 (biosimilar Betaseron)	Phase I trial initiation in relapsing forms of MS (2H).
	PF582 (biosimilar Lucentis)	Phase Ib/IIa trial initiation in wet age-related macular degeneration (4Q).
	Recombinant Anthrax Vaccine	Phase Ia trial initiation in anthrax (2H).
	Recombinant Malaria Vaccine	Phase I trial initiation in malaria (2H).
2015	PF530 (biosimilar Betaseron)	Phase I trial results in relapsing forms of multiple sclerosis (1H).
	PF582 (biosimilar Lucentis)	Phase III equivalance trial in wet age-related macular degeneration (3Q).
	PF708 (generic Forteo)	ANDA-enabling pharmacokinetic bioequivalence trial initiation in osteoporosis (2H).
	Recombinant Malaria Vaccine	Phase I trial results in malaria.
2016	PF688 (biosimilar Cimzia)	Phase I trial initiation in Crohn's disease and rheumatoid arthritis.
	Recombinant Anthrax Vaccine	Phase Ia trial results in anthrax (3Q).
2017	PF582 (biosimilar Lucentis)	Phase III trial results in age-related macular degeneration.

ANDA = abbreviated new drug application
Sources: Pfenex reports

Valuation and Financial Analysis

Our Outperform rating on PFNX shares is based on our belief that the stock represents an attractive value at current price levels. Recognizing the difficulty in precision valuation of developmental-stage biotechnology companies, we have taken a three-prong approach that includes net present value, comparable analysis, and attribution of value to the technology platform and pipeline to Pfenex, which we believe elucidates the company's value. PFNX shares are trading at about $75 million in enterprise value ($3.95 per share); we see significant room for upside potential in PFNX shares.

Net present value. We performed a net present value exercise using a conservative set of criteria in which we attribute all of the company's value to PF582. Other assumptions in our analysis include the following:

- We rely heavily on the experience of biosimilars in Europe with regard to price discounting and market share. Price discounts range from midsingle digits to over 25%, and certain compounds, such as biosimilar filgrastim, have achieved greater than 60% penetration in the five major European jurisdictions.

- We used the conservative end of both of the aforementioned criteria when valuing PF582, with pricing assumptions of a 30%-40% discount to the current market price of Lucentis, approval only in the indication studied, and patient penetration rates capped at 5%.

Based on these criteria and using discount rates of 15%, we estimate an $8.85 of value associated with PF582. The purpose of such a conservative exercise is to elucidate the value of company, which is currently trading at an enterprise value of about $75 million, or $3.95 per share. Based on the experience in Europe, one could credibly double the penetration rate assumptions and reduce the discount price to arrive closer to $20 per share, void attribution to other company assets.

In addition to conservatively valuing PF582, this exercise attributed no value to the company's other assets, including the technology platform, intellectual property, partnerships, and other pipeline candidates. We therefore believe that the risk/reward trade-off holds significantly more room for upside than downside, and our financial projection (as shown in exhibit 14, on page 20) provides a more-optimistic outlook, with key assumptions that include approval and launch in Canada in 2018 and the United States in 2020. Our penetration assumptions into the Lucentis market are 10% in Canada in 2019 and 17% in 2020. In the United States, we assume a first-year penetration rate of 3% in 2020 and a second-year rate of 14%. Corresponding PF582 revenue are $47 million in 2019 and $141 million in 2020, driving full-year profitability of $0.26 per share in 2020.

Comparable analysis. Recognizing that the biotechnology industry is extremely heterogeneous, we compiled a list of companies that we believe have comparable attributes to Pfenex, as shown in exhibit 3.

Exhibit 3
Pfenex Inc.
Analysis of Comparable Companies
(dollars in millions except share price)

Company	Ticker	Share Price	Market Cap	Enterprise Value	Rating
Auspex Pharmaceuticals, Inc.	ASPX	$19.40	$519.14	$364.40	Outperform
Eleven Biotherapeutics, Inc.	EBIO	$12.27	$199.28	$142.80	
Momenta Pharmaceuticals, Inc.	MNTA	$10.77	$568.06	$654.35	
Nektar Therapeutics	NKTR	$12.42	$1,577.05	$1,338.10	Outperform
Ophthotech Corporation	OPHT	$37.59	$1,253.29	$122.32	
Protalix BioTherapeutics, Inc.	PLX	$3.02	$282.69	$339.96	

Source: FactSet

Attribution of value to the platform, earlier pipeline candidates, and partnerships. We believe that the next two years hold great promise for organic and inorganic value creation inflection points for Pfenex. Exhibit 4 outlines key value drivers and exhibit 5 compares the profile of the company today with its potential profile two years out. In our view, Pfenex is a diverse platform technology with significant intermediate- and long-term potential to be unlocked by its proprietary product pipeline.

Exhibit 4
Pfenex Inc.
Potential Two-Year Value Drivers

Organic	Inorganic
Phase I results with PF582 (biosimilar Lucentis)	531(k) approvals (potentially filgrastim from Sandoz in 2015)
Phase I results with PF530 (biosimilar Betaseron)	Increased press regarding biosimilars
Phase I results with PF694 (biosimilar Pegasys)	Additional biosimilar product approvals in the United States
Pharmacokinetics study results with PF708 (generic Forteo)	Increase appetite for low cost options among private and public payors
Phase I results with anthrax and malaria vaccines	
Additional collaborations	

Source: Company reports and William Blair estimates

Exhibit 5
Pfenex Inc.
Current and Potential Profile

2H 2014	2H 2016
PF582 (biosimilar Lucentis) in Phase Ib/IIa clinical trial	PF582 (biosimilar Lucentis) in pivotal Phase III clinical trial
PF530 (biosimilar Betaseron) in Phase I/II clinical trial*	PF530 (biosimilar Betaseron) in pivotal Phase III clinical trial Phase I data announced*
PF694 (biosimilar Pegasys) in process development	PF694 (biosimilar Pegasys) in Phase I/II clinical trial
PF708 (generic Forteo) in process development	PF708 (generic Forteo) in ANDA-enabling pharmacokinetic study
Px563L (anthrax vaccine) in Phase Ia clinical trial*	Px563L (anthrax vaccine) in Phase II clinical trial* Phase Ia data announced
Px533 (malaria vaccine) in Phase I clinical trial*	Px533 (malaria vaccine) in Phase II clinical trial* Phase I data announced

* = projected
ANDA=abbreviated new drug application
Sources: Company reports and William Blair estimates

Pfenex has roughly $50 million in cash, which we project will sustain it for at least 18-24 months. In addition, we anticipate multiple opportunities for capital fundraising, including corporate and government collaborations and monetization of wholly owned assets.

Key 12- to 18-Month Potential Value Creating Inflection Points

We see the potential for several value-creating inflection points over the coming 12 to 18 months. Given the company's current enterprise value of approximately $75 million, or $3.95 per share, we believe that many of these catalysts could have a material and positive impact on PFNX shares. We highlight the following upcoming events (see exhibit 2, on page 4, for a complete outline):

- Phase Ib/IIa data on PF582 versus Lucentis: This is a trial of 25 patients who were given either Lucentis or PF582. Given the size and nature of this trial, we believe that the most-relevant insight into the data will be safety and tolerability. Specifically, we hope adverse event profiles

are similar between the two arms of the trial. Clinical data is expected in the fourth quarter 2014; the primary endpoint of the trial is safety and tolerability with secondary endpoints of evaluating biosimilarity between PF582 and Lucentis.

- Phase I data from PF530 will be an important inflection point, in our view. PF530 is a biosimilar form of Betaseron and is entering clinical testing later this year. We expect initial results in the first half of 2015.
- Phase Ia trial initiation of anthrax vaccine by the end of the year.
- Phase I challenge trial of malaria vaccine results in 2015.
- Potential for corporate collaborations: Pfenex has a proven track record of collaborating with large pharmaceutical and biotechnology companies; we expect continued collaborative engagements.

Risk Factors

We believe that Pfenex is affected by many of the same risks as other developmental-stage biotechnology companies but it also has some unique risks. Generally, we believe that the risks associated with investing in Pfenex can be categorized into four broad areas: clinical, regulatory, capital, and commercial. While the same might be said of other companies in the biotechnology sector, the type and level of risk in each of the aforementioned categories is different for Pfenex, in our view.

Technical and clinical risk. Unlike most developmental-stage companies, Pfenex does not typically take on the risks associated with exploring novel biologic pathways for therapeutic treatment. Rather, the company is trying to make a compound biologically similar to a currently marketed drug. Therefore, the clinical risks are that the Pfenex compound will not be biosimilar or that adverse events will emerge with Pfenex's biosimilar candidate that have not been observed with the reference product. Biosimilar product candidates developed by Pfenex are produced in a proprietary expression system, and significant bioanalytical tests are conducted to characterize the drug candidate and ensure comparability with the reference product. However, we acknowledge risks in using a cell expression system, which to date is unproved by any global regulatory body.

Regulatory risk. We believe that all development candidates in the biotechnology industry carry some level of regulatory risks. However, with a regulatory pathway for approval of biosimilar drugs becoming clearer, we anticipate the potential for a reduced level of regulatory risks associated with these types of drugs. Notably, in June 2014 the FDA accepted the first biosimilar drug candidate (biosimilar filgrastim from Novartis) for review in the 351(k) pathway; we believe that the drug could be approved in the second quarter of 2015.

Capital risk. Biotechnology companies typically have an ongoing need for capital until reaching FDA drug approval, commercialization, and ultimately cash flow positivity. Capital can come into companies from a variety of sources, including strategic collaborations and equity financing. While we believe that Pfenex is well positioned to execute strategic deals, we assume that the company will need to revisit the capital markets prior to becoming profitable.

Commercial risk. Pfenex has stated an interest in participating in the commercialization of its lead product candidate, PF582. While we believe that this is an achievable goal due to the concentration of retinal surgeons in the United States, we acknowledge that to date Pfenex has no commercial experience as a company.

Management

Pfenex management consists of a team with significant executive experience at a number of large pharmaceutical companies, which develop, manufacture, and commercialize biologic drugs. We believe that the management team, led by Dr. Bertrand Liang, has the expertise and the industry experience to leverage the company's proprietary manufacturing platform and develop clinical programs through development.

Bertrand C. Liang, M.D., Ph.D., M.B.A., President, Chief Executive Officer, and Director
Dr. Liang has served as the chief executive officer and on the board of directors since December 2009. From 2006 through 2008, he served as vice chairman of Paramount BioSciences, a venture capital firm investing in early-stage healthcare companies. Dr. Liang also served as vice president of new ventures and development at Biogen Idec from 2003 to 2005, and prior to the merger, as vice president and head of hematology and oncology from mid-2002 to 2003. From 1999 through 2002, Dr. Liang held the position of development leader at Amgen. He founded and previously served on the board of directors of Coronado Biosciences. Dr. Liang holds a bachelor's degree in chemistry, biology, and philosophy from Boston University; an M.D. from Northwestern University's medical school; a Ph.D. from University of Bolton; and an M.B.A. from Regis University.

Paul A. Wagner, Ph.D., CFA, Chief Financial Officer
Dr. Wagner has led the finance and corporate development program since April 2014. From 2006 to 2014, he held the position of director, portfolio manager, and senior equity analyst at Allianz Global Investors, where he was responsible for biotechnology and pharmaceutical investments. Dr. Wagner was the head of development licensing at PDL BioPharma from 2005 to 2006. Prior to PDL, Dr. Wagner held the position of vice president at Lehman Brothers, from 1999 to 2005. Dr. Wagner received a bachelor's degree from the University of Wisconsin and a Ph.D. in chemistry from The California Institute of Technology. Dr. Wagner is also a CFA charterholder.

Patrick K. Lucy, Chief Business Officer
Mr. Lucy has served as the chief business officer since 2009. Prior to joining Pfenex, Mr. Lucy held the position of director of business development at Dow Pharma, a business unit within The Dow Chemical Company, from 2002 to 2009. From 1999 through 2002, he held the position of director of business development at Collaborative BioAlliance. Mr. Lucy held several positions from 1996 to 1999 as a validation manager, capital project manager, and quality control biochemistry supervisor at Lonza Biologics. From 1991 to 1996, Mr. Lucy held the position of biochemistry quality control supervisor at Repligen Corporation. Mr. Lucy holds a bachelor's degree in biology from Villanova University.

Henry W. Talbot, Ph.D., Vice President of Research and Operations
Dr. Talbot has served as the vice president of research and operations since 2009. Prior to his role at Pfenex, Dr. Talbot was the biotechnology site leader at The Dow Chemical Company from 1999 to 2009. From 1994 to 1998, Dr. Talbot was director of fermentation and manufacturing at Mycogen Corporation, before it was acquired by The Dow Chemical Company. Dr. Talbot holds a bachelor's degree in biology from the University of Colorado, Boulder, an M.S. in microbiology from the University of Missouri, and a Ph.D. in microbiology from Oregon State University.

Company Background

Pfenex is a San Diego–based biotechnology company focused on biosimilars and difficult-to-manufacture protein-based therapeutics; its origins trace back to The Dow Chemical Company. Dow used the technology for industrial enzyme production, and we believe that one of the attractive features of Pfenex is that Dow invested and evolved the technology for over a decade. Moreover, Pfenex benefits from having key employees who possess significant institutional knowledge as a result of working with the technology while it was a part of Dow.

We believe that Pfenex's debut into public markets comes at time of growing investor interest in biosimilar drugs, clarifying regulatory pathways, and numerous biologic drug patent expirations by the end of this decade. In our view, Pfenex is well positioned to participate in an area that we view as an emerging-growth segment of the biotechnology industry. The nature of biosimilar markets and the commercial opportunity is reasonably well characterized; we estimate that branded biologics represent over $160 billion in annual sales. While there are only a few biologics that are off patent, we expect that in 2015, roughly $24 billion in branded sales will lose patent protection globally, and that by 2020, the number could be more than $40 billion. Several of the biotechnology industry's early success stories, such as Neupogen, Remicade, Enbrel, and Rituxan, fall into this category. With such attractive markets becoming available, we expect several biosimilar market participants that represent a variety of profiles. Exhibit 6 provides an outline of select biosimilar drugs approved in Europe.

Exhibit 6
Pfenex Inc.
Biosimilars Approved in Europe

Product	Therapeutic	Therapeutic Area	Manufacturer
Abasria	Insulin glargine	Diabetes	Eli Lilly/ Boehringer Ingelheim
Abseamed	Epoetin alfa	Anemia associated with chemotherapy	Pfizer
Neulasta	Pegfilgrastim	Infection associated with chemotherapy	Amgen
Pegasys	Peginterferon alpha-2a	Hepatitis C infection	Roche
Betaseron	Interferon beta-1b	Multiple sclerosis	Bayer

Sources: Pfenex reports

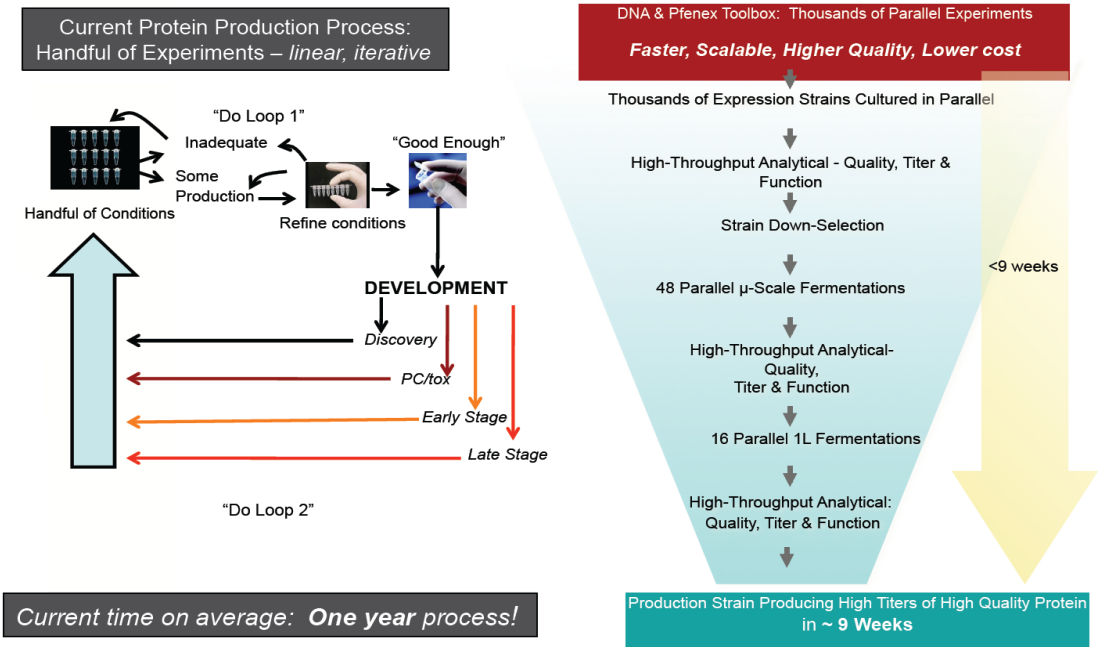
Given the size of the biosimilar market opportunity, we expect there to be consistent growth in investor interest over the coming two to three years. In addition, we expect that there will be a variety of different types of market participants, ranging from providers of hardware and technical services to innovator companies, such as Pfenex, which offer a proprietary approach to production improvement. A question that we receive frequently from investors is how Pfenex plans to compete with larger industry participants with significantly greater levels of resources.

In our opinion, there are several large biopharmaceutical companies uniquely positioned to play prominent roles in the field of biosimilars. Amgen and Biogen Idec, for example, have both articulated an interest in participating in the biosimilar markets. Consider that both companies have large, global, biological manufacturing capabilities with commercial infrastructure in key global markets; leveraging these two capabilities makes good strategic sense, in our view. However, we believe that there will be alternative business models that seek to find niches in global markets, or process improvement, such as Pfenex. Moreover, we believe that the Pfenex technology platform provides the company with the flexibility to participate directly in cases where it has material expression (and

therefore cost) efficiency advantages or potentially in collaboration with larger companies that have established commercial infrastructure. The latter might be a strategically prudent consideration in commercial markets requiring larger sales-and-marketing infrastructure.

Continuing with our view that Pfenex can play a unique role in the biosimilar market, several early data sets point toward potential advantages that the company's proprietary technology platform offers over traditional techniques for therapeutic protein production. We believe that these differences should translate into a strong competitive profile. A key advantage associated with the Pfenex technology is production strain selection and expression efficiency. The technology is geared toward expression of aglycosylated proteins, which represent $15 billion in global product sales. Exhibit 7 highlights several advantages of the Pfenex technology.

Exhibit 7
Pfenex Inc.
Pfenex Expression Technology Platform



Sources Pfenex reports

Technology Platform: From Industrial Enzymes to Technical Service, to Proprietary Biosimilar Candidates

The nucleus of the Pfenex technology platform originated at Dow Chemical Company via its acquisition of Mycogen Corporation, where it was used to produce low-cost industrial enzymes. Over the course of more than a decade, Dow further developed the technology and spun the company out in 2009. This long period of technology investment and advancement, paralleled with improvements in research tools and information technology, has enabled the development of the patented Pfenex Expression Technology. The resulting platform is capable of identifying a final production strain in nine weeks, compared with traditional methods, which take a year or longer. This capability lends itself nicely to the growing field of therapeutic protein optimization and production.

Given the unique capabilities of the technology platform, Pfenex has a long history of providing technical services to large pharmaceutical companies seeking assistance in protein development and production. Before Pfenex became involved in the development of biosimilar candidates, it provided protein production and process services for innovative product candidates for the pharmaceutical industry, including 11 of the 15 largest companies (based on 2013 market capitalization). We believe

that this period of the company's evolution, which included servicing Pfizer, Bristol-Myers Squibb, and MedImmune, provided funding and experience, which has been parlayed into differentiated expertise and tool sets. We also believe that this collaborative experience provides excellent proof of concept regarding the utility and sophistication of the technology platform. Specifically, in over 100 client programs that have failed in at least one other production system, Pfenex has demonstrated an 81% success rate in producing active, soluble protein that matched the customer product profile.

Given the long-term value differentiation between the service provider and proprietary drug development business models, it is not particularly surprising that Pfenex transitioned to development of its own drugs. Moreover, we believe that the company's timing is consistent with important environmental changes, including clarification of regulatory pathways for biosimilar compounds and upcoming patent expiries for several large aglycosylated compounds (exhibit 8).

Exhibit 8
Pfenex Inc.
Marketed Aglycosylated Protein Therapeutics

Product	Therapeutic Area	Manufacturer	2013 Sales (B)
Ranibizumab (Lucentis)	Opthalmology	Roche/Novartis	$4.3
Genotropin	Endocrinology	Pfizer	$3.0
Peg-filgrastim (Neulasta)	Oncology	Amgen	$4.4
Peg-intron alpha-2a (Pegasys)	Hepatitis C	Roche	$1.5
Interferon beta-1b (Betaseron)	Multiple Sclerosis	Bayer	$1.4
		Total market size	$14.60

Source: Pfenex reports

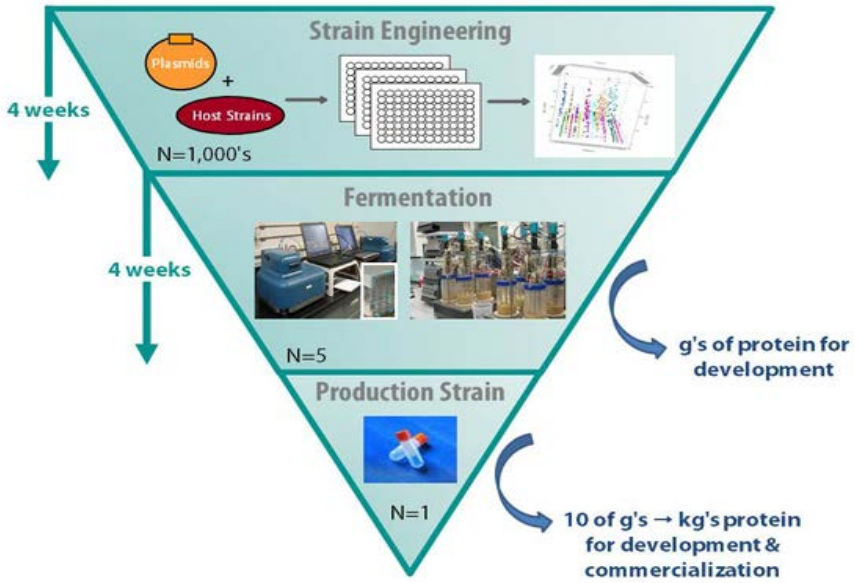
A Closer Look at the Pfenex Expression Technology

Protein-based compounds, such as biologics, are complex macromolecules that represent significant challenges during manufacturing. Due to the inherent structure, biologics could be roughly 300 times larger in size than traditional chemical-based drugs, which prevents the use of processes typically reserved for synthesizing small molecules. To circumvent the deficiency, protein production requires farming cells derived from living organisms by taking advantage of their innate ability to efficiently produce the desired protein product.

Protein production progresses through a trial-and-error approach, which involves selecting microorganism strains that express the greatest amount of protein, followed by optimizing conditions to further improve the yield (exhibit 9, on the following page). This methodology is iterative and has historically been inefficient, adding significant development time to market and contributing to the high cost of goods associated with biologic therapeutics. The company's proprietary Pfenex Expression Technology is a platform based on automated, robotically enabled, and parallel high-throughput screening of novel, genetically engineered bacterial *Pseudomonas fluorescens* expression strains, thereby eliminating redundancies that can result from the traditional protein production approach. In addition, the company conducts extensive bioanalytical testing to ensure the platform produces active therapeutic protein with optimal yields, purity, and biological activity. The patented platform technology is capable of identifying a final production strain in roughly nine weeks, which compares favorably with roughly one year using the traditional trial-and-error method. Thus, the Pfenex technology differentiates itself with speed, efficiency, and strong bioanalytics.

Currently, Pfenex strategically avoids targeting glycosylated proteins, which involve the "decoration of sugar chemical moieties" on already-complex macromolecules. The process of glycosylation is still poorly understood by the scientific community, creating an additional dimension of complexity and challenge for the manufacturers. Targeting aglycosylated proteins enables Pfenex to focus on leveraging the patented platform technology to produce biosimilars at a low cost.

Exhibit 9
Pfenex Inc.
Pfenex Expression Technology Platform



Source: Pfenex reports

Intellectual Property Coverage of the Pfenex Technology and Products
Pfenex is the owner or licensee of more than 80 patents, including 11 issued and 8 pending patent applications in the United States that provide coverage for the technology and lead product candidates. The company's U.S.-issued patents expire between 2026 and 2031; we believe that the substantial level of intellectual capital, know-how, and trade secrets provides significant additional platform protection that extends well beyond the scope of patent claims.

We highlight Pfenex's owned or licensed patent portfolio that 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; and
- vaccine antigens, recombinant anthrax protective antigen, microbial toxins and toxoids, and the malarial vaccine candidate antigen *P. falciparum* circumsporozoite protein (CSP).

Key Program Analysis—PF582

PF582 (Ranibizumab)
The company's most-advanced candidate PF582, currently in Phase Ib/IIa study, is a biosimilar to the drug Lucentis, which is indicated for the treatment of visual impairment due to wet AMD, macular edema following retinal vein occlusion, and diabetic macular edema. Lucentis is among the most-successful biologics to date, with sales of $4.3 billion globally in 2013. We believe that the Pfenex development timelines align nicely with the patent expiration schedule for Lucentis. As illustrated in exhibit 10, on the following page, the Lucentis patents begin to expire in Canada in 2018, followed by those in the United States in 2020. We believe that the corresponding market opportunity will be $530 million in 2018 and an additional $2.0 billion in the second quarter of 2020 (based on 2013 sales). The remaining $1.7 billion will become available after January 2022.

We believe that Lucentis is an attractive reference drug because of the sizable markets it addresses and challenging manufacturing profile. The mechanism of action of Lucentis is inhibition of vascular endothelial growth factor (VEGF), which resides at the heart of the underlying neoangiogenic pathogenesis.

In our analysis of the commercial opportunity for PF582, we considered several factors, including:

Clinical and regulatory pathway and timelines. Given the nature of the U.S. biosimilar guidelines, which require significant testing at the front end of the development process, Pfenex has conducted extensive bioanalytical testing in which it compared PF582 with Lucentis. Specifically, in more than 100 different analytical tests and preclinical animal models, PF582 demonstrated comparability to Lucentis. This data package formed the basis of a submission to the FDA, which granted a biosimilar initial advisory meeting that took place in January 2014. While details of the Phase III trial have not been disclosed, subsequent meetings with the FDA indicated that the PF582 analytical data appears acceptable to support further development of biosimilar Lucentis.

Pfenex is conducting a Phase Ib/IIa clinical trial to evaluate the safety and efficacy of PF582 compared with Lucentis for the treatment of wet AMD. The trial is expected to enroll 25 patients in multiple sites in New Zealand, and we expect data in fourth quarter 2014. We believe there are several notable aspects of the Phase Ib/IIa clinical trial.

- The trial is symmetrically randomized, so while we expect the two arms of the study to be balanced numerically, there is a possibility that baseline demographics, which were not controlled in the randomization, might be unbalanced between the arms, thus making interpretation of efficacy data more difficult. By way of background, the efficacy endpoints are visual acuity and retinal thickness.

- Although an "n of 1," the sentinel patient inspires hope, in our view. This patient, treated with PF582 prior to randomization, experienced a five-letter improvement, 40% improvement in retinal thickness, and 90% reduction in lesion size—consistent with the experience of Lucentis.

- We believe the most-relevant observational focus should be safety and tolerability. Specifically, we hope to observe similar adverse event rates and types between the arms and that no new adverse events are observed that have not historically been seen with Lucentis.

Pending positive results from the Phase Ib/IIa trial, we expect Pfenex to initiate a Phase III trial in 2015. While design details have not been disclosed, we anticipate a bioequivalence trial compared with Lucentis, with roughly 200 patients in each arm. A trial of this nature could be completed by 2017, which is well aligned with the 2018 patent expiration of Lucentis in Canada. Again, Lucentis patents in the United States expire in 2020.

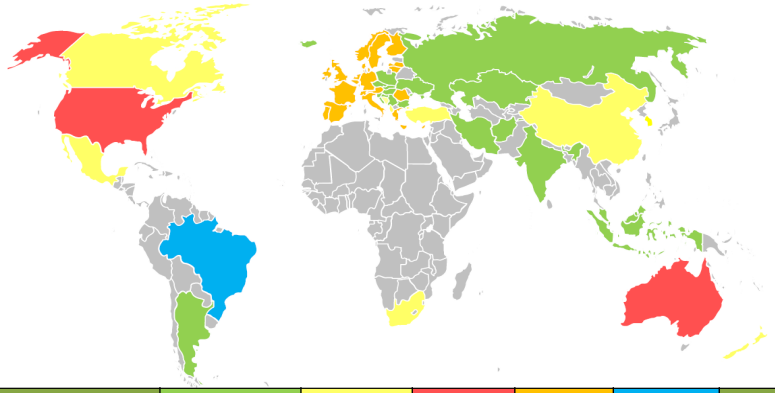
Market dynamics for VEGF inhibitors in existing ophthalmic indications. We believe that the follow-on biologic experience of infliximab (Remicade) provides an excellent example of label extrapolation, where approval of the agent in one indication enabled labeling for the breadth of the reference compound. The same has been true with biosimilar erythropoietin in Europe. Therefore, we believe that once PF582 is approved in one indication, it will be granted approval for the entire Lucentis label. Lucentis is currently approved in three indications: wet AMD, diabetic macular edema, and retinal vein occlusion.

- *Wet age-related macular degeneration (wet AMD):* AMD is a significant public health problem, affecting 30 million-50 million people globally. The wet form, which is treated effectively in many cases by VEGF inhibition, accounts for roughly 10% of the total AMD population, with global prevalence estimated to be 15 million people and annual incidence cases of roughly 600,000. As the name suggests, AMD is associated with age and represents the leading cause of severe vision loss in people over 60 years old.

- *Diabetic macular edema (DME):* Like AMD, DME occurrences are increasing, based on underlying demographic trends. Unlike AMD, however, the association with DME is diabetes, a large and rapidly proliferating public health problem globally, affecting an estimated 285 million adults. Another key contrast to AMD, which largely affects those over 60 years old, is the fact that DME is the leading cause of blindness in young adults in developed countries. The global prevalence of DME is roughly 21 million; 28% of patients with type 2 diabetes and 12% of patients with type 1 diabetes are expected to develop DME.

- *Retinal vein occlusion (RVO):* Relative to wet AMD and DME, patients with RVO are a severely undertreated population. Among the estimated 1.1 million sufferers, only roughly 8%, or 90,000 patients, are getting treatment. In addition, RVO primarily affects people over the age of 60 and is a leading cause of vision loss in the United States and Europe.

Exhibit 10
Pfenex Inc.
Lucentis Intellectual Property Expiry Road Map



Country IP Status	Current Open	Q2 2018	Q2 2020	Jan 2022	2023	Cumulative
Diseased Population (2013)	9,475,259	10,643,711	2,667,202	4,817,247	1,162,885	28,766,303
2013 Sales (IMS Health)	$65MM	$471MM	$2B	$1.7B	$1MM	$4.2B

Source: Pfenex reports

Timing of Lucentis Patent Expirations and Launches

The timing of the PF582 commercial introductions will be based principally on country-specific timing of the patent expirations of Lucentis. Based on 2013 sales levels, we estimate that $2.5 billion of the total $4.3 billion in Lucentis sales is generated in geographies that will lose patent coverage

by the end of 2020. Chief contributors to these sales levels are the Canadian market, which opens in 2018, and the U.S. market, which open in 2020. Exhibit 10 provides a schedule of key patent expiration dates and estimated corresponding sales levels in 2013.

Commercial Opportunity and Direct Marketing Approach
Pfenex will design its commercial strategy based on the specific marketing requirements of each candidate, which typically vary by geography. In the case on PF582, we believe there are several dynamics that should render the U.S. and European markets reachable by Pfenex. For example, we estimate that there are roughly 2,000 retinal specialists in the United States who perform most of the medical procedures involving diseases of the back of the eye. Given the concentration of this call point (the retinal surgeon), we believe that Pfenex could effectively promote PF582 with a specialty salesforce and marketing group of fewer than 100 persons.

The European market has the benefit of greater experience with biosimilars, with examples of products that have achieved over 60% penetration, such as filgrastim in Germany and the United Kingdom. We also believe that the European market is structurally an attractive one for Pfenex to commercialize PF582, based on the concentration of call point, cost sensitivity, and availability of highly effective distributors in several key markets. However, the more-relevant market consideration in both the United States and Europe, in our view, is the competitive dynamic, which has two levels: emerging technologies and the role of Avastin, as discussed below.

Emerging technologies. We recognize that markets for wet AMD therapeutics will continue to grow and evolve with new VEGF inhibitors such as Eylea gaining traction and new modalities such as anti-PDGF agents taking shape. We believe that our conservative valuation approach provides ample flexibility for anticipated changes in the marketplace currently served by Lucentis.

- *Ophthotech* is a biopharmaceutical company specializing in the development of novel therapeutics to treat diseases of the back of the eye, with a focus on developing candidate compounds for AMD. The company's leading candidate, Fovista, an anti-PDFG agent, is being studied in combination with Lucentis, Eylea, and Avastin in three Phase III trials consisting of roughly 1,850 patients. The Phase IIb results demonstrated a statistically significant 62% comparative benefit in visual acuity with Fovista and Lucentis versus Lucentis monotherapy.

- *Santen* is a Japan-based specialized pharmaceutical company primarily engaged in the ophthalmic field. The company initiated a Phase I/IIa trial with DE-120, a dual inhibitor of VEGF and PDGF, in AMD in January 2014.

- *Avalanche* is a clinical-stage specialty pharmaceutical company with *proprietary* technology that enables long-term protein delivery to the eye. The company's Ocular BioFactory technology is based on an adeno-associated virus (AAV) with viral genes replaced with specific genes that encode for the therapeutic protein. The company's primary candidate, AVA-101, is a one-time subretinal injection for durable remission of AMD by upregulating VEGF inhibitor soluble fms-like tyrosine kinase-1 (sFlt-1). Data from Phase I is limited but highly encouraging.

The role of Avastin in the United States and Europe. Avastin, a drug marketed by Roche for the treatment of cancer, is used broadly off-label in the United States and Europe for the treatment of AMD. Both Lucentis and Avastin antibodies target VEGF, a growth factor associated with neovascularization. While the practice of using Avastin in the AMD setting has been met with resistance, there has been evidence (particularly in Europe) of increasing acceptance. For example, in both the United Kingdom and France, regulators have shown support for the use of Avastin as an alternative to Lucentis for treatment of AMD. Ultimately, however, we believe that the global markets for Lucentis indications remain underserved and that a low-cost, labeled alternative would have a meaningful market opportunity.

Other Key Candidates

PF530 Is a Biosimilar to Interferon Beta-1b for the Treatment of MS

PF530 is a biosimilar candidate to the reference product Betaseron, a drug marketed by Bayer for the treatment of relapsing MS. Betaseron is in the beta interferon class of MS drugs and achieved roughly $1.4 billion in sales in 2013. Within the context of our research coverage of Biogen Idec, we believe that the global market for therapeutic category sales for drugs treating relapsing remitting disease could exceed $18 billion by 2017, owing largely to more convenient and tolerable oral therapy. There are four marketed drugs in the beta interferon class: Avonex, Rebif, Betaseron, and Plegridy. Exhibit 11 provides a thumbnail sketch of the profiles of each of the drugs.

Exhibit 11
Pfenex Inc.
2013 Beta Interferon-Based Therapeutics Worldwide Sales

Product	Manufacturer	2013 Sales	How Administered
Avonex	Biogen Idec	$3.0 billion	Intramuscular injection
Rebif	Merck	$2.6 billion	Subcutaneous injection
Betaseron	Bayer	$1.4 billion	Subcutaneous injection
Plegridy	Biogen Idec	N/A	Subcutaneous injection

Source: Company reports

We expect PF530 to enter clinical trials in the second half of this year; Pfenex is collaborating with Strides Arcolab to develop the drug. Assuming success, we believe that the drug could enter Phase III trials in the first half of 2015. While the global markets for MS drugs are extremely dynamic as a result of multiple new market entrants over the past five years, we integrate two important considerations into our outlook for PF530: the class in which it resides and MS drug pricing.

The first of these two dynamics is the ***entry of new oral drugs*** into the MS market, which has created a paradigm shift in the patient management. Notably, we believe that the oral drugs (such as Gilenya from Novartis and Tecfidera from Biogen Idec) have meaningfully expanded the market by increasing the number of patients on therapy and keeping patients on therapy for longer periods. The interferon class is likely to compress as a result of the impact of the abovementioned oral therapies; however, we anticipate a unique role for PF530 to compete on price. Biogen Idec recently received European approval of a pegylated formulation of Avonex (Plegridy), which we expect will take market share, particularly in the United States and Western Europe, given its dosing convenience; however, we expect Biogen Idec to market Plegridy with premium pricing.

The second dynamic that stands to become a more-relevant source of differentiation in the era of biosimilars is ***price***. Notably, price inflation of beta interferon drugs has been significant over the past decade, particularly in the United States, and we believe that the combination of significant price inflation for the reference product and its class, combined with the Pfenex expression system, which could be more efficient, should enable meaningful pricing flexibility while maintaining attractive margins. Reports in the August 1999 issue of *The Lancet* suggest the pricing in Europe for beta interferon 1b (Betaseron) ranged from $11,200 to $20,000 annually. We estimate that the price range is $11,000 to $14,000 today. While European list pricing does not always reflect the spectrum of discounting that occurs in many European countries, the broad pricing ranges provide some perspective on how to think about reference pricing for PF530.

Given that the epidemiology of MS is associated with northern latitudes, we believe that the most likely commercial pathway for Pfenex is in Central and Eastern Europe and other emerging markets. The market opportunity across these countries is modest relative to the overall size of the MS market at roughly $150 million to $200 million. However, some of these markets, such as Turkey, are among the most rapidly expanding pharmaceutical markets in the Western world.

Ten Additional Candidates in or Entering Process Development

As illustrated in exhibit 12, Pfenex has leveraged the capabilities of its technology platform to build a diversified product pipeline consisting of biosimilar candidates as well as vaccine candidates. Notably, the vaccine candidates are wholly funded by federal government grants. We see potential for significant clarity over the coming two years as the pipeline gains visibility and as the reality of biosimilar approvals in the United States takes hold. Beyond PF582 and PF530, Pfenex has two additional proprietary candidates, PF708 (generic Forteo) and PF688 (biosimilar Cimzia) in process development. The company also has five additional partnered therapeutic agents currently undergoing preclinical testing: PF444 (biosimilar human growth hormone), PF529 (biosimilar Neulasta), PF690 (biosimilar Oncaspar), PF694 (biosimilar Pegasys), and PF726 (next-generation pegylated interferon beta), as well as vaccine candidates targeting malaria and anthrax, which are discussed in the next section.

Exhibit 12
Pfenex Inc.
Pipeline

Compound (Branded referenced drug)	Preclinical	Phase I	Phase II	Phase III	Market	Market Size	Partner
PF582 (Lucentis)	Age-Related Macular Degeneration					$4 billion	Proprietary
PF688 (Cimzia)	Crohn's Disease and Arthritis					$600 million	Proprietary
PF708 (Forteo)	Osteoporosis					$1 billion	Proprietary
PF444 (Genotropin)	Growth Disturbance					$1 billion	Strides Arcolab
PF529 (Neulasta)	Neutropenia					$4 billion	Strides Arcolab
PF530 (Betaseron)	Multiple Sclerosis					$1.5 billion	Strides Arcolab
PF690 (Oncaspar)	Acute Lymphoblastic					$200 million	Strides Arcolab
PF694 (Pegasys)	Hepatitis B and C Virus					$1.4 billion	Strides Arcolab
PF726 (next-generation pegylated inteferon beta)	Multiple Sclerosis					$1.5 billion	Strides Arcolab
Px563L vaccine	Anthrax					$215 million	U.S. Government
Px563L-SDI vaccine	Anthrax					$215 million	U.S. Government
Px533 vaccine	Malaria					Limited	U.S. Government

Sources: Pfenex reports

Corporate and Government Collaborations

Pfenex Vaccine Development Initiative Represents a Self-Funded Call Option for Investors
Pfenex is leveraging its technical expertise and proprietary expression systems in the field of vaccine development. Px563L is a novel anthrax vaccine candidate, which could provide the U.S. government with a response to the unmet demand for increased quantity, stability, and dose-sparing regimens of the anthrax vaccine. The company expects to begin a Phase I trial in the second half of this year. The development progress has been funded by the U.S. Department of Health and Human Services through the Biomedical Advanced Research and Development Authority (BARDA) under a $23.9 million fully funded contract, from which the company has already recorded $18.4 million as revenue through the first quarter of this year as reimbursement for services performed.

In addition to the anthrax vaccine, Pfenex is developing Px533 as a first-in-class prophylactic vaccine candidate against malaria infection. The compound will enter Phase I development in the second half of this year. The development of Px533 has been funded by Leidos, formerly Science Applications International Corporation, through its malaria vaccine production and support services contract with the National Institute of Allergy and Infectious Diseases (NIAID). Clinical trials for Px533 are managed by NIAID.

We believe that the company's vaccine initiative offers investors a free call option as it has been funded through various grants from the BARDA and NIAID. Both the malaria and anthrax programs are fully funded through Phase I trials this year. Looking ahead, we believe that Pfenex is well positioned to opportunistically advance each of these programs, which should lead to additional visibility for investors.

Key Collaborations Bring Funding, Global Reach, and Development Assistance…
Pfenex has entered into several private-sector and public collaborations, which have enabled pipeline expansion, funding, additional reach into global markets, and development assistance. We believe the company's most-meaningful collaborative relationship at this time is with Strides Arcolab, an India-based company with significant and integrated experience in many key global markets. Under its joint development and license agreement, which was signed in December 2012, Pfenex and Strides Arcolab plan to develop several biosimilar products. Under the structural terms of this initial agreement, Pfenex plays a key role in the earlier stages of process development and strain selection, whereas Strides is responsible for developing working cell banks and manufacturing clinical material. Through Phase I, each party is responsible for its own costs.

In March 2013, Pfenex entered a joint venture agreement with Strides to develop and ultimately commercialize compounds that have completed Phase I trials. The joint venture is structured with Strides holding majority control at 51% equity. However, both parties have equal board representation and voting rights.

…And Future Collaborations Could Represent Meaningful Catalysts for the Stock
One of the most-exciting features of the Pfenex technology platform is its versatility, which we believe positions the company well for downstream collaborations. Based on discussions with management and as suggested earlier in this report, we expect Pfenex to deliberately migrate away from shorter term "fee for service" collaborations and toward longer-term relationships with greater development and economic participation. We believe that the company will continue to evolve its platform by pursuing new opportunities to leverage its technology capabilities and optimize product candidates, while maintaining a more-participatory role with greater economic involvement. Any new collaboration would represent upside to our current projections.

Tremendous Potential in the U.S. and Global Markets, in Our View

We believe the emerging biosimilar markets will be substantial, due to the large number of blockbuster biologic products that will lose patent protection in the coming years, the abbreviated global biosimilar regulatory pathways, and an increasing mandate for lower drug costs by governments and private payers. According to the IMS Institute for Healthcare Informatics, the 2012 global biologics market represented over $160 billion in sales with virtually the entire market composed of branded innovator products. In addition, the market for global biosimilars increased to $2.4 billion in 2012, representing a compound annual growth rate of 34% since 2007, compared with a rate of 9% over the same period for innovative biologics. We expect the biologics market to shift toward biosimilars over the coming years, much like generic small molecule drugs, which now account for an estimated 80% of the dispensed small molecule drug market in the United States. Currently, few biologics are off-patent; however, in 2015, roughly $24 billion of aggregate estimated 2013 product sales will lose patent protection worldwide. This number will increase every year as several large-market biologic products lose patent protection. By 2020, we estimate roughly $45 billion of aggregate 2010 product sales will have become available globally, representing 47 products for which intellectual property rights will have expired.

The market opportunities for the company's two most-advanced product candidates are substantial, in our opinion. Lucentis achieved roughly $4.3 billion in global product sales in 2013. By second quarter 2018, roughly $530 million in current sales levels will lose patent protection and become available to PF582. In addition, markets with $2.0 billion in current sales will lose patent protection and become available for biosimilars in 2020, and after January 2020, markets with an additional $1.7 billion in current sales will lose patent protection. Betaseron achieved over $1.4 billion in product sales in 2013. Interferon beta-1b product sales in markets where no intellectual property barriers exist total in excess of $52 million in 2013 with other territories becoming available between 2017 and 2021.

Exhibit 13
Pfenex Inc.
Biosimilar Market Opportunity and Timing

Market opportunity is significant
Patent cliff: By 2020, biologic products represesnting roughly $45 billion of aggregate 2010 product sales will become available globally.
Favorable pricing: 2010 discounts on certain biosimilars in EU member states ranged between 8% and 23%, compared with the reference products.
Global cost containment favors utilization of biosimilars
Increasing mandate for lower drug costs by governments and private payers
Strong uptake and growth of biosimilars: roughly 30%-40% volume penetration in EU Big Five.
Regulatory pathways (abbreviated) for biosimilars are defined
EU: CHMP 437/04 published 2005
U.S.: 351(k) pathway established in 2010; five draft guidance documents - **4th guidance:** Comparative analytical similarity data submission prior to being granted a biosimilar initial advisory meeting - **As of 12/31/13:** 10 INDs; 32 biosimilar product development type meetings held with FDA
Strong barriers to entry
Quality, long timeline to create production strain, process development, and minimizing COGS are all challenges for biosimilars creating both hurdles and opportunities
Bioanalytical characterization and attention to COGS are key factors to compete

Sources: Pfenex reports.

Overview of Biosimilar Regulations in the United States and Europe

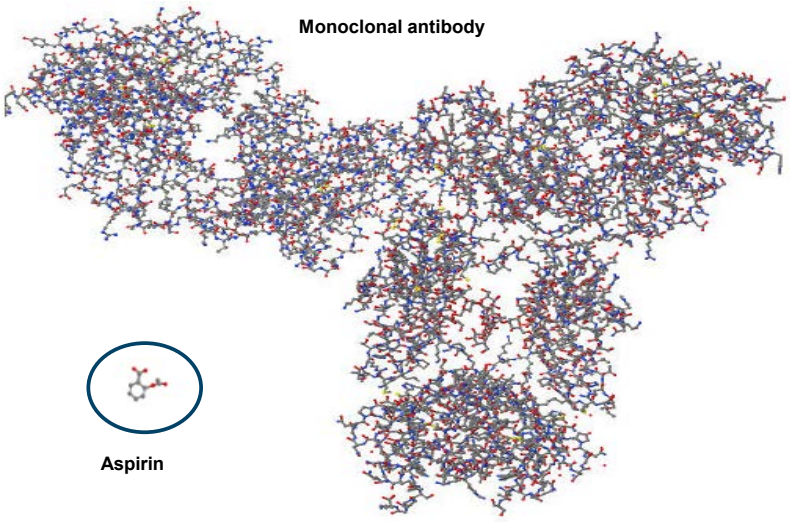
Essential to understanding the need for a unique platform for protein-based drugs is recognizing the differences between chemical-based drugs and biologics. Exhibit 14 provides a comparison of the two types of drugs; an important consideration from an efficacy and safety standpoint is in the manufacturing process. Generally, the production of chemical-based drugs is more reproducible and consistent. Protein-based drugs are inherently complex and can be difficult to reproduce consistently. Therefore, the "generic" drug pathways were not a suitable fit for establishing regulatory standards for biosimilars. Exhibit 15 provides an illustration of a monoclonal antibody compared with the chemical structure of aspirin.

Exhibit 14
Pfenex Inc.
Biologic Drugs Versus Chemical Drugs

	Biologic Drugs	Chemical Drugs
Characteristic	Complex, typically large molecules	Small, simple molecules
Ease of Manufacturing	Not practical through traditional manufacturing process	Straightforward through traditional chemical manufacturing process
Method of Manufacturing	"Farming" microorganism (bacterium) to produce the specific drug	Combining smaller and different chemical ingredients
Route of Administration	Intravenous or subcutaneous	Typically oral
Examples	Enbrel, Rituxan, and Humira	Aspirin, Lipitor, and Abilify

Sources: Pfenex reports

Exhibit 15
Pfenex Inc.
Complexity Comparison of a Monoclonal Antibody Versus a Small Molecule



Source: FDA Center for Drug Evaluation and Research

In 2005, the European Union implemented a formal regulatory pathway for biosimilar therapeutics. Under the guidance, comprehensive studies demonstrating comparable quality, activity, safety, and efficacy are required to obtain the biosimilarity designation by European regulatory authorities. In subsequent years, the guidelines have been revised and updated on a regular basis. The additional clarity to the regulatory pathway has led to an estimated 20 biosimilar product approvals as of this year. Exhibit 6, on page 9, highlights key biosimilar drugs approved in Europe.

The United States enacted the Biologics Price Competition and Innovation Act (BPCIA) in 2009**,** which provided an abbreviated approval pathway for biosimilar products under section 351(k) of the Public Health Service Act (PHSA). This guidance provides clarity as to what regulators perceive as satisfying the quantitative definition of biosimilarity. We highlight the emphasis placed on bio-analytical assessment and the totality of clinical evidence. We acknowledge that to date, there has been no biosimilar therapeutics approved under the 351(k) pathway and that the understanding of market acceptance of biosimilar products is limited. However, as we describe below, there is a growing number of candidates progressing through what we view to be a regulatory framework with improving clarity.

A biosimilar application must contain information demonstrating: 1) biosimilarity to the reference product through data derived from analytical studies, animal studies (including an assessment of toxicity), and clinical studies (including an assessment of immunogenicity and pharmacokinetics or pharmacodynamics), unless the FDA determines that such data is unnecessary; 2) sameness of strength, dosage form, and route of administration to the reference product as well sameness of mechanism of action; 3) approval of the reference product for the condition of use prescribed, recommended, or suggested in the labeling indications proposed for the biosimilar product; and 4) appropriate manufacturing, processing, packing, and holding facilities that meet the standards designed to ensure a safe, pure, and potent medicine. Unless the FDA waives the requirement, clinical studies must be sufficient to show the safety, purity and potency of the proposed product for one or more appropriate conditions of use for which licensure is sought and for which the reference product is licensed.

Through the end of 2013, the FDA received 10 investigational drug applications for biosimilars, held 32 biosimilar product development meetings, and, as of May 2014, had released five draft guidance documents regarding the implementation of the 351(k) pathway. Of particular note is the fourth guidance document, in which the FDA identifies both the types of meetings that biosimilar product sponsors might pursue with the agency as well as the expectations, requirements, and procedures that apply to each meeting and its outcome. The FDA granted Pfenex a biosimilar initial advisory meeting for PF582, which took place on January 28, 2014.

Sandoz (a division of Novartis) was the first company to announce that it had filed for approval of a biologic under the BPCIA. On July 24, the company announced that the FDA had accepted the filing, which is for a follow-on form of filgrastim (Neupogen). Based on guidelines in the 351(k) pathway of the BPCIA, the review period is expected to be 10 months, which should therefore result in approval in second quarter 2015.

Exhibit 16
Pfenex, Inc.
Overview of U.S. and EU Biosimilar Regulation

U.S. Biosimilar Regulatory Pathway	EU Biosimilar Regulatory Pathway
351(k) U.S. biosimilar approval pathway established in 2010 • Five FDA guidance ducuments provide additional clarity on path	**CHMP/437/04 biosimilar approval pathway established in 2005** • Biosimilar guidance on quality as well as nonclinical and clinical issues, including immunogenicity
Benefits of 351(k) = abbreviated development	**EMA**
Bioanalytical assessment is a key element of biosimilar market authorization • Defines degree of similarity and whether 351(k) pathway is available for the proposed product	**First biosimilar approved in 2006 (Omnitrope)**
FDA Guidance adds clarity regarding pathway timing and requirements • Similar to EU process: totality of evidence • Specific delineation and outcomes of meetings with the FDA in fourth guidance document • Unlike generics, patent disputes do not trigger 30-month delay; FDA review of 351(k) submission may continue during any litigation	**As of 2014 20 biosimilars products have been approved by the EMEA** • Price discounts between 8%-23% of innovator for biosimilars in 2010 • Average 71% penetration in EU markets • 50% EPO biosimilar penetration in Germany • 90% EPO and filgrastim biosimilar penetration in Hungary
Additional interchangeability guidance expected in 2014	**Australia, Canada, Japan, South Korea, and South Africa have adopted a biosimilar pathway similar to the EU** • Abbreviated pathway with limited preclinical and clinical studies, with reference to innovator product

Source: Pfenex reports

Conclusion

We believe that Pfenex offers investors the opportunity to participate in the biosimilars space, which we expect to represent a significant growth area within the industry. We believe that management has adroitly parlayed its expertise in cell expression and bioanalytics into a differentiated technology platform that has the potential to expand the company's clinical pipeline and be a source of nondilutive capital inflows through collaborative deals. The coming 12-18 months stand to be formative as a result of the company's advancing clinical pipeline, which is represented by wholly owned compounds and those being developed in collaboration with partners such as Strides Arcolab and the U.S. government. We also see potential for additional collaborations.

The most-advanced clinical asset is wholly owned PF582, a biosimilar form of the drug Lucentis, which is indicated in a variety of ophthalmic settings, including AMD. PF582 is being studied in a Phase Ib/IIa trial with 12 patients receiving either Lucentis or PF582. Primary and secondary endpoints are safety, tolerability, and bioequivalence, and we expect results later this year. We believe that safety insights into this initial data set serve as a risk-reducing inflection point with potential for read-through to other Pfenex pipeline candidates.

Financially, Pfenex is well capitalized with roughly $50 million on the balance sheet, which we believe is sufficient to sustain the company for the next 18-24 months, based on our current burn rate estimates. With an estimated enterprise value of about $75 million and numerous upcoming catalysts that stand to increase value, we believe that current price levels represent an attractive entry point for investors. We are therefore initiating coverage of PFNX shares with an Outperform rating.

Exhibit 17
Pfenex, Inc.
Income Statement

	2013A	Q1A	Q2E	Q3E	Q4E	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Revenue	11,914	2,558	1,750	1,800	1,850	7,958	8,200	8,200	8,200	8,200	8,200	9,150	9,550
PF582	0	0	0	0	0	0	0	0	0	6,327	46,812	140,838	373,953
Total revenues	**$11,914**	**$2,558**	**$1,750**	**$1,800**	**$1,850**	**$7,958**	**$8,200**	**$8,200**	**$8,200**	**$14,527**	**$55,012**	**$149,988**	**$383,503**
Cost of revenue	6,423	1,908	2,325	1,500	1,550	7,283	8,000	9,000	10,000	10,000	25,285	77,537	220,000
Gross profit	5,491	650	(575)	300	300	675	200	(800)	(1,800)	4,527	29,727	72,451	163,503
SG&A	6,698	1,495	1,505	3,050	2,150	8,200	8,000	9,000	10,000	14,500	20,300	41,000	48,000
R&D	5,490	678	1,350	2,350	2,450	6,828	13,500	17,800	18,135	18,550	19,650	20,575	21,100
Total operating expenses	12,188	4,081	5,180	6,900	6,150	22,311	29,500	35,800	38,135	43,050	65,235	139,112	289,100
Loss from operations	**($6,697)**	**($1,523)**	**($3,430)**	**($5,100)**	**($4,300)**	**($14,353)**	**($21,300)**	**($27,600)**	**($29,935)**	**($28,523)**	**($10,223)**	**$10,876**	**$94,403**
Other expense, net	(36.0)	(18.0)	(8.5)	(8.5)	(8.5)	(43.5)	(32.0)	(30.0)	(28.0)	(26.0)	(24.0)	(22.0)	(20.0)
Net loss before income taxes	(6,733)	($1,541)	($3,439)	($5,109)	($4,309)	(14,397)	(21,332)	(27,630)	(29,963)	(28,549)	(10,247)	10,854	94,383
Income tax benefit	2,671	(1)	450	450	450	1,349	1,600	1,400	1,200	1,000	800	(2,338)	(14,157)
Net loss	($4,062)	($1,542)	($2,989)	($4,659)	($3,859)	($13,048)	($19,732)	($26,230)	($28,763)	($27,549)	($9,447)	$8,515	$80,226
Net loss attributable to common stockholders	**(5,757)**	**(1,977)**	**(2,989)**	**(4,659)**	**(3,859)**	**(13,483)**	**(19,732)**	**(26,230)**	**(28,763)**	**(27,549)**	**(9,447)**	**8,515**	**80,226**
Net loss per common share basic and diluted	**($0.53)**	**($0.14)**	**($0.15)**	**($0.23)**	**($0.18)**	**($0.70)**	**($0.92)**	**($0.94)**	**($0.99)**	**($0.92)**	**($0.30)**	**$0.26**	**$2.36**
Weighted-average common shares basic and diluted	10,860	10,877	20,500	20,702	20,906	18,246	21,426	27,864	28,979	30,137	31,342	32,596	33,899

Sources: Pfenex reports and William Blair & Company, L.L.C. estimates

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DJIA:	16,662.91
S&P 500:	1,955.06
NASDAQ:	4,464.93

The prices of the common stock of other public companies mentioned in this report follow:

Amgen Inc. (Market Perform)	$132.80
Avalanche Biotechnologies, Inc.	$27.26
Bayer AG	$128.60
Biogen Idec Inc. (Outperform)	$342.47
Bristol-Myers Squibb Company (Outperform)	$49.66
The Dow Chemical Company	$52.02
Express Scripts, Inc. (Outperform)	$73.04
Leidos Holdings, Inc.	$16.03
Novartis AG	$86.93
PDL BioPharma, Inc.	$9.47
Pfizer Inc.	$28.64
Repligen Corporation	$19.18
Roche Holding AG	$36.14

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Market Perform (Hold)	31%	Market Perform (Hold)	3%
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