FIBROGEN INC
Form 10-K
February 27, 2019

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, 2018

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: 001-36740

FIBROGEN, INC.

(Exact name of registrant as specified in its charter)

Delaware	77-0357827
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
409 Illinois Street	
San Francisco, CA	94158
(Address of principal executive offices)	(zip code)

Registrant’s telephone number, including area code:

(415) 978-1200

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

Title of Each Class	Name of Exchange on Which Registered
Common Stock, $0.01 par value	The NASDAQ Global Select Market

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 Section 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 every Interactive Data File required to be submitted 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 such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K 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	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 Exchange Act Rule 12b-2). Yes No

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the registrant, computed by reference to the closing price as of the last business day of the registrant's most recently completed second fiscal quarter, June 30, 2018, was approximately $3,548.1 million. Shares of Common Stock held by each

executive officer and director and stockholders known by the registrant to own 10% or more of the outstanding stock based on public filings and other information known to the registrant have been excluded since such persons may be deemed affiliates. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

The number of shares of common stock outstanding as of January 31, 2019 was 85,562,391.

DOCUMENTS INCORPORATED BY REFERENCE

Items 10, 11, 12, 13 and 14 of Part III of this Annual Report on Form 10-K incorporate information by reference from the definitive proxy statement for the registrant's 2019 Annual Meeting of Stockholders to be filed with the Securities and Exchange Commission pursuant to Regulation 14A not later than after 120 days after the end of the fiscal year covered by this Annual Report on Form 10-K.

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FORWARD-LOOKING STATEMENTS

This Annual Report filed on Form 10-K and the information incorporated herein by reference, particularly in the sections captioned “Risk Factors,” “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and “Business,” contains forward-looking statements, which involve substantial risks and uncertainties. In this Annual Report, all statements other than statements of historical or present facts contained in this Annual Report, including statements regarding our future financial condition, business strategy and plans and objectives of management for future operations, are forward-looking statements. In some cases, you can identify forward-looking statements by terminology such as “believe,” “will,” “may,” “estimate,” “continue,” “anticipate,” “contemplate,” “intend,” “tar “project,” “should,” “plan,” “expect,” “predict,” “could,” “potentially” or the negative of these terms or other similar terms or expressions that concern our expectations, strategy, plans or intentions. Forward-looking statements appear in a number of places throughout this Annual Report and include statements regarding our intentions, beliefs, projections, outlook, analyses or current expectations concerning, among other things, our ongoing and planned preclinical development and clinical trials, the timing of and our ability to make regulatory filings and obtain and maintain regulatory approvals for roxadustat, pamrevlumab and our other product candidates, our intellectual property position, the potential safety, efficacy, reimbursement, convenience clinical and pharmaco-economic benefits of our product candidates, the potential markets for any of our product candidates, our ability to develop commercial functions, our ability to operate in China, expectations regarding clinical trial data, our results of operations, cash needs, spending of the proceeds from our initial public offering and the concurrent private placement, financial condition, liquidity, prospects, growth and strategies, the industry in which we operate and the trends that may affect the industry or us. We have based these forward-looking statements largely on our current expectations and projections about future events and financial trends that we believe may affect our financial condition, results of operations, business strategy and financial needs. These forward-looking statements are subject to a number of risks, uncertainties and assumptions described in the section of this Annual Report captioned “Risk Factors” and elsewhere in this Annual Report.

These risks are not exhaustive. Other sections of this Annual Report may include additional factors that could adversely impact our business and financial performance. Moreover, we operate in a very competitive and rapidly changing environment. New risk factors emerge from time to time, and it is not possible for our management to predict all risk factors nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in, or implied by, any forward-looking statements.

You should not rely upon forward-looking statements as predictions of future events. We cannot assure you that the events and circumstances reflected in the forward-looking statements will be achieved or occur. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee future results, levels of activity, performance or achievements. The forward-looking statements made in this Annual Report are based on circumstances as of the date on which the statements are made. Except as required by law, we undertake no obligation to update publicly any forward-looking statements for any reason after the date of this Annual Report or to conform these statements to actual results or to changes in our expectations.

This Annual Report also contains market data, research, industry forecasts and other similar information obtained from or based on industry reports and publications, including information concerning our industry, our business, and the potential markets for our product candidates, including data regarding the estimated size and patient populations of those and related markets, their projected growth rates and the incidence of certain medical conditions, as well as physician and patient practices within the related markets. Such data and information involve a number of assumptions and limitations, and you are cautioned not to give undue weight to such estimates.

You should read this Annual Report with the understanding that our actual future results, levels of activity, performance and achievements may be materially different from what we expect. We qualify all of our

forward-looking statements by these cautionary statements.

PART I

ITEM 1. BUSINESS

OVERVIEW

We are a leading biopharmaceutical company discovering and developing a pipeline of first-in-class therapeutics. We have applied our pioneering expertise in hypoxia-inducible factor ("HIF") and connective tissue growth factor ("CTGF") biology to develop innovative medicines for the treatment of anemia, fibrotic disease, and cancer.

Roxadustat, our most advanced product candidate, is an oral small molecule inhibitor of HIF prolyl hydroxylase ("HIF-PH") activity that has received New Drug Application ("NDA") approval in anemia associated with chronic kidney disease ("CKD") in dialysis-dependent ("DD") patients from the National Medical Products Administration ("NMPA") (previously known as the China Food and Drug Administration) of the People's Republic of China ("China").

In conjunction with our collaboration partners, AstraZeneca AB ("AstraZeneca") and Astellas Pharma Inc. ("Astellas"), we have completed the Phase 3 trials of roxadustat intended to support our NDA in the United States ("U.S.") and Marketing Authorization Application ("MAA") in the European Union ("EU") for the treatment of anemia in CKD. We and our partners are in the process of preparing an NDA for submission to the U.S. Food and Drug Administration ("FDA") and an MAA for submission to the European Medicines Agency ("EMA") this year, both of which would cover anemia patients with dialysis-dependent CKD and non-dialysis-dependent CKD.

In Japan, Astellas submitted an NDA for the treatment of anemia in CKD patients on dialysis in September 2018, which is currently under review by the Pharmaceuticals and Medical Devices Agency ("PMDA"). We expect an approval decision on the Japan dialysis NDA in the second half of 2019.

Beyond anemia in CKD, roxadustat is in Phase 3 clinical development in the U.S. and Europe and in Phase 2/3 development in China for anemia associated with myelodysplastic syndromes ("MDS").

Pamrevlumab, a human monoclonal antibody that inhibits the activity of CTGF, is advancing toward Phase 3 clinical development for the treatment of idiopathic pulmonary fibrosis ("IPF") and pancreatic cancer, and is currently in a Phase 2 trial for Duchenne muscular dystrophy ("DMD").

Applying our internally developed proprietary technology in recombinant human collagen, FibroGen is also developing a biosynthetic corneal implant in China.

ROXADUSTAT FOR THE TREATMENT OF ANEMIA IN CHRONIC KIDNEY DISEASE

Roxadustat is an internally discovered HIF-PH inhibitor that acts by stimulating the body's natural pathway of erythropoiesis, or red blood cell production, to treat anemia.

The topline results from our Phase 3 study used to support the China NDA in dialysis, as well as the Phase 3 study in non-dialysis, are described in the section below captioned "Roxadustat for the Treatment of Anemia in Chronic Kidney Disease in China." We expect CKD non-dialysis patients to be added to the roxadustat label once regulatory inspections of the Phase 3 non-dialysis clinical trial sites are performed by the NMPA.

Globally, the Phase 3 CKD-anemia program encompasses 15 Phase 3 studies of roxadustat in both non-dialysis-dependent ("NDD") and dialysis-dependent CKD patients designed to support independent regulatory approvals in the U.S., Europe, Japan, and China.

We, and our partners Astellas and AstraZeneca, each announced topline Phase 3 results for roxadustat in 2018 which we plan to include in support of regulatory submissions in the U.S. and Europe in 2019. These results are described in the following section. The pooled safety analyses for the U.S. (both for NDD-CKD and DD-CKD), including the major adverse cardiovascular event ("MACE") endpoint, a composite endpoint of death, myocardial infarction and stroke, are anticipated to be completed in the second quarter of 2019, and we intend to submit a U.S. NDA in the third quarter of 2019. We expect Astellas to submit an MAA to the EMA shortly thereafter. Both the U.S. NDA and European MAA for roxadustat are expected to cover anemia associated with dialysis dependent CKD and non-dialysis-dependent CKD.

Our partner Astellas has filed its NDA for roxadustat for the treatment of anemia in dialysis patients with the PMDA, and the Phase 3 results used to support the Japan NDA are described in the section below captioned "Roxadustat for the Treatment of Anemia in

Chronic Kidney Disease in Japan. Astellas has completed one of the two Phase 3 studies in non-dialysis CKD expected to serve as a basis for a supplemental NDA in Japan for the treatment of anemia in non-dialysis CKD patients.

CKD affects 10-12% of the adult population globally. While anemia is common in patients at advanced stages of CKD who face increased risks of health consequences, many of those patients are left untreated or are sub-optimally treated for anemia due to safety concerns and limited access to the currently available therapies such as erythropoiesis stimulating agents ("ESAs"). Even in major markets such as the U.S., the use of ESAs to treat anemia in CKD has largely been limited to the dialysis-dependent CKD population in recent years. We and our partners believe that, as an oral agent with an acceptable safety profile, roxadustat could increase treatment access to patients and expand the non-dialysis anemia market.

In the longer term, we believe roxadustat has the potential to address anemia markets beyond CKD, including chemotherapy-induced anemia ("CIA"), anemia related to inflammation (such as inflammatory bowel disease, lupus, and rheumatoid arthritis), MDS, and in surgical procedures requiring red blood cell transfusions. Roxadustat is in ongoing clinical trials in MDS, and we plan to initiate a Phase 2 clinical trial of roxadustat in the U.S. in CIA in 2019.

Completed Phase 3 Clinical Trials of Roxadustat in CKD Anemia for U.S. and European Regulatory Submissions

We recently announced that roxadustat met all pre-specified primary efficacy endpoints in the three U.S. and Europe Phase 3 trials conducted by us, which we have named ANDES in non-dialysis-dependent CKD, HIMALAYAS in incident (newly initiated) dialysis patients, and SIERRAS in dialysis-dependent CKD patients. These results are detailed below and analysis of secondary endpoints is ongoing.

AstraZeneca has also announced positive topline results from each of its roxadustat Phase 3 trials (named OLYMPUS in non-dialysis CKD and ROCKIES in dialysis-dependent CKD). AstraZeneca and FibroGen are collaborating on the development and commercialization of roxadustat for the treatment of anemia in the U.S., China, and other markets in the Americas and in Australia/New Zealand, as well as Southeast Asia.

Astellas has also announced positive topline results from their trial named ALPS, a roxadustat Phase 3 trial in non-dialysis patients, and PYRENEES, a roxadustat Phase 3 trial in dialysis patients. Astellas and FibroGen are collaborating on the development and commercialization of roxadustat for the treatment of anemia in territories including Japan, Europe, the Commonwealth of Independent States, the Middle East, and South Africa.

The table below is a summary of our Phase 3 CKD anemia trials by regulatory approval region.

Roxadustat Phase 3 CKD Anemia Clinical Trials

		Estimated or Completed # of Patients Enrolled				
Study Sponsor, Number	Comparator	U.S.	Europe	China DD-CKD NDA Approved NDD-CKD NDA reviewed by NMPA, awaiting inspection	Japan DD-CKD NDA Filed	
Non-Dialysis						
FibroGen - FGCL-4592-060 (ANDES)	Placebo	--------	922 --------			
Astellas - 1517-CL-0608 (ALPS)	Placebo	--------	597 --------			
AstraZeneca - D5740C00001 (OLYMPUS)	Placebo	2,781				
Astellas - 1517-CL-0610	Darbepoetin alfa		616			
FibroGen - FGCL-4592-808	Placebo			151		
Astellas - 1517-CL-0310	Darbepoetin alfa					~325
Astellas - 1517-CL-0314	None					~100
NDD-CKD Subtotal by Region		4,300	2,135	151		~425
Incident Dialysis						
FibroGen - FGCL-4592-063 (HIMALAYAS)	Epoetin alfa	--------	1,043 --------			
Stable and Incident Dialysis						
AstraZeneca - D5740C00002 (ROCKIES)	Epoetin alfa	2,133				
Stable Dialysis						
FibroGen - FGCL-4592-064 (SIERRAS)	Epoetin alfa	--------	741 --------			
Astellas - 1517-CL-0613 (PYRENEES)	Epoetin alfa or Darbepoetin alfa	--------	838 --------			
FibroGen - FGCL-4592-806	Epoetin alfa			304		
Astellas - 1517-CL-0302	None					56
Astellas - 1517-CL-0307	Darbepoetin alfa					303
Astellas - 1517-CL-0308	None					75
Astellas - 1517-CL-0312	None					164

DD-CKD Subtotal by Region	4,755	2,622	304	598
Total by Regulatory Approval Region	9,055	4,757	455	~1,000
Combined Total to Support U.S. and EU Approvals	9,671			

Non-Dialysis CKD Patients (ANDES) – FibroGen

ANDES is a 922-patient Phase 3, randomized, double-blinded, placebo-controlled trial designed to evaluate the efficacy and safety of roxadustat vs. placebo for the treatment of anemia in patients with later stage CKD (stages 3, 4 or 5) who are not dialysis dependent. This study was conducted in the U.S. and 14 other countries. Treatment duration was up to 4.5 years, with average duration of 1.7 years. Baseline hemoglobin levels averaged 9.1 g/dL in both the roxadustat (N=616) and the placebo (N=306) arms.

a. U.S. primary efficacy endpoint: roxadustat was superior to placebo in mean hemoglobin change from baseline to the average over Weeks 28 to 52 (2.00 vs. 0.16 g/dL, respectively, $p<0.0001$).
b. EU primary efficacy endpoint: a higher proportion of roxadustat-treated patients (86.0%) achieved a hemoglobin response in the first 24 weeks (defined as achieving a hemoglobin level of at least 11 g/dL and a hemoglobin increase of at least 1 g/dL) as compared to placebo (6.6%), $p=0.0007$.

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In a pre-specified secondary efficacy analysis, roxadustat reduced the risk of rescue therapy by 81% (hazard ratio (HR)=0.19) defined as the time to first use of blood transfusion, administration of an ESA or intravenous ("IV") iron in the first 52 weeks of treatment, p<0.0001. In addition, roxadustat reduced the risk of blood transfusion by 74% (HR=0.26) in the time to first blood transfusion during the first 52 weeks of treatment, p<0.0001.

Incident Dialysis CKD Patients Study (HIMALAYAS) – FibroGen

HIMALAYAS is a 1,043-patient Phase 3 randomized, open-label, active-controlled trial to assess the efficacy and safety of roxadustat compared to epoetin alfa, an ESA, for the treatment of anemia in CKD patients who have newly initiated dialysis treatment for end-stage renal disease ("ESRD") and have had minimal or no exposure to an ESA prior to study participation. This study was conducted in the U.S. and 17 other countries. Treatment duration was up to 4.4 years, with mean duration of 1.8 years. Mean baseline hemoglobin was 8.43 g/dL in the roxadustat arm (N=522) and 8.46 g/dL in the epoetin alfa arm (N=521).

a. U.S. primary efficacy endpoint: the mean hemoglobin change from baseline to the average over Weeks 28 to 52 was 2.57 g/dL (roxadustat) vs. 2.36 g/dL (epoetin alfa), a least squares mean difference of 0.18 g/dL, with the 95% confidence interval ("CI") of (0.08, 0.29). The non-inferiority criteria was met as the lower bound of the 95% CI was well above the non-inferiority margin of -0.75 g/dL, and superiority over epoetin alfa was also achieved, p=0.0005.
b. EU primary efficacy endpoint: roxadustat met the non-inferiority criteria compared to epoetin alfa: 88.2% of the roxadustat-treated patients achieved a hemoglobin response in the first 24 weeks (defined as achieving a hemoglobin level of at least 11 g/dL and a hemoglobin increase of at least 1 g/dL) compared to an 84.5% responder rate in the epoetin alfa arm; lower bound of the 95% CI (-0.9%, 7.6%) of the treatment difference in responder rate is well above the non-inferiority margin of -15%.

Roxadustat-treated patients had a statistically significant reduction in hepcidin, a key regulator of iron metabolism, as compared to ESA-treated patients. Roxadustat was shown to increase hemoglobin regardless of baseline inflammation status.

Stable Dialysis CKD Patients Study (SIERRAS) – FibroGen

SIERRAS is a 741-patient U.S. Phase 3, randomized, open-label, active-controlled trial to assess the efficacy and safety of roxadustat compared to epoetin alfa for the treatment of anemia (in maintaining hemoglobin level) in dialysis CKD patients who were receiving stable doses of ESA prior to study participation. Treatment duration was up to 3.5 years, with a mean duration of 1.9 years. Mean baseline hemoglobin levels were 10.3 g/dL in both roxadustat and epoetin alfa arms.

a. U.S. primary efficacy endpoint: the mean hemoglobin change from baseline to the average over Weeks 28 to 52 was 0.39 g/dL (roxadustat) vs. -0.09 g/dL (epoetin alfa), a least squares mean treatment difference of 0.48 g/dL (95% CI 0.37, 0.59). Roxadustat met the non-inferiority criteria as the lower bound of 95% CI was well above the non-inferiority margin of 0.75 g/dL. Roxadustat also achieved superiority, p<0.0001.
b. EU primary efficacy endpoint: the mean hemoglobin change from baseline to the average over Weeks 28 to 36 was 0.54 g/dL (roxadustat) vs. -0.02 g/dL (epoetin alfa), a least squares mean treatment difference of 0.53 g/dL with a 95% CI (0.39, 0.67). Roxadustat met the non-inferiority criteria as the lower bound of the 95% CI was well above the non-inferiority margin of -0.75 g/dL. Roxadustat also achieved superiority over epoetin alfa, p<0.0001.

Roxadustat-treated patients had a statistically significant reduction in hepcidin as compared to ESA-treated patients. Roxadustat was shown to increase hemoglobin regardless of baseline inflammation status. In addition, in the pre-specified secondary efficacy analysis, roxadustat-treated patients had a 33% reduction in the risk of blood transfusion compared to epoetin alfa (HR=0.67) in the time to first blood transfusion during treatment, p=0.0337.

Safety – ANDES, HIMALAYAS, and SIERRAS

The preliminary safety analyses of each of these three studies show an overall safety profile consistent with the results observed in prior roxadustat studies. The adverse events reported are consistent with those expected in these study populations with similar background diseases. Fully adjudicated MACE results from the pooled safety analyses both for non-dialysis and dialysis CKD populations for the U.S. and EU, are anticipated to be completed in the second quarter of 2019, and we intend to submit a U.S. NDA in the third quarter of 2019. We expect Astellas to submit an MAA to the EMA shortly thereafter. Both the U.S. NDA and European MAA for roxadustat are expected to cover anemia associated with dialysis dependent CKD and non-dialysis-dependent CKD.

Non-Dialysis CKD Patients (OLYMPUS) – AstraZeneca

OLYMPUS is AstraZeneca's Phase 3, randomized, double-blinded, placebo-controlled trial designed to evaluate the efficacy and safety of roxadustat vs. placebo for the treatment of patients with anemia in CKD stages 3, 4 or 5 whose disease progression is

moderate to severe and who are non-dialysis dependent. The trial met its primary efficacy endpoint by demonstrating a statistically-significant and clinically-meaningful improvement in mean change from baseline in hemoglobin levels averaged over Weeks 28 to 52 vs. placebo. The trial evaluated 2,781 patients in 26 countries.

Non-Dialysis CKD Patients (ALPS) – Astellas

ALPS is Astellas' Phase 3, randomized, double-blind, placebo-controlled study of the efficacy and safety of roxadustat for the treatment of anemia in CKD patients not on dialysis. The trial met its primary endpoints by demonstrating superiority in efficacy vs. placebo in terms of both hemoglobin response rate in the first 24 weeks and hemoglobin change from baseline at Weeks 28 to 52. The preliminary safety analysis for this trial shows an overall event profile consistent with the results seen in previous roxadustat studies in CKD patients with anemia.

Stable Dialysis CKD Patients (ROCKIES) – AstraZeneca

ROCKIES is AstraZeneca's Phase 3, randomized, open-label, active-controlled trial designed to assess the efficacy and safety of roxadustat vs. epoetin alfa, for the treatment of anemia in patients with CKD who are dialysis dependent. The trial met its primary efficacy endpoint by demonstrating a statistically-significant improvement in mean change from baseline in hemoglobin levels averaged over Weeks 28 to 52 vs. epoetin alfa. The trial evaluated 2,133 patients in 18 countries.

Stable Dialysis CKD Patients (PYRENEES) – Astellas

PYRENEES is Astellas' Phase 3, randomized, active-controlled trial designed to assess the efficacy and safety of roxadustat vs. epoetin alfa or darbepoetin alfa, for the treatment of anemia in patients with CKD who are dialysis dependent. The trial, in 838 patients, met its primary efficacy endpoint.

Estimated Glomerular Filtration Rate Attenuation

We believe there could be significant clinical benefit of roxadustat treatment in the non-dialysis-dependent CKD patients if we are able to show the attenuation of renal disease progression. The estimated glomerular filtration rate ("eGFR") is a measure of the filtration function of the kidney and renal disease progression. In the preliminary analysis of our pooled Phase 3 non-dialysis studies (ANDES, ALPS, and OLYMPUS) of patients with eGFR 15 or higher (CKD stages 3 and 4), the one-year decline in eGFR in roxadustat treated patients was shown to be significantly less than that in placebo treated patients.

Background of Anemia in CKD

Anemia can be a serious medical condition in which patients have insufficient red blood cells and low levels of hemoglobin ("Hb"), a protein in red blood cells that carries oxygen to cells throughout the body.

Anemia in CKD is associated with increased risk of hospitalization, cardiovascular complications, and death. In addition, anemia frequently causes significant fatigue, cognitive dysfunction, and reduced quality of life. Severe anemia is common in patients with CKD, cancer, MDS, inflammatory diseases, and other serious illnesses.

Anemia is particularly prevalent in patients with CKD. The prevalence of CKD in the adult population is estimated at 10-12% globally, and is generally a progressive disease characterized by gradual loss of kidney function that may eventually lead to kidney failure or ESRD requiring dialysis or a kidney transplant to survive. Blood transfusion is used for treating life-threatening severe anemia. However, blood transfusions reduce the patient's opportunity for a kidney transplant, increase risk of infections and the risk of complications such as heart failure and allergic reactions.

There are five stages of CKD that are primarily defined by the Glomerular Filtration Rate (“GFR”).

Stages of CKD and Prevalence in the U.S.

*U.S. prevalence is estimated for adults 20 years of age or older
†GFR: Glomerular Filtration Rate (ml/min/1.73 m^2)
Sources: The prevalence of stage 1 through stage 4 CKD was calculated based on 2016 estimates by the United States Renal Data System ("USRDS") presented in the 2018 USRDS annual data report: Epidemiology of kidney disease in the United States ("2018 USRDS ADR"), using data from the National Health and Nutrition Examination Survey ("NHANES") 2013-2016 and 2016 data from the U.S. Census Bureau. The prevalence of stage 5 CKD was calculated based on 2016 data from the 2018 USRDS ADR using data from the U.S. National ESRD database, NHANES 2013-2016 and 2016 data from the U.S. Census Bureau.

The prevalence rate of anemia in patients with Hb<12 g/dL is set forth below.

Sources: The prevalence of anemia in stage 1 through stage 4 CKD and stage 5 NDD-CKD was derived from Stauffer and Fan, Prevalence of Anemia in Chronic Kidney Disease in the United States, PLoS ONE (2014). The prevalence of anemia in patients undergoing dialysis was derived from Goodkin et al., Naturally Occurring Higher Hemoglobin Concentration Does Not Increase Mortality among Hemodialysis Patients, J Am Soc Nephrol (2011).

In the U.S., according to the USRDS, a majority of dialysis-eligible CKD patients are currently on dialysis. Of the approximately 509,000 patients receiving dialysis in the U.S., approximately 78% are being treated with ESAs for anemia. Despite the presence of anemia in stages 3 and 4 CKD patients in clinical practice, patients typically do not receive ESA treatment for their anemia until they initiate dialysis. As of 2016, approximately 13% of U.S. NDD-CKD patients were being treated with ESAs prior to initiation of dialysis (2018 USRDS ADR). In many CKD patients, the disease progresses gradually over decades and patients can spend years suffering from the symptoms and negative health effects of anemia before they receive treatment. Many of these patients die from cardiovascular events before they initiate dialysis.

According to IQVIA (formerly Quintiles and IMS Health) MIDAS™ reports, for the twelve months ending September 2018, global ESA sales in all anemia indications totaled $7.6 billion, including $3.5 billion in the U.S.

Roxadustat — A Novel, Orally Administered Treatment for Anemia

Roxadustat is an orally administered small molecule that corrects anemia by a mechanism of action that is different from that of ESAs. As a HIF-PH inhibitor, roxadustat activates a response that is naturally activated when the body responds to reduced oxygen levels in the blood, such as when a person adapts to high altitude. The response activated by roxadustat involves the regulation of multiple, complementary processes to promote erythropoiesis and increase the blood’s oxygen carrying capacity.

Coordinated erythropoiesis includes both the stimulation of red blood cell progenitors, by increasing the body’s production of erythropoietin (“EPO”), and an increase in iron availability for hemoglobin synthesis. Patients taking roxadustat typically have a transient increase in circulating endogenous EPO levels at peak concentration within or near the physiologic range naturally experienced by humans adapting to hypoxic conditions such as at high altitude, following blood donation or impaired lung function, such as pulmonary edema. By contrast, ESAs act only to stimulate red blood cell progenitors without a corresponding increase in iron availability, and are typically dosed at well above the natural physiologic range of EPO. The sudden demand for iron stimulated by ESA-induced erythropoiesis can lead to functional or absolute iron deficiency. We believe these high doses of ESAs are a main cause of the significant safety issues that have been attributed to this class of drugs. In contrast, the differentiated mechanism of action of roxadustat, which involves induction of the body’s own natural pathways to achieve a more complete erythropoiesis, has the potential to provide a safer and more effective treatment of anemia, including in the presence of inflammation, which normally limits iron availability.

We believe that roxadustat has the potential to offer safety, efficacy, reimbursement, and convenience advantages over ESAs.

Our clinical trials to date have shown that roxadustat can correct and maintain hemoglobin levels of anemic CKD patients with lower circulating EPO levels than what has historically been reported with treatment by ESAs to minimize red blood cell transfusion risks, even in the presence of inflammation, and without routine IV iron supplementation, thereby offering potential safety and efficacy benefits over ESAs.

Potential for Reduced Hepcidin Levels and Anemia Correction Without Routine IV Iron Supplementation

An important differentiator of roxadustat from ESAs is that roxadustat also mobilizes iron from the body's iron stores. It has been consistently shown to correct anemia in CKD regardless of iron-repletion status, whereas iron repletion is required as a condition for treatment under ESA labels. Furthermore, roxadustat can correct and maintain hemoglobin without routine IV iron supplementation.

IV iron supplementation is routinely used to support anemia correction in a majority of hemodialysis patients treated with ESAs in the U.S. Many CKD patients have deficient iron stores, or absolute iron deficiency, and cannot absorb enough iron from diet or oral iron supplements to correct this deficiency. Physicians administer IV iron to ensure these patients are iron replete prior to initiating ESA treatment and continue to receive IV iron to mitigate iron depletion caused by ESA-mediated erythropoiesis. Additionally, many CKD patients who have adequate iron stores suffer from functional iron deficiency.

While IV iron can help correct anemia when used in combination with ESAs, published studies have suggested both acute and chronic risk of morbidity and mortality associated with the use of IV iron. Increased use of IV iron has been associated with increased risk of hospitalization and death.

We believe that elevated levels of hepcidin, the major hormone that regulates iron metabolism, contributes to both absolute and functional iron deficiency. However, our clinical trials have not only consistently shown roxadustat's ability to correct anemia without use of routine IV iron supplementation, but they have also shown a reduction in hepcidin levels with roxadustat treatment.

Minimizing IV iron use helps to avoid the safety risks associated with IV, and, because the cost of oral iron is significantly less than the cost of IV iron, treatment with roxadustat could also potentially confer significant costs savings from not requiring routine IV iron supplementation.

Potential for Anemia Correction for Patient Populations Who are Hyporesponsive to ESAs

Incident dialysis patients and patients who have chronic inflammation are often hyporesponsive to ESAs, which necessitates the use of higher doses of ESAs to increase hemoglobin levels, thus increasing both safety risk and treatment cost. In contrast, roxadustat has been shown to be similarly effective in patients with inflammation as those without inflammation without increasing dose. Roxadustat's ability to overcome the suppressive effects of inflammation on erythropoiesis also may enable patients to safely achieve higher hemoglobin levels, which may reduce red blood cell transfusions (as reported in the U.S. Phase 3 study in dialysis patients (SIERRAS) earlier in this section). We believe roxadustat's consistent treatment effect on CKD anemia regardless of inflammation status may confer clinical safety and efficacy benefits.

While we have not finished analyzing our U.S. and Europe Phase 3 trial data, our China Phase 3 trials showed that roxadustat was able, in these smaller studies, to increase hemoglobin regardless of baseline inflammation status: both in dialysis-dependent CKD patients and non-dialysis-dependent CKD patients (as described in the section below

captioned “Roxadustat for the Treatment of Anemia in Chronic Kidney Disease in China.”). Our Phase 2 clinical trials showed similar results.

Potential for Anemia Correction with Moderate EPO Levels

Randomized trials have suggested that high doses of ESAs administered in an attempt to achieve a target hemoglobin level may cause the safety issues associated with ESA therapy. These high ESA doses in the inflamed/hyporesponsive patients result in serum EPO levels much higher than physiological range. In contrast, the level of endogenous EPO elevation among patients treated with roxadustat is typically within or near the range observed when ascending to a higher elevation or giving blood. Treating anemia while maintaining lower circulating EPO levels may mitigate, or even avoid, the risks from exposure to supraphysiologic erythropoietin levels in ESA therapy, and may potentially enable a more effective and safe treatment of anemia in CKD patients.

The following graph depicts:

1) the circulating endogenous EPO levels in natural physiologic adaptations, such as adjustment to high altitude, blood loss, or pulmonary edema [left,];
2) transient peak endogenous EPO levels estimated for CKD patients who achieved a hemoglobin response to therapeutic doses of roxadustat in our Phase 2 clinical studies [middle,]; and
3) the estimated peak circulating recombinant EPO levels resulting from IV ESA doses in distributions reported by the Dialysis Outcomes and Practice Patterns Study for the fourth quarter of 2011 in the U.S. (after bundling was initiated and when the hemoglobin target in ESA labeling was in the range of 10-11 g/dL [right,]).

[1] Milledge & Cotes (1985) J Appl Physiol 59:360;[2] Goldberg et al. (1993), Clin Biochem 26:183, Maeda et al. (1992), Int J Hematol 55:111; [3] Kato et al. (1994) Ren Fail 16:645; [4] The transient peak endogenous EPO concentrations ("Cmax"), data for roxadustat was derived from a subset of 243 patients who achieved a hemoglobin response to roxadustat in our Phase 2 studies for whom we believe doses depicted approximated therapeutic doses. Hemoglobin target ranges for these patients were above the hemoglobin levels specified in the current ESA package insert for CKD patients. Only doses in those patients whose hemoglobin responded in Phase 2 studies are reflected in the figure. The subset of patients included 134 non-dialysis CKD patients treated to thrice-weekly, twice-weekly, or weekly doses of roxadustat for >16 weeks. The subset also included 109 dialysis CKD patients, including incident dialysis patients whose anemia was corrected with therapeutic doses and stable dialysis patients who received maintenance doses. Cmax of endogenous EPO levels were not measured in all patients; instead the range of EPO Cmax levels were estimated based on data derived from a more limited number of patients in whom EPO levels were measured at various roxadustat doses and among whom there was substantial variation in measured EPO levels. Accordingly, individual patients who received roxadustat may have realized EPO Cmax levels significantly above or below these estimated levels. Moreover, the estimates reflected in the graph may not be reflective or predictive of actual EPO Cmax levels or ranges that will be realized in larger populations of patients receiving roxadustat in our Phase 3 clinical trials. [5] EPO Cmax was computed from ESA dose distributions based on Flaherty et al. (1990) Clin Pharmacol Ther 47:557.

Potential Cholesterol Benefits

In addition, in our Phase 2 and China Phase 3 clinical trials, we observed reductions in total cholesterol and an improvement in average high-density lipoprotein ("HDL")/low-density lipoprotein ("LDL") ratio. Since many CKD patients have high cholesterol levels, which contribute to cardiovascular-related morbidity and mortality, the improvement in the average HDL/LDL ratio observed with roxadustat treatment could confer a benefit to patients.

Potential Reimbursement and Convenience Advantages

Potentially Differentiated Reimbursement Framework

ESAs are included in the Medicare Improvements for Patients and Providers Act bundled payment system in the dialysis-dependent CKD setting and reimbursed under Medicare Part B in the non-dialysis-dependent CKD setting. Based on our roxadustat data to date, we believe roxadustat has the potential to correct anemia through a differentiated mechanism of action and that offers different therapeutic effects than ESA and the potential to displace multiple drugs in current use (such as ESAs and IV iron), and/or those in development (such as agents for suppression of hepcidin). Although the bundle currently covers ESAs or other IV products encompassed by the bundle, due to the differentiated innovative nature of roxadustat, it is unclear whether roxadustat will be included in or excluded from the bundle. We believe that there may be commercial benefits in either event, however are unable to predict the potential benefits until further guidance from the Centers for Medicare and Medicaid Services becomes available.

In the non-dialysis CKD setting, we expect that roxadustat, an oral treatment, should be subject to Medicare Part D, which would allow physicians to prescribe roxadustat without the financial and reimbursement risk associated with purchasing and storing injectable ESAs. We believe that this should encourage significantly greater usage outside of the dialysis setting than injectable agents like ESA.

Potential Reduction of Other Medications

In addition to potentially eliminating routine IV iron supplementation, based on our Phase 2 and China Phase 3 clinical trial results to date, we believe that roxadustat has the potential to reduce the use of other medications frequently required in some CKD anemia patients, such as anti-hypertensives and statins.

Oral Administration

Many physicians that treat CKD patients, particularly primary care and family practice physicians, cardiologists, endocrinologists, and internists, do not typically stock or administer ESAs. An easily accessible oral agent that is dispensed by pharmacies could significantly increase the number of physicians treating anemia in patients with CKD, and therefore, the number of patients receiving treatment.

In addition, the oral administration of roxadustat potentially offers a significant convenience advantage for CKD patients who have yet to initiate dialysis and are therefore not regularly visiting a dialysis center. Patients can more easily self-administer medicine in any setting, rather than being subject to the inconvenience and restrictions of regular visits to physicians' offices or infusion centers to receive treatment with ESAs.

Potential Pharmacoeconomic Advantages

Based on our Phase 2 clinical trial results to date, we believe that roxadustat's potential pharmacoeconomic advantages over ESA therapy may include safety (with a potential decrease in cardiovascular events and hospitalizations, with consequently lower associated treatment costs), lower administrative cost, reduction or elimination of IV iron and potentially other medications. If demonstrated in our Phase 3 studies, these pharmacoeconomic advantages may support reimbursement worldwide, including in Europe and China.

The Market Opportunity for Roxadustat

We believe that there is a significant opportunity for roxadustat to address markets currently served by injectable ESAs. According to IQVIA (formerly Quintiles and IMS Health) MIDAS™ reports, over the 12 months ending

September 30, 2018, global ESA sales in all indications totaled $8.0 billion, driven primarily by $5.6 billion sold in the U.S. and Europe. We believe that a substantial portion of ESA sales are for CKD anemia. For example, Amgen reported in January 2019 that its ESA portfolio of EPOGEN® (epoetin alfa) and Aranesp® (darbepoetin alfa) had total 2018 worldwide sales of $2.6 billion, of which $2.3 billion was in nephrology where CKD patients are treated. We further believe that the number of patients requiring anemia therapy will grow steadily as the global CKD population and access to dialysis care continue to expand, particularly in China and other emerging markets including the rest of Asia, Latin America, Eastern Europe, the Middle East, and the Commonwealth of Independent States. In established markets, such as the U.S., as obesity, hypertension, and diabetes prevalence continue rising, and the mortality of ESRD patients decline, the prevalence of ESRD is expected to grow further. Recent research published in Journal of American Society of Nephrology predicts the prevalence of ESRD in the U.S. to increase by 29% - 68% by 2030 from the level in 2015, to between 971,000 to 1,259,000 in 2030. The USRDS estimates the total U.S. prevalence of ESRD as of 2016 at 724,075, including 509,014 patients on dialysis and 215,061 transplant recipients.

Furthermore, we believe that there is a significant opportunity for roxadustat to address patient segments that are currently not effectively served by ESAs, such as anemia in the non-dialysis CKD patient population, which is substantially larger than the dialysis CKD patient population. Diabetes and hypertension are the leading causes of secondary CKD. Although we estimate approximately 36% of diabetic and 20% of hypertensive CKD patients are anemic (Hb<12 g/dL), we believe the majority of these patients are currently untreated for anemia since they are under the care of primary care, family practice physicians, and other non-nephrology specialists, such as endocrinologists, diabetologists, cardiologists, and internists, where ESA therapies are not readily available.

We believe that roxadustat may provide a safer option to address the CIA market, which was once comparable in size to the dialysis-dependent CKD anemia market. In addition, other types of anemias, including anemia related to inflammatory diseases, MDS, and surgical procedures requiring transfusions that are not addressed adequately with currently available therapies may be addressable opportunities.

To maximize the commercial potential for roxadustat, we incorporated several unique elements into our Phase 3 program. We have performed the first placebo-controlled Phase 3 studies in non-dialysis CKD patients to potentially demonstrate the benefits of anemia therapy and safety of roxadustat compared to placebo. We have also performed the largest Phase 3 study in incident dialysis anemia patients, who are at the highest risk for death, and are the most difficult patients to stabilize and treat for anemia in CKD. Based on data from our Phase 2 studies, we believe that roxadustat may offer a safer alternative to ESAs for this particularly vulnerable patient population. We are also evaluating the cardiovascular safety of roxadustat compared to placebo in non-dialysis CKD patients. Separately, we are evaluating cardiovascular safety of roxadustat compared to ESA in the dialysis population of CKD patients.

Phase 1 and Phase 2 Clinical Trials

We have an extensive roxadustat clinical pharmacology program which includes many completed Phase 1 studies. Our Phase 2 program includes eight roxadustat studies, four in CKD non-dialysis patients and four in CKD dialysis patients, which achieved the following objectives:

- Identified optimal roxadustat dosing regimens for anemia correction and maintenance of hemoglobin response.
- Demonstrated roxadustat’s potential to treat anemia in both non-dialysis and dialysis patients, including incident dialysis patients, the most unstable and high-risk CKD patient population.
- Generated substantial safety data indicating that roxadustat is well tolerated, appears safe, and could offer an improved cardiovascular profile relative to ESAs.
- Demonstrated that roxadustat may be able to treat anemia without the need for IV iron supplementation.
- Demonstrated that roxadustat can reduce hepcidin levels and potentially treat anemia in a significant subset of patients with inflammation.

The following chart summarizes the design of our completed Phase 2 studies outside of Japan and China and the primary objectives of each study.

Completed Phase 2 Studies

Study Number Study Location	CKD Patient Population	Study Objective	Number of Roxadustat Patients	Number of Comparator Patients Placebo	ESA	Total Number of Patients in Study	Treatment Duration (Weeks)	Dose Frequencies
FGCL-4592-017 U.S.	Non-Dialysis	Correction, Pharmacokinetics	88	29		117	4	TIW, BIW
FGCL-4592-041 U.S.	Non-Dialysis	Correction & Maintenance	145			145	16;24	TIW, BIW, QW
FGCL-4592-040 U.S.	Stable Dialysis	Conversion & Maintenance	117	4	40	161	6;19	TIW
FGCL-4592-053 Russia, U.S., Hong Kong	Incident Dialysis	Correction	60			60	12	TIW
FGCL-4592-059 U.S.*	Non-Dialysis & Dialysis	Long-Term Safety & Maintenance	15			15	Up to 5 years	TIW, BIW, QW
Total			425			498		

*Study conducted by Astellas

QW = weekly; BIW = two times per week; TIW = three times per week

Safety Summary

In addition to the more than 1,100 subjects who have been exposed to roxadustat in Phase 1 and Phase 2 clinical studies, our Phase 3 program has studied roxadustat in over 11,000 patients globally. The preliminary Phase 3 safety analyses reported have shown an overall safety profile consistent with the results observed in prior roxadustat studies. The adverse events reported are consistent with those expected in these study populations with similar background diseases. The pooled safety analyses, including MACE for CKD in both non-dialysis and dialysis populations in the U.S. and EU Phase 3 programs, are anticipated to be completed in the second quarter of 2019.

ROXADUSTAT FOR THE TREATMENT OF ANEMIA IN CHRONIC KIDNEY DISEASE IN CHINA

Roxadustat received NDA approval in December 2018 from the NMPA for the treatment of anemia caused by CKD in dialysis patients. Roxadustat is the first HIF-PH inhibitor to be approved, for any indication, anywhere in the world. We believe this is the first time that China became the first-in-world approval country for a first-in-class drug. We are planning to launch roxadustat in China in the third quarter of 2019.

We believe there is a particularly significant unmet medical need for the treatment of anemia in CKD in China. Specifically, anemia is undertreated in the rapidly growing population of dialysis patients. In the non-dialysis population, only a small percentage of patients receive anemia treatment, and those who do receive only a minimal level, including patients who are eligible for dialysis and are severely anemic. In the context of the rapidly growing Chinese pharmaceutical market, we believe that the demand for anemia therapy will continue to grow as a result of an expanding CKD population, as well as the central government’s mandate to make dialysis, which is still in the early

stages of infrastructure development, more available through expansion of government reimbursement and build-out of dialysis facilities. The Chinese government has also put pharmaceutical innovation as a top priority for the country. As the standard of living improves in China, the demand for access to innovative drugs increases. In this context, we believe that roxadustat is a particularly promising product for this market.

FibroGen applied for market approval of roxadustat in China as a Domestic Class I innovative drug. This China-specific pathway is independent of any U.S., EU or Japan approval. We expect the population of non-dialysis CKD patients to be added to the roxadustat label in mid-2019 pending scheduling and completion of the standard Phase 3 clinical site inspections by the China Food and Drug Inspection (“CFDI”) under the NMPA.

As part of the approval, we have committed to a 2,000-patient post-approval safety study, which is a mandatory regulatory requirement of approved Domestic Class 1 innovative drugs.

Phase 3 Studies in China

In January 2017, we reported topline results from the two China Phase 3 studies of roxadustat in CKD anemia:

Study 4592-808: Eight-Week Placebo-Controlled Portion of 26-Week Correction in China Non-Dialysis CKD Patients

In the double-blind, placebo-controlled eight-week portion of the 26-week clinical trial of CKD patients not on dialysis in China, 151 anemia patients were randomized 2:1 to receive roxadustat (n=101) or placebo (n=50). Roxadustat met its primary efficacy endpoint of correcting anemia, by achieving a statistically significant increase in hemoglobin levels compared to placebo over eight weeks. Furthermore, the secondary endpoint of hemoglobin response was met as hemoglobin response was achieved by a higher proportion of patients in the roxadustat arm than in the placebo arm.

Roxadustat-treated patients achieved a mean hemoglobin increase of 1.9g/dL from baseline (8.9g/dL) over eight weeks of treatment vs. a mean change in hemoglobin of -0.4g/dL (from 8.9 g/dL baseline) in the placebo arm; the least square mean (“LS Mean”) difference of the two arms is significant, $p<0.000000000000001$.

A significantly higher proportion of roxadustat patients achieved hemoglobin response (an increase ≥1g/dL from baseline) after eight weeks vs. placebo patients, 84.2% compared to 0.0% ($p<0.000000000000001$). Sixty-seven percent of the roxadustat-treated patients vs 6% of placebo- patients achieved hemoglobin correction to be at or above the desired range of Hb≥10 g/dL within eight weeks, $p=0.000000000000077$.

There was a significant increase in hemoglobin level from baseline at every weekly measurement between Weeks two to eight per figure below.

FGCL-4592-808: Mean (+/- SE) Change from Baseline in Hemoglobin (Hb)

After Week eight, placebo patients were converted to roxadustat treatment and patients originally in the roxadustat arm continued treatment through Week 26. Anemia correction and hemoglobin maintenance were observed up to Week 27.

FGCL-4592-808: Mean Change in Hemoglobin over Time in Phase 3 China Non-Dialysis CKD Patients (26 Weeks) Including Placebo Crossover to Roxadustat

In the 26-week portion of this China Phase 3 non-dialysis study, 97.6 % of patients who received up to 26 weeks of roxadustat achieved anemia correction with Hb ≥10.0g/dL. For patients who crossed over from placebo to roxadustat, there was an increase in mean hemoglobin levels over 18 weeks of roxadustat treatment, with mean hemoglobin increasing from 8.6 g/dL (averaged over Weeks seven to nine) to 10.8 g/dL (averaged over Weeks 23 to 27); a statistically significant increase ($p < 0.0001$). Hemoglobin levels declined after Week 27 when patients were no longer receiving roxadustat, as illustrated by the figure above.

In the 26-week portion of this non-dialysis study, roxadustat was shown to increase hemoglobin regardless of baseline inflammation status: both in patients with inflammation (CRP >4.9 mg/L) and in patients without inflammation (CRP ≤4.9 mg/L).

The durability of roxadustat's effect on hemoglobin levels was further supported by data from the subset of patients (n=23) who participated in the 52-week safety extension of this non-dialysis China Phase 3 study. Approximately 95% of the non-dialysis patients who completed the 52-week safety extension period maintained Hb ≥10.0g/dL at the end of treatment.

In addition, in the eight-week portion of this non-dialysis study, roxadustat led to significant reduction in serum hepcidin levels (-56.1 ng/mL for roxadustat patients vs -15.1 ng/mL for placebo, p=0.00000005). Anemia treatment with roxadustat was effective without the use of IV iron and there was no iron parameter (ferritin or TSAT) requirement for patients at study entry.

Study 4592-806: 26-Week Maintenance in China Dialysis-Dependent CKD Patients

In the Phase 3 CKD study, 304 patients (271 hemodialysis and 33 peritoneal dialysis patients) previously on epoetin alfa were randomized to and treated with roxadustat (n=204) or epoetin alfa (n=100) for 26 weeks. Prior to randomization, patients in this study were previously treated with stable doses of EPO: 7% patients were treated with ® ("Li Xue Bao") epoetin alfa, manufactured in Japan and marketed in China by Kyowa Hakko Kirin China Pharmaceutical Co., Ltd. ("Kirin EPO") and 93% of patients were treated with one of eight other brands of EPO commercially available in China. All the patients randomized to the active comparator arm were treated with Kirin EPO.

The primary endpoint was mean change in hemoglobin from baseline to the average level during the final five weeks of the 26-week treatment period. Roxadustat met the predefined non-inferiority criterion for this primary endpoint in comparison to Kirin EPO in both full analysis set and per protocol set ("PPS") analysis. In a pre-specified sequential analysis, roxadustat also showed statistical superiority over Kirin EPO for the primary endpoint, the mean hemoglobin increase observed in the roxadustat arm was higher than in the Kirin EPO arm, 0.75g/dL vs. 0.46g/dL, with a significant difference in the LS Mean hemoglobin change in the two treatment arms, p=0.037, in PPS analysis; baseline hemoglobin was 10.4 g/dL in both treatment arms.

Anemia in patients treated with roxadustat was corrected earlier than in Kirin EPO patients, and roxadustat maintained hemoglobin levels at a higher level (between 10-12 g/dL) than those receiving Kirin EPO despite the increase in average dose of Kirin EPO (relative to average baseline EPO dose) received by patients in the comparator arm (as shown in the inflammation figures below).

FGCL-4592-806: Mean (+/- SE) Change from Baseline in Hemoglobin (Hb)

We performed a subgroup analysis based on patients' levels of inflammation, a common co-morbidity with CKD patients. Roxadustat raised and maintained hemoglobin levels in patients with inflammation (defined as having baseline CRP levels >ULN 4.9 μg/L) at doses that were equal to or lower than those received by the patients without inflammation. In contrast, patients with inflammation in the Kirin EPO arm realized lower hemoglobin levels than patients with normal CRP levels (despite receiving higher doses of EPO than patients without inflammation), reflecting roxadustat's potential to overcome the hyporesponsiveness seen in ESA treatment, as discussed in the section above titled "Limitations of the Current Standard of Care for Anemia in CKD". The two figures below show mean change in hemoglobin with mean patient dose, and mean hemoglobin levels with mean patient dose, in patients with and without inflammation.

FGCL-4592-806: Mean (+/- SE) Change in Hemoglobin (Hb) from Baseline and

Mean (+/- SE) Dose for Patients with and without Inflammation

FGCL-4592-806: Mean (+/- SE) Hemoglobin (Hb) and

Mean (+/- SE) Dose for Patients with and without Inflammation

One hundred and twelve roxadustat patients continued treatment in a safety extension study for a total of 52 weeks. Approximately 96% of the dialysis patients who completed the 52-week safety extension period maintained Hb ≥10.0 g/dL at the end of treatment.

Hepcidin, the key hormone that regulates iron metabolism, is generally elevated and contributory to EPO hyporesponsiveness in patients with inflammation. Consistent with previously reported Phase 2 CKD data from the U.S. and China, a reduction of serum hepcidin levels was observed in our two China Phase 3 studies of roxadustat in CKD. In the Phase 3 dialysis study, the mean decrease in serum hepcidin levels from baseline to the end of 26 weeks of treatment was 30.2 ng/mL in the roxadustat arm vs. 2.2 ng/mL in the EPO comparator arm. In the Phase 3 non-dialysis study, the mean decrease in hepcidin levels at the end of 8-week double-blind treatment period was 56.1 ng/mL in roxadustat arm vs. 15.1 ng/mL in the placebo arm (p=0.00000005).

Roxadustat was generally well tolerated and there were no safety signals observed in the China Phase 3 clinical trials, including through the 52-week safety extension periods. There were no study drug-related deaths. The AEs and SAEs reported in the Phase 3 studies were generally representative of the underlying patient population and associated co-morbidities. Treatment of anemia with roxadustat in these Phase 3 clinical trials did not lead to an increase in blood pressure.

China Phase 2 Studies

We performed two Phase 2 studies in China, one trial in non-dialysis CKD patients, and another trial in CKD patients on dialysis. In these trials, hemoglobin correction in non-dialysis CKD patients and hemoglobin maintenance in dialysis CKD patients replicated the results seen in the U.S. trials. SAEs were progression of CKD, infection and high potassium levels and the most common adverse events were infections, high potassium levels, nausea and dizziness. There were no dose-related trends or imbalances in the nature of adverse events between patients treated with roxadustat compared to patients treated with either placebo (study 047) or epoetin alfa control (study 048) groups.

Market Opportunity

Addressable Patient Populations in China

Based on a large-scale cross-sectional survey performed between September 2009 and September 2010 published in the Lancet (Zhang, et al. Lancet (2012)), there are an estimated 119.5 million CKD patients in China. Based on the prevalence ratios, there were approximately 19 million patients in CKD stages 3, 4, or 5, which we have grouped into three categories: dialysis CKD patients; dialysis-eligible patients who need dialysis under treatment guidelines but are not dialyzed ("Dialysis-Eligible NDD-CKD"); and stages 3 and 4 patients, as well as stage 5 patients who are not eligible for dialysis ("Other NDD-CKD").

Dialysis-Dependent CKD

Based on the latest estimates and published data, we believe there are approximately 600,000 dialysis patients in China, making it the largest dialysis population in the world.

Dialysis treatment is delivered in the form of hemodialysis or peritoneal dialysis. In China, approximately 85% of dialysis patients with CKD are on hemodialysis. Hemodialysis is performed primarily in dialysis clinics within hospitals, most of which are publicly owned. This is in contrast to the U.S. where freestanding dialysis centers located outside of hospitals is common practice. With recent regulatory changes, the number of privately owned dialysis clinics is growing at a rapid pace, a trend that has provided additional capacity to meet the growing demand. The remaining 15% of CKD patients are on peritoneal dialysis, which is self-administered at home by patients. Peritoneal dialysis patients typically visit their nephrologists on a monthly basis at the hospital for monitoring and follow-up. The prevalence rate of anemia (defined as Hb< 12) in the dialysis population in China is estimated to be approximately 85%.

Dialysis-Eligible NDD-CKD

Dialysis-Eligible NDD-CKD refers to patients who need dialysis under Chinese treatment guidelines but are not dialyzed. The Chinese treatment guidelines recommend initiation of dialysis at eGFR <10 mL/min/1.73m^2 (eGFR <15 mL/min/1.73m^2 for diabetic nephropathy patients). The number of Dialysis-Eligible NDD-CKD patients in China has been consistently estimated at 1-2 million. While the size of the dialysis population in China has been growing rapidly, it nevertheless falls far short of the number who require dialysis treatment. We believe that this Dialysis-Eligible NDD-CKD population is characteristic of developing markets like China and at risk for severe anemia. The prevalence rate of anemia (defined as Hb <12) in this population in China is estimated to be approximately 90%.

Other NDD-CKD

Other NDD-CKD refers to the sub-groups of CKD patients within non-dialysis who are earlier stage: CKD patients in stage 3 and stage 4, as well as stage 5 who are not eligible for dialysis. As with the Dialysis-Eligible NDD-CKD population, the Other NDD-CKD population is largely untreated with ESAs. Some of these patients receive medical care in endocrinology, cardiology or internal medicine clinics outside of nephrology, where they are treated for their primary disease. The prevalence rate of anemia (defined as Hb <12 for women and <13 for men) in this population in China is estimated to be approximately 50% for Stage 3 and 80% for Stage 4.

Unmet Medical Need and Roxadustat Differentiation

Anemia is considered a risk multiplier for CKD patients and is commonly associated with increased rates of cardiovascular events, hospitalizations, CKD progression, and death. Several of the advantages that roxadustat, our oral therapeutic, potentially offers over ESAs are particularly suited to address the unmet medical need in each of the three categories of CKD patients in China.

We believe there is chronic under-treatment of anemia within the CKD patient population on dialysis in China. The most recent treatment guidelines published by the Chinese Society of Nephrology in 2018 recommended treatment to hemoglobin 11.0 g/dL to 12.0 g/dL. Even though over 70% of hemodialysis CKD patients, and approximately 60% of peritoneal dialysis CKD patients are treated with ESAs, based on the Chinese Renal Data System in 2015, less than 60% of dialysis patients reached 10.2 g/dL.

We believe many of the factors that lead to under-treatment of anemia can be overcome with rsoxadustat:

- The use of IV iron is often needed for ESAs to correct hemoglobin levels, due to functional or actual iron deficiency. However IV iron is also often under-prescribed because of limited reimbursement and the clinical risk associated with IV iron supplementation. Regardless of baseline iron conditions in patients, we have shown in our China Phase 3 data that roxadustat can achieve target hemoglobin rates without routine IV iron supplementation, due in part to roxadustat's ability to decrease hepcidin and make use of endogenous stores of iron or oral iron supplements. Therefore, for any patients not achieving target hemoglobin levels due to lack of available iron, roxadustat may be able to overcome these iron deficiencies better than ESAs.
- Incident dialysis patients and patients who have chronic inflammation are often hyporesponsive to ESAs, and are not able to achieve corrected hemoglobin levels at normal ESA doses. Phase 3 clinical data suggest that roxadustat can treat inflammed patients to target hemoglobin levels without use of higher doses.
- In addition to the issues outlined above for dialysis patients, the peritoneal dialysis population, who generally receives dialysis treatment at home, and the Dialysis-Eligible NDD-CKD patients, who are generally untreated, face the same logistical issues that impede ESA use in the Other NDD-CKD population. Roxadustat, as an oral medication, can be easily administered in any setting and stored at room temperature. Injectable drugs like ESAs present a challenge in China because even subcutaneous administration is performed at hospitals and not in the home, in part due to the difficulty in refrigeration and administration of injectable medicines. Frequent hospital visits, for the sole purpose of receiving injectable ESA treatment (as well as IV iron, which is often necessary with ESA treatment), can present a substantial logistical and financial burden on patients.

Current ESA Market Size and Drivers of Market Growth in China

China is the second largest pharmaceutical market after the United States. Total Healthcare expenditures in China have been estimated to be approximately $640 billion in 2015. Total ESA sales in China were approximately $330 million in 2017, of which an estimated 80%, or approximately $275 million, is derived from CKD anemia sales, based on data from IQVIA China Hospital Pharmaceutical Audit ("CHPA"). The ESA market in China has grown at a 12% compound annual growth rate between 2013 and 2017 based on data from IQVIA CHPA.

In addition to anemia being largely untreated in the non-dialysis CKD population, the CKD population in China is growing steadily.

- Expansion of Reimbursement. Reimbursement exists for the use of ESAs in the treatment of anemia in CKD and the coverage levels have expanded substantially in the past decade. We expect the availability of Severe Disease reimbursement to significantly drive the utilization of dialysis services (including anemia therapies) in the coming years.
- Expansion of Dialysis-Dependent CKD Population and Investment in Dialysis Infrastructure. We believe the number of CKD patients on dialysis increased from approximately 275,000 in 2011 to approximately 500,000 in 2016 and has grown at a compound annual growth rate of 13% per year from 2011 to 2016. With this substantial rate of growth, the Ministry of Health and the Chinese Society of Nephrology have publicly recognized the need for further investment in dialysis infrastructure. Peritoneal dialysis is an alternative to hemodialysis and does not require the level of capital investment in facilities and equipment that is necessary to enable hemodialysis.
- Demographics-Driven Growth. Diabetes and hypertension are common causes of CKD, the rates of which have been growing in China over past two decades. China is experiencing epidemiological changes in metabolic diseases due to economic development, urbanization and an aging population. We believe the increase in diabetes and hypertension prevalence will also result in an increase of CKD patients.

Commercialization

AstraZeneca is our commercialization partner for roxadustat in China. Under our collaboration agreement, AstraZeneca will lead commercialization and has responsibility for marketing, market access, and sales. FibroGen has

responsibility for medical affairs, manufacturing (as the Marketing Authorization Holder), and pharmacovigilance. FibroGen and AstraZeneca will work together to manage distribution.

Pricing

AstraZeneca and FibroGen have been working closely to determine pricing (both for self-pay and reimbursement) that reflects the value proposition of roxadustat, including the differentiation of roxadustat in efficacy and other clinical outcomes, lack of routine IV iron supplementation, convenience against current standard of care, cost effectiveness, and affordability.

Reimbursement

We believe reimbursement and hospital listing are the most critical market access factors for commercialization success in China.

China is a single-payor market with near universal healthcare provided by the government. Over 95% of the population receives healthcare coverage under one government-funded medical reimbursement plan or another, each with different levels of reimbursement. Commercial health insurance is available but is minimally adopted, and is seen as a supplement above and beyond government reimbursement.

Dialysis is reimbursed under Critical Disease Insurance (CDI), where up to 90% of costs are covered. Dialysis-Eligible NDD-CKD and Other NDD-CKD treatment is covered under outpatient care, where reimbursement is generally lower, at an estimated 50-60%.

To obtain government reimbursement for a therapeutic, the government must agree to add it to the NRDL or the provincial reimbursement drug lists at a negotiated price (at times at a significant discount). Prior to this time, the market is self-pay, where patients will be responsible for 100% of the launch price determined by the company. We believe the self-pay market in China is expanding, given the rise in personal income levels in the country. Nevertheless, as roxadustat could potentially address an unmet medical need for a much larger number of patients in China, securing reimbursement from the government is expected to be critical to widespread market adoption.

The government has committed to updating the NRDL in 2019. Previous updates to the NRDL occurred in 2017 and 2009. In addition, there were also NRDL price negotiations in 2018 for oncology drugs. Admission to the NRDL depends on a number of factors, including on-market experience, scale of patient adoption, physician endorsement, cost effectiveness and budget impact. Given that roxadustat was approved at the end of 2018, we may or may not qualify for the NRDL update in 2019. Provincial governments have some discretion to add roxadustat to provincial reimbursement drug lists. With or without being listed on the NRDL, we can apply for inclusion in the provincial reimbursement drug lists of selected provinces, which may take months, depending on the province.

Hospital Listing

Government hospitals currently represent over 90% of the pharmaceutical market in China. In order for roxadustat to be prescribed at a government hospital, it has to be carried in the hospital formulary. The process of entry into the formulary is commonly referred to as “hospital listing”, and typically requires a long lead time. These decisions are made on a hospital-by-hospital basis with timing that can range from every six months to every five years. Some hospitals also have temporary listing procedures that can accelerate timing. Private hospital and non-hospital pharmacies, which represent a small minority of the drug market in China, do not require a formulary process to sell a drug. While the opportunity for roxadustat remains significant, given these market access challenges, the rate of market uptake for a drug is typically modest in China.

Tendering

Provincial and municipal government agencies will establish a provincial drug procurement agency to operate a mandatory collective tender process for purchases by government hospitals of a medicine included in provincial or local medicine procurement catalogs. The provincial or local medicine procurement catalogs are determined by the provincial drug procurement agency based on the National Essential Drugs List, the NDRL, hospital formularies, etc. If roxadustat has been included in a government hospital formulary, the NDRL or the provincial reimbursement drug list, the relevant hospitals must participate in collective tender processes for the purchase of roxadustat. During the collective tender process, the provincial drug procurement agency will establish a committee consisting of recognized pharmaceutical experts. The committee will assess the bids submitted by the various participating pharmaceutical manufacturers, taking into consideration, among other things, the quality and price of the drug product and the service and reputation of the manufacturer. Only drug products that have been selected in the collective tender processes may be purchased by participating hospitals. If we are unable to win purchase contracts through the collective tender processes in which we decide to participate, there will be limited demand for roxadustat, and sales revenues from roxadustat will be materially and adversely affected.

ROXADUSTAT FOR THE TREATMENT OF ANEMIA IN CHRONIC KIDNEY DISEASE IN JAPAN

Dialysis-Dependent CKD Patients in Japan

In September 2018, Astellas submitted an NDA in Japan for roxadustat for the treatment of anemia in CKD patients on dialysis based on positive results from four Phase 3 studies. We expect Astellas to receive a decision on the dialysis NDA in the second half of 2019. Topline results from these four Phase 3 studies are as follows:

Phase 3 Study 1517-CL-0307: Double-Blind Study in Hemodialysis

In 2018, Astellas and FibroGen reported results from Astellas' Phase 3 study of roxadustat in 303 CKD hemodialysis patients with anemia. Average hemoglobin levels were effectively maintained at 10.99 g/dL during Weeks 18 to 24 in roxadustat-treated hemodialysis patients who had previously been treated with ESAs. The primary efficacy endpoint of change in average hemoglobin levels from baseline to Weeks 18 to 24 was -0.04 g/dL and -0.03 g/dL in the roxadustat-treated group and darbepoetin-treated group, respectively. The non-inferiority of roxadustat to darbepoetin alfa in change of average hemoglobin from baseline was confirmed as the lower bound of the 95% CI (-0.18, 0.15) of the treatment difference was greater than the pre-specified non-inferiority margin (-0.75 g/dL).

The hemoglobin maintenance rate (defined as the proportion of patients who achieved an average target hemoglobin level between 10.0 and 12.0 g/dL during Weeks 18 to 24) was 79% in roxadustat-treated patients and 83% in patients in the darbepoetin alfa arm. The hemoglobin maintenance rate of patients with at least one hemoglobin value during Weeks 18-24 was 95% in the roxadustat arm and 91% in the darbepetin alfa arm. Among patients taking roxadustat, serum iron, ferritin, and TSAT were clinically stable; and transferrin and TIBC increased through Week 4 and then remained stable. No remarkable changes in iron parameters occurred with darbepoetin alfa.

Roxadustat was well tolerated in this study, and the safety profile of roxadustat was consistent with that observed in previous studies both in dialysis and non-dialysis patients.

Phase 3 Study 1517-CL-0302: Open-Label Study in Peritoneal Dialysis Patients

In 2017, Astellas and FibroGen reported results from Astellas' multi-center, open-label Phase 3 study of roxadustat in peritoneal dialysis CKD patients with anemia. This 24-week study enrolled a total of 56 peritoneal dialysis patients, of whom 43 patients had previously received ESAs (ESA-conversion patients), and 13 patients had not previously received ESAs (ESA-naïve patients). Roxadustat was well tolerated and shown to correct hemoglobin levels in ESA-naïve patients and maintain hemoglobin levels within the target range in both ESA-conversion patients and ESA-naïve patients.

The hemoglobin maintenance rate (defined as the proportion of patients who achieved an average target hemoglobin level between 10.0 and 12.0 g/dL during Weeks 18 to 24) was 92% in ESA-naïve patients and 74% in ESA-conversion patients. The hemoglobin maintenance rate of patients with at least one hemoglobin value during Weeks 18 to 24 was 92% in ESA-naïve patients and 87% in ESA-conversion patients. The mean of average hemoglobin levels reached during Weeks 18 to 24 was 11.05 g/dL in ESA-naïve patients and 10.93 g/dL in ESA-conversion patients. The mean change in hemoglobin from baseline to the average during Weeks 18 to 24 was 1.69 g/dL in ESA-naïve patients and 0.14 g/dL in ESA-conversion patients. The preliminary safety analysis for this trial is consistent with the safety profile of roxadustat in previous clinical trials.

Phase 3 Study 1517-CL-0308: Open-Label Study in ESA-Naïve Hemodialysis Patients

In 2018, Astellas completed its 24-week long multi-center, open-label, randomized, non-comparator Phase 3 study of roxadustat in 75 CKD ESA-naïve hemodialysis patients with anemia. The hemoglobin response rate at the end of treatment (defined as the proportion of patients who achieved a hemoglobin level ≥10.0 g/dL and a hemoglobin increase from baseline ≥ 1.0 g/dL) was 86.5% in patients randomized to a starting dose of 50 mg of roxadustat, and 89.2% in patients randomized to a starting dose of 70 mg of roxadustat.

Roxadustat was well tolerated in this study, and the results were consistent with the roxadustat safety profile observed to date.

Phase 3 Study 1517-CL-0312: Open-Label ESA-Conversion Study in Hemodialysis

In 2018, Astellas completed its 52-week, multi-center, open-label, non-comparator Phase 3 study of roxadustat in 164 CKD hemodialysis patients with anemia. This study was an ESA-conversion study. The hemoglobin maintenance rate (defined as the proportion of patients who achieved an average target hemoglobin level between 10.0 and 12.0 g/dL) was 79.1% during Weeks 18 to 24, and 71.2 % during Weeks 46 to 52.

Roxadustat was well tolerated in this study, and the results were consistent with the roxadustat safety profile observed to date.

Non-Dialysis-Dependent CKD Patients in Japan

Our partner Astellas has completed ASP-1517-314, one of the two non-dialysis CKD Phase 3 studies for Japan. The two studies are expected to serve as a basis for a supplemental NDA for the treatment of anemia in non-dialysis CKD patients.

Status with Regulatory Agencies

China

Roxadustat received NDA approval in December 2018 from the NMPA for the treatment of anemia caused by CKD in dialysis patients. In doing so, China became the first in-world approval country for a first-in-class (HIF-PH inhibitor) drug. We expect CKD non-dialysis patients to be added to the roxadustat label in mid-2019 pending scheduling and completion of the standard Phase 3 clinical site inspections by the CFDI.

Japan

In September 2018, Astellas submitted an NDA on roxadustat for the treatment of anemia in CKD patients on dialysis. Astellas plans to submit an NDA for anemia for CKD patients not on dialysis upon completion of both non-dialysis CKD Phase 3 studies in Japan.

U.S. and Europe

In conjunction with our collaboration partners, we have completed the Phase 3 trials of roxadustat intended to support marketing authorization applications in the U.S. and EU for the treatment of anemia in CKD. We and our partners are in the process of preparing an NDA for submission to the FDA and an MAA for submission to the EMA in 2019.

Investigational New Drug and Clinical Trial Applications

Roxadustat is being studied under one Investigational New Drug Application (“IND”), and several Clinical Trial Applications (“CTAs”), all with a specified indication of treatment of anemia in CKD. We originally submitted the IND in the U.S. to the FDA in April 2006. Our collaboration partner, Astellas, submitted the CTA in Japan with the PMDA in June 2009. We and our collaboration partners Astellas and AstraZeneca have also submitted CTAs in Europe, Latin America, Canada, Russia, and Asia, beginning in 2013.

For the treatment of anemia in MDS patients, we have submitted an IND to the FDA in the U.S. with CTAs in Asia, Europe, and CTA to the NMPA in China in 2017.

ROXADUSTAT FOR THE TREATMENT OF ANEMIA ASSOCIATED WITH MYELODYSPLASTIC SYNDROMES

Based on roxadustat's mechanism of action and safety and efficacy profile to date, we believe it has the potential to treat anemia associated with many other conditions, including MDS.

Background of Anemia in MDS

MDS are a group of rare disorders characterized by poorly formed or dysfunctional blood cells in the bone marrow, leading to anemia in most cases. Anemia, a serious medical condition, is associated with increased risks of hospitalization, cardiovascular complications, need for blood transfusions, exacerbation of other serious medical conditions, and death, and frequently leads to significant fatigue, cognitive dysfunction, and decreased quality of life.

MDS is regarded as the most prevalent form of acquired bone marrow failure syndrome in adults. However, the incidence and prevalence of MDS are not yet well understood, and may be greatly underestimated, possibly due to under reporting and under diagnosis. MDS diagnosis became reportable under the World Health Organization oncology classification system only in 2001. The

National Cancer Institute estimates approximately 4.9/100,000 people in the U.S. were diagnosed with MDS annually from 2007 to 2011, an increase from 3.3/100,000 annually for 2001 to 2003.

The incidence rate of MDS increases in older populations to 30.2/100,000 people among those 70 and 79 years of age, and further to 59.8/100,000 among those 80 years of age and older. The population-based registries are believed to have underestimated the incidence of MDS due to under diagnosis. It has been reported, using Medicare billing claims data, that the incidence of MDS in patients aged 65 years and older was approximately 162/100,000 as of 2003. The prevalence of MDS in the U.S. is estimated to be between 60,000 and 170,000, and continues to rise as more MDS therapies become available and patients are living longer with MDS.

In China, the incidence of MDS has been estimated to be 1.51/100,000 in the adult population. This lower rate (relative to other major markets such as the U.S., Western Europe, and Japan) may be due to under diagnosis.

Anemia is the most common clinical presentation in MDS, leading to red blood cell transfusions and related risks such as iron overload and significant impairment of the quality of life in affected patients. Dependency on red blood cell transfusions is associated with shorter life expectancy in patients with MDS.

Limitations of the Current Standard of Care for MDS and Anemia Associated with MDS

As a bone marrow disorder MDS patients often rely on repeated blood transfusions. Currently, there is no drug approved for the treatment of anemia in MDS patients in China or in the U.S., and transfusions are not readily accessible in China due to limited blood supply.

Stem cell transplantation is the only treatment that can cure MDS, but is available to only a small fraction of higher risk young MDS patients who are eligible for bone marrow transplant. For these patients, treatment is often delayed until the disease progresses because of the known risks associated with transplantation and low success rates. This treatment option is unavailable to the majority of MDS patients who are older or who are deemed low risk.

There are limited approved pharmacologic treatments for MDS. The FDA-approved treatments for MDS include the aza nucleosides (HMA) 5-azacitidine and decitabine which are typically used for treating intermediate or higher risk patients (based on the International Prognostic Scoring System). Further, these therapies are not approved for lower risk MDS patients because of their significant undesirable effects on bone marrow. These hypomethylating agents can achieve remission in a minority of the treated patients for a short duration of time before progression to acute myeloid leukemia, and are associated with significant levels of neutropenia and thrombocytopenia on top of those caused by the underlying disease. Revlimid® (lenalidomide) is approved in the U.S. and in the EU only for treating MDS patients with 5q (del), a condition present in only 7% to 15% of MDS patients in whom a region of DNA has been deleted on one of the pair of chromosome 5 in the patient's immature red blood cells. With a 61% to 67% responder rate in this sub-population, treatment with lenalidomide is associated with significant side effects such as neutropenia (55% to 75%) and thrombocytopenia (41% to 44%).

While there are no approved therapies for anemia of MDS in the U.S., treatment guidelines recommend the use of ESAs to address anemia in lower risk MDS patients that have a low EPO level. ESA doses used for MDS anemia are generally five times the doses typically used for treating anemia in CKD patients, and the response rates are as low as 20% to 32% in lower risk MDS patients. The low response rate and high ESA doses typical in MDS are primarily due to inflammation, which contributes to ESA-resistance and elevated hepcidin levels, functional iron deficiency, and the underlying progressive dysfunction of the bone marrow. Patients who initially respond to ESAs generally will develop resistance as their MDS progresses and become dependent on blood transfusions.

Red blood cell transfusion is generally reserved for severe anemia in MDS patients. In the U.S., red blood cell transfusions are usually used when Hb <9.0 g/dL or lower. However, in China, the hemoglobin threshold for red blood cell transfusion is as low as <6.0 g/dL in MDS patients due to limited blood supply. Frequent red blood cell transfusions impose both financial and time burdens on patients and payors since frequent visits to the hospital for blood tests and transfusions are required. More importantly, transfusions are associated with risk of development of alloantibodies, which is related to the number of prior transfusions, and the transmission of infectious agents, a particular concern in MDS patients who may have neutropenia and compromised immune systems. Most notably, chronic red blood cell transfusions result in iron overload where iron can damage the heart, liver and other organs, as well as have a negative impact on clonal evolution and on hematopoietic stem cell therapy outcome. Iron overload from red blood cell transfusions is thought to be inhibitory on erythropoiesis and excess iron impacts hepcidin regulation causing a self-reinforcing feedback loop on erythropoiesis. For these reasons, patients with iron overload are treated with iron chelating agent in an attempt to reduce iron toxicity, but gastrointestinal and renal side effects lead to one year discontinuation rate of iron chelator as high as 49%. Given these risk factors, red blood cell transfusion dependency is a strong non-favorable prognostic factor for survival of MDS patients.

The disease burden of anemia in MDS is high. Severe anemia interferes with the quality of life of patients and their ability to work, in addition to damaging other organ systems due to insufficient oxygen delivery to tissues. When red blood cell transfusions become necessary to sustain bodily functions, the risk of transfusion-related complications can further threaten MDS patients' lives and well-being.

Our Solution

We believe there is a significant need for a safer, more effective, and more convenient approach to address anemia in patients with lower-risk MDS. Roxadustat, our orally administered small molecule HIF-PH inhibitor, stimulates the body's natural mechanism of red blood cell production and iron hemostasis based on cellular-level oxygen-sensing and iron-regulation mechanisms. Roxadustat activates a coordinated erythropoietic response in the body that includes the stimulation of red blood cell progenitors, an increase in the body's production of endogenous EPO, and an increase in iron availability for hemoglobin synthesis. Moreover, in anemia of CKD, roxadustat has demonstrated the ability in clinical trials to increase and maintain hemoglobin levels in the presence of inflammation as measured by C-reactive protein, where ESAs have shown limited effect. We believe that we may be able to replicate this result in MDS anemia patients, where it is not uncommon for patients to present with autoimmune and inflammatory conditions.

Clinical Development of Roxadustat in MDS

We are conducting a Phase 3 clinical trial to evaluate the safety and efficacy of roxadustat for treatment of anemia in MDS in the U.S. and Europe. This is a multi-center Phase 3 study in transfusion-dependent, lower risk MDS patients with up to 24 patients in the open-label, lead-in portion of the trial, followed by the 160-patient randomized, double-blind, placebo-controlled part of the study, in which subjects will be randomized 3:2 to receive roxadustat or placebo three-times-weekly for 28 weeks, with safety extension to one year. The primary endpoint is the proportion of patients who achieve transfusion independence.

In China, we are conducting a Phase 2/3 clinical trial to evaluate the safety and efficacy of roxadustat in non-transfusion dependent, lower risk MDS patients with anemia. The initial open-label portion of the study will enroll up to 40 patients, followed by135 patients planned for the randomized, double-blind, placebo-controlled Phase 3 portion of the study, in which subjects will be randomized 2:1 to receive roxadustat or placebo three-times weekly for 26 weeks. The primary endpoint for this study is percentage of patients achieving a hemoglobin response.

We plan on reporting data from the open-label components of both MDS studies in 2019, and after review of the U.S. open-label data, we and our partners will advance to the double-blind portion of the U.S. transfusion-dependent Phase

3 MDS study.

HIF-PH Inhibitor Platform

We have been a world leader in prolyl hydroxylase inhibition since the mid-nineties. Over the past two decades, we have built a robust drug discovery platform based on our deep understanding of the inhibition of prolyl hydroxylase enzymes using small molecules. Our platform is supported by internal proprietary research and numerous academic collaborations, including a long-standing funded collaboration with a research group at the University of Oulu, Finland, headed for many years by our scientific co-founder, Kari I. Kivirikko, M.D., Ph.D. Dr. Kivirikko is one of the world's leading experts in collagen prolyl hydroxylases, and he remains an advisor to us.

Prior to the discovery of HIF regulation by prolyl hydroxylase activity, we acquired compound collections from several pharmaceutical companies and assembled a diverse library of prolyl hydroxylase inhibitors to target collagen prolyl hydroxylase enzymes for fibrosis. Consequently, we were particularly well positioned to rapidly generate proof-of-concept for a number of aspects of HIF biology, and to direct medicinal chemistry efforts towards increasing potency and selectivity for the newly identified HIF-PH enzymes.

We have applied our expertise in the field of HIF-PH inhibition to develop an understanding, not only of the role of HIF in erythropoiesis, but also of other areas of HIF biology with important therapeutic implications. This consistent progression of discovery has led to findings relating to HIF-mediated effects associated with inflammatory pathways, various aspects of iron metabolism, insulin sensitivity and glucose and fat metabolism, neurological disease, and stroke. The extensive patent portfolio covering our discoveries represents an important competitive advantage.

The strength of our platform capitalizes on these internal discoveries, as well as some of the complexities of HIF biology that we and the scientific community have uncovered over the past decades. There are at least three different HIF-PH enzymes that are known to regulate the stability of HIF — these enzymes are commonly referred to in the scientific literature as PHD1, PHD2 and PHD3. Studies of genetically modified mice, in which the individual HIF-PH enzymes have been deleted, have revealed that PHD2 plays a major role in the regulation of erythropoiesis by HIF. In contrast, PHD1 and PHD3 appear to play less important roles in HIF-mediated erythropoiesis, but instead have been implicated in other important biological pathways.

We believe that inhibitors selectively targeting certain prolyl hydroxylases could have important therapeutic applications beyond anemia. For example, as PHD1 has been implicated in ischemic tissue injury, it has been proposed that PHD1 inhibitors may provide a novel therapeutic approach to protect organs and tissues from ischemic damage. PHD3 on the other hand has been implicated in insulin signaling, raising the possibility that PHD3 inhibitors may have therapeutic utility in the treatment of diabetes. Despite the challenges associated with selectively inhibiting just one enzyme from a closely related family, we have made important advances in the identification of selective HIF-PH inhibitors.

We currently have active research programs focused on exploring the therapeutic utility of selective prolyl hydroxylase inhibitors.

PAMREVLUMAB FOR THE TREATMENT OF FIBROSIS AND CANCER

We were founded to discover and develop therapeutics for fibrosis and began studying CTGF shortly after its discovery. Our accumulated discovery research efforts indicate that CTGF is a critical common element in the progression of serious diseases associated with fibrosis.

From our library of human monoclonal antibodies that bind to different parts of the CTGF protein and block various aspects of CTGF biological activity, we selected pamrevlumab, for which we have exclusive worldwide rights. We believe that pamrevlumab blocks CTGF and inhibits its central role in causing diseases associated with fibrosis. Our data to date indicate that pamrevlumab is a promising and highly differentiated product candidate with broad potential to treat a number of fibrotic diseases and cancers.

We are currently conducting Phase 2 trials in pancreatic cancer and DMD and plan on initiating Phase 3 studies in pancreatic cancer and IPF in the second quarter of 2019. We have reported results from our Phase 2 trials in IPF and pancreatic cancer, and plan on initiating our Phase 3 studies in pancreatic cancer and IPF in the second quarter of 2019. Pamrevlumab has received orphan drug designation for IPF and Fast Track designation for the treatment of both IPF patients and patients with locally advanced unresectable pancreatic cancer from the FDA.

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Overview of Fibrosis

Fibrosis is an aberrant response of the body to tissue injury that may be caused by trauma, inflammation, infection, cell injury, or cancer. The normal response to injury involves the activation of cells that produce collagen and other components of the extracellular matrix (“ECM”) that are part of the healing process. This healing process helps to fill in tissue voids created by the injury or damage, segregate infections or cancer, and provide strength to the recovering tissue. Under normal circumstances, where the cause of the tissue injury is limited, the scarring process is self-limited and the scar resolves to approximate normal tissue architecture. However, in certain disease states, this process is prolonged and excessive and results in progressive tissue scarring, or fibrosis, which can cause organ dysfunction and failure as well as, in the case of certain cancers, promote cancer progression.

Excess CTGF Causes Fibrosis. Pamrevlumab Blocks CTGF and Can Reverse Fibrosis

Excess CTGF levels are associated with fibrosis. CTGF increases the abundance of myofibroblasts, a cell type that drives wound healing, and stimulates them to deposit ECM proteins such as collagen at the site of tissue injury. In the case of normal healing of a limited tissue injury, myofibroblasts eventually die by programmed cell death, or apoptosis, and the fibrous scarring process recedes. In fibrotic conditions, excess CTGF results in chronic activation of myofibroblasts, which leads to chronic ECM deposition and fibrosis (refer to figure above).

Multiple biological agents and pathways have been implicated in the fibrotic process (Wynn J Pathol (2008)). Many fibrosis pathways converge on CTGF (refer to figure below), which the scientific literature demonstrates to be a central mediator of fibrosis (Oliver et al., J Inv Derm (2010)). In the case of cancer, the sustained tumor-associated fibrotic tissue promotes tumor cell survival and metastasis. The figure below shows the commonality of cellular mechanisms that may result in fibrosis and cancer.

Most Biological Factors Implicated in Fibrosis Work Through CTGF

CTGF is a secreted glycoprotein produced by fibroblasts, endothelium, mesangial cells and other cell types, including cancers, and is induced by a variety of regulatory modulators, including TGF-ß and VEGF. CTGF expression has been demonstrated to be up-regulated in fibrotic tissues. Thus, we believe that targeting CTGF to block or inhibit its activity could stop or reverse tissue fibrosis. In addition, since CTGF is implicated in nearly all forms of fibrosis, we believe pamrevlumab has the potential to provide clinical benefit in a wide range of clinical indications that are characterized by fibrosis.

Until recently, it was believed that fibrosis was an irreversible process. It is now generally understood that the process is dynamic and potentially amenable to reversal. Based on studies in animal models of fibrosis of the liver, kidney, muscle and cardiovascular system, it has been shown that fibrosis can be reversed. It has also been demonstrated in humans that fibrosis caused by hepatitis virus can be reversed (Chang et al. Hepatology (2010)). Additionally, we have generated data in human and animal studies that lung fibrosis progression can be slowed, arrested, or possibly reversed in some instances upon treatment with pamrevlumab. We do not believe that there is clinical evidence that therapies currently on the market directly prevent or reverse fibrosis in IPF.

While certain other companies are working on topical inhibition of CTGF, we are not aware of other products in development that target CTGF inhibition for deep organ fibrosis and cancer.

Clinical Development of Pamrevlumab — Overview

We have performed clinical trials of pamrevlumab in IPF, pancreatic cancer, liver fibrosis and diabetic kidney disease. In eleven Phase 1 and Phase 2 clinical studies involving pamrevlumab to date, including more than 450 patients who were treated with pamrevlumab (about half of patients dosed for more than six months), pamrevlumab has been well-tolerated across the range of doses studied, and there have been no dose-limiting toxicities seen thus far.

Idiopathic Pulmonary Fibrosis

Understanding IPF and the Limitations of Current Therapies

IPF is a form of progressive pulmonary fibrosis, or abnormal scarring, which destroys the structure and function of the lungs. As tissue scarring progresses in the lungs, transfer of oxygen into the bloodstream is increasingly impaired. Average life expectancy at the time of confirmed diagnosis of IPF is estimated to be between three to five years, with approximately two-thirds of patients dying within five years of diagnosis. Thus, the survival rates are comparable to some of the most deadly cancers. The cause of IPF is unknown but is believed to be related to unregulated cycles of injury, inflammation and fibrosis.

Patients with IPF experience debilitating symptoms, including shortness of breath and difficulty performing routine functions, such as walking and talking. Other symptoms include chronic dry, hacking cough, fatigue, weakness, discomfort in the chest, loss of appetite, and weight loss. Over the last decade, refinements in diagnosis criteria and enhancements in high-resolution computed tomography imaging technology ("quantitative HRCT") have enabled more reliable diagnosis of IPF without the need for a lung biopsy more clear distinction from other interstitial lung diseases.

The U.S. prevalence and incidence of IPF are estimated to be 44,000 to 135,000 cases, and 21,000 new cases per year, respectively, based on Raghu et al. (Am J Respir Crit Care Med (2006)) and on data from the United Nations Population Division. We believe that with the availability of technology to enable more accurate diagnoses, the number of individuals diagnosed per year with IPF will continue to increase.

There are currently two therapies approved to treat IPF in Europe and the U.S., pirfenidone and nintedanib. The approvals and subsequent launches of pirfenidone and nintedanib have clearly shown the commercial potential in IPF. Hoffmann-La Roche ("Roche") reported worldwide sales of pirfenidone for 2017 of approximately $930 million, and approximately $1.01 billion for 2018. Similarly, Boehringer Ingelheim Pharma GmbH & Co. KG ("Boehringer Ingelheim") reported total sales of approximately $1.03 billion for nintedanib in 2017, and approximately $643 million in the first half of 2018.

In clinical trials, we have used advanced medical imaging technology to quantify changes in fibrosis throughout the lungs. Our data to date using these measures demonstrate that pamrevlumab may stabilize and in some instances reverse pulmonary fibrosis (as measured by HRCT) and improve pulmonary function in IPF patients.

Phase 3 Clinical Development – Randomized, Double-Blind, Placebo-Controlled Trial of Pamrevlumab in IPF

We plan to begin enrolling our double-blind, placebo-controlled Phase 3 trial of pamrevlumab in the second quarter of 2019. The trial will randomize (3:2) approximately 500 IPF patients (who are not being treated during the study with approved therapies) to either pamrevlumab or placebo. This study is powered to meet the FDA requirement of a highly statistically-significant result in the primary efficacy endpoint of change from baseline in forced vital capacity ("FVC"). Secondary endpoints will include clinical outcomes of disease progression, patient reported outcomes, and quantitative changes in lung fibrosis volume from baseline.

Study 067 – Randomized, Double-Blind, Placebo-Controlled Phase 2 Trial of Pamrevlumab in IPF

In August 2017, we reported positive topline results from our randomized, double-blind, placebo-controlled Phase 2 clinical trial (Study 067) designed to evaluate the safety and efficacy of pamrevlumab in patients with mild-to-moderate IPF (baseline FVC percentage predicted of 55%), as well as topline results from two sub-studies that were added to evaluate the safety of combining pamrevlumab with recently approved IPF therapies.

In the double-blind, placebo-controlled 48-week portion of this study, one hundred-three (103) patients were randomized (1:1) to receive either 30mg/kg of pamrevlumab or placebo intravenously every three weeks. Lung function assessments were conducted at baseline and at Weeks 12, 24, 36 and 48. Quantitative HRCT assessments were performed at baseline and on Weeks 24 and 48.

Pamrevlumab met the primary efficacy endpoint of change of FVC percent predicted, a measure of a patient's lung volume as a percentage of what would be expected for such patient's age, race, sex and height. The average decline (least squares mean) in FVC percent predicted from baseline to Week 48 was 2.85 in the pamrevlumab arm (n=50) as compared to an average decline of 7.17 in the placebo arm (n=51), a statistically significant difference of 4.33 (p=0.0331, using a linear slope analysis in the Intent to Treat ("ITT") population).

Pamrevlumab-treated patients had an average decrease (least squares mean) in FVC of 129 ml at Week 48 compared to an average decrease of 308 ml in patients receiving placebo, a statistically significant difference of 178 ml (p=0.0249, using a linear slope analysis in the ITT population). This represents a 57.9% relative difference. In addition, the pamrevlumab-treated arm had a lower proportion of patients (10%) who experienced disease progression (defined by a decline in FVC percent predicted of greater than or equal to 10%) or death, than did the placebo arm (31.4%) at Week 48 (p=0.0103). The percentage of pamrevlumab patients who experienced disease progression and discontinued therapy was less than 15% of that in the placebo arm.

In this study, we measured change in quantitative lung fibrosis from baseline to Week 24 and Week 48 using quantitative HRCT. The pamrevlumab arm achieved a statistically significant reduction in the rate of progression of lung fibrosis compared to placebo using HRCT to measure quantitative lung fibrosis (“QLF”). The change in QLF volume from baseline to Week 24 for pamrevlumab-treated patients was 24.8 ml vs. 86.4 ml for placebo, with a treatment difference of -61.6 ml, p=0.009. The change in QLF volume from baseline to 48 weeks was 75.4 ml in pamrevlumab-treated patients vs. 151.5 ml in patients on placebo, with a treatment difference of -76.2 ml, p=0.038.

As in our previous open label Phase 2 study, a correlation between FVC percent predicted and quantitative lung fibrosis was confirmed at both Week 24 and 48 in this study.

We are not aware of any other IPF therapies that have shown a statistically significant effect on lung fibrosis as measured by quantitative HRCT analysis.

The treatment effects of pamrevlumab were demonstrated not only on change in FVC, a measure of pulmonary function and IPF disease progression, and change in fibrosis using quantitative HRCT, but pamrevlumab-treated patients also showed a trend of clinically meaningful improvement in a measure of health-related quality of life using the St. George's Respiratory Questionnaire (SGRQ) vs. a reduction in quality of life seen in placebo patients over the 48 weeks of treatment. The SGRQ quality of life measurement has been validated in chronic obstructive pulmonary disease. In the patients that were evaluated by the UCSD Shortness of Breath Questionnaire, pamrevlumab-treated patients had a significant attenuation of their worsening dyspnea in comparison to placebo.

Pamrevlumab was well-tolerated in the placebo-controlled study. The TEAEs were comparable between the pamrevlumab and placebo arms and the adverse events in the pamrevlumab arm were consistent with the known safety profile of pamrevlumab. In this study, as compared with the placebo group, fewer pamrevlumab patients were hospitalized, following an IPF-related or respiratory TEAE, or died for any reason.

The double-blind, active-controlled combination sub-studies were designed to assess the safety of combining pamrevlumab with standard of care medication in IPF patients. Study subjects were on stable doses of pirfenidone or nintedanib for at least three months and were randomized 2:1 to receive 30 mg/kg of pamrevlumab or placebo every three weeks for 24 weeks. Thirty-six patients were enrolled in the pirfenidone sub-study and 21 patients were enrolled in the nintedanib sub-study. Pamrevlumab appeared to be well-tolerated when given in combination with either pirfenidone or nintedanib.

Study 049 – Open-Label Phase 2 Trial of Pamrevlumab in IPF

We completed an open-label extension of Study 049, a Phase 2 open-label, dose-escalation study to evaluate the safety, tolerability, and efficacy of pamrevlumab in 89 patients with IPF. During the initial one-year treatment period, pamrevlumab was administered at a dose of 15 mg/kg in Cohort 1 (53 patients) and 30 mg/kg in Cohort 2 (36 patients) by IV infusion every three weeks for 45 weeks. After 45 weeks of dosing, subjects whose FVC declined less than predicted were allowed to continue dosing in an extension study until they had disease progression. Nineteen patients from Cohort 1 (35.8%) and 18 patients from Cohort 2 (50.0%) entered the extension study. Efficacy endpoints were pulmonary function assessments, extent of pulmonary fibrosis as measured by quantitative imaging and measures of health-related quality of life. We presented data from our open-label Phase 2 IPF extension study (049) at the International Colloquium on Lung and Airway Fibrosis in November 2016, reporting that no safety issues were observed during prolonged treatment with pamrevlumab. Some of the 37 patients who enrolled in the extension study were treated with pamrevlumab for up to five years. Trends regarding improved or stable pulmonary function and stable fibrosis observed during the initial one-year study were also observed in the extension study.

In Cohort 1, we enrolled patients with a wide range of disease severity to assess safety and efficacy. Baseline FVC percent predicted for Cohort 1 was 43% to 90%, with a mean of 62.8%. In contrast, other IPF clinical trials, such as those for pirfenidone and nintedanib, have enrolled patients who on average had mild to moderate disease (mean FVC percent predicted 73.1% to 85.5%). Fourteen patients in Cohort 1 withdrew, and ten of the 14 had severe disease.

In order to enroll IPF patients similar to those in other IPF trials, we amended the protocol for Cohort 2 to include only patients with mild to moderate disease (FVC ≥ 55% predicted). Baseline FVC percent predicted for Cohort 2 was 53% to 112%, with a mean of 72.7%. Based on this definition of disease severity, 37 patients in Cohort 1 and 32

patients in Cohort 2 had mild to moderate disease.

The table below provides a summary of the observed quantitative change in fibrosis for mild to moderate patients in Cohorts 1 and 2 as measured by quantitative HRCT. Twenty-four percent of these patients had improved fibrosis at Week 48. We believe that this is the first trial to demonstrate a reversal of fibrosis (as measured by HRCT) in a subset of IPF patients. Stable fibrosis has been considered the only achievable favorable outcome in IPF. The table below sets forth the number of patients who showed stable or improved fibrosis at Weeks 24 and 48 compared to the amount of fibrosis at the start of the trial.

Changes in Fibrosis in Patients with Mild to Moderate IPF Treated with Pamrevlumab in FGCL-3019-049

	Stable or Improved Compared to Baseline		Improved Compared to Baseline		Improved Compared to Week 24
	Week 24	Week 48	Week 24	Week 48	Week 48
Cohort 1	21/45(47%)	14/38(37%)	12/45(27%)	12/38(32%)	8/38(21%)
Cohort 2	12/29(41%)	9/28(32%)	5/29(17%)	4/28(14%)	8/26(31%)
Combined	33/75(44%)	23/66(35%)	17/74(23%)	16/66(24%)	16/64(25%)

As we observed in our randomized, double-blind, placebo-controlled Phase 2 clinical trial (Study 067), fibrosis improvement or stabilization in patients with mild to moderate disease as measured as reticular fibrosis by quantitative HRCT correlated with improvement or stabilization of pulmonary function measured by FVC ($p<0.0001$; $r=-0.59$ Cohorts 1 and 2 combined). The figure below shows FVC changes up to Week 48 for mild to moderate patients with stable or improved fibrosis (as measured by HRCT) vs. patients with worsening fibrosis. Patients with stable or improved fibrosis showed improved pulmonary function, on average, which was significantly different or better than patients with worsening fibrosis who showed a substantial decline in FVC ($p= 0.0001$, Cohorts 1 and 2 combined). Patients with worsening fibrosis had pulmonary function that was similar to the annual decline in pulmonary function for typical IPF patients.

Categorical Analysis of FVC Change from Baseline (BL) (mean ±SE) in FGCL-3019-049

Eighty-nine patients had at least one adverse event. The most common reported events were cough, fatigue, shortness of breath, upper respiratory tract infection, sore throat, bronchitis, nausea, dizziness, and urinary tract infection. To date, including the open-label extension, there have been 45 SAEs in 31 patients, four of which were considered possibly related by the principal investigator to study treatment. During the first year of treatment there were 38 TSAEs in 24 patients. Adverse events observed to date are consistent with typical conditions observed in this patient population.

Open-Label Phase 1 Trial of Pamrevlumab in IPF

Study 002 was a Phase 1 open-label study to determine the safety and pharmacokinetics of escalating single doses of pamrevlumab. Patients with a diagnosis of IPF by clinical features and surgical lung biopsy received a single IV dose of pamrevlumab at 1, 3, or 10 mg/kg. A total of 21 patients were enrolled in the study; six patients received a dose of 1 mg/kg, nine patients received 3 mg/kg, and six patients received 10 mg/kg. Pamrevlumab was well tolerated across the range of doses studied; and there were no dose-limiting toxicities. TEAE that were considered to be possibly related by the principal investigator to pamrevlumab were mild and self-limited, consisting of pyrexia, cough and headache.

Pancreatic Cancer

Understanding Pancreatic Cancer and the Limitations of Current Therapies

Certain solid malignant tumors have a prominent fibrosis component consisting mostly of ECM that contributes to metastasis and progressive disease. ECM is the connective tissue framework of an organ or tissue.

Pancreatic ductal adenocarcinoma, or pancreatic cancer, is the third leading cause of cancer deaths in the U.S. According to the Europe Commission's European Cancer Information System, there were 100,005 new cases of pancreatic cancer and 95,373 deaths from pancreatic cancer in the EU projected for 2018. The National Cancer Center of Japan estimated that there were 36,239 new cases of pancreatic cancer in 2014, increased from 24,442 cases in 2004. In its report of December 2017, Decision Resources Group estimated that the major market sales (U.S., EU5 and Japan) of pancreatic cancer drugs will grow from $1.3 billion in 2016 to approximately $3.7 billion in 2026. According to the U.S. National Cancer Institute, in 2018, there were approximately 55,000 new cases of pancreatic cancer projected in the U.S. Fifty percent of new cases are metastatic. Another 15-20% have localized resectable tumors. The remaining 30-35% have localized but unresectable tumors.

For those with non-resectable tumors, median survival is eight to 12 months post-diagnosis, and about 8% realize five years of survival; similar to metastatic cases. For those with resectable tumors, 50% survive 17 to 27 months post-diagnosis and ~20% report five-year survival.

Pancreatic cancer is aggressive and typically not diagnosed until it is largely incurable. Most patients are diagnosed after the age of 45, and according to the American Cancer Society, 94% of patients die within five years from diagnosis. The majority of patients are treated with chemotherapy, but pancreatic cancer is highly resistant to chemotherapy. Approximately 15% to 20% of patients are treated with surgery; however, even for those with successful surgical resection, the median survival is approximately two years, with a five year survival rate of 15% to 20% (Neesse et al. Gut (2011)). Radiation treatment may be used for locally advanced diseases, but it is not curative.

The duration of effect of approved anti-cancer agents to treat pancreatic cancer is limited. Gemcitabine demonstrated improvement in median overall survival from approximately four to six months, and erlotinib in combination with gemcitabine demonstrated an additional ten days of survival. Nab-paclitaxel in combination with gemcitabine was approved by the FDA in 2013 for the treatment of pancreatic cancer, having demonstrated median survival of 8.5 months. The combination of folinic acid, 5-fluorouracil, irinotecan and oxaliplatin (FOLFIRINOX) was reported to increase survival to 11.1 months from 6.8 months with gemcitabine. These drugs illustrate that progress in treatment for pancreatic cancer has been modest, and there remains a need for substantial improvement in patient survival and quality of life.

The approved chemotherapeutic treatments for pancreatic cancer target the cancer cells themselves. Tumors are composed of cancer cells and associated non-cancer tissue, or stroma, of which ECM is a major component. In certain cancers such as pancreatic cancer, both the stroma and tumor cells produce CTGF which in turn promotes the proliferation and survival of stromal and tumor cells. CTGF also induces ECM deposition that provides advantageous conditions for tumor cell adherence and proliferation, promotes blood vessel formation, or angiogenesis, and promotes metastasis, or tumor cell migration, to other parts of the body.

Pancreatic cancers are generally resistant to powerful chemotherapeutic agents, and there is now growing interest in the use of an anti-fibrotic agent to diminish the supportive role of stroma in tumor cell growth and metastasis. The anti-tumor effects observed with pamrevlumab in preclinical models indicate that it has the potential to inhibit tumor expansion through effects on tumor cell proliferation and apoptosis as well as reduce metastasis.

Phase 3 Clinical Development – Randomized, Double-Blind, Placebo-Controlled Trial of Pamrevlumab in Locally Advanced, Unresectable Pancreatic Cancer

We plan to begin enrolling a double-blind placebo controlled Phase 3 trial of pamrevlumab as a neoadjuvant therapy for pancreatic cancer in the second quarter of 2019. We intend to enroll approximately 260 patients, randomized 1:1 to receive either pamrevlumab, in combination with gemcitabine and nab-paclitaxel, or chemotherapy with placebo. After completion of the 6-month treatment period, if the results show an improved resection rate in the pamrevlumab arm, we may request a meeting with the FDA to discuss the adequacy of these results to support a marketing application under the provisions of accelerated approval. After this interim assessment of resection rates, the study will continue to collect data on overall survival, the primary endpoint.

Study 069 – Randomized, Open-Label, Active-Controlled Phase 1/2 Trial of Pamrevlumab in Locally Advanced Pancreatic Cancer

We continue to follow patients in our ongoing open-label, randomized (2:1) Phase 1/2 trial (FGC004C-3019-069) of pamrevlumab combined with gemcitabine plus nab-paclitaxel chemotherapy vs. the chemotherapy regimen alone in patients with inoperable locally advanced pancreatic cancer that has not been previously treated. We enrolled 37 patients in this study and completed the six-month treatment period and surgical assessment at the end of 2017. The overall goal of the trial is to determine whether the pamrevlumab combination can convert inoperable pancreatic cancer to operable, or resectable, cancer. Tumor removal is the only chance for cure of pancreatic cancer, but only approximately 15% to 20% of patients are eligible for surgery.

We reported updated results from this ongoing study at the American Society of Clinical Oncology Annual Meeting in June 2018. A higher proportion (70.8%) of pamrevlumab-treated patients whose tumors were previously considered unresectable became eligible for surgical exploration than patients who received chemotherapy alone (15.4%), based on pre-specified eligibility criteria at the end of 6 months of treatment. Furthermore, a higher proportion of pamrevlumab-treated patients (33.3%) achieved surgical resection than those who received chemotherapy alone (7.7%).

In addition, this data showed improved overall survival among patients who were resected vs. not resected (NE vs. 18.56 months, p-value=0.0141) and a trend toward improved overall survival in patients eligible for surgery vs. patients who were not (27.73 vs. 18.40 months, p-value=0.0766). No increase in serious adverse events was observed in the pamrevlumab arm and no delay in wound healing was observed post-surgery.

Patients with locally advanced unresectable pancreatic cancer have median survival of less than 12 months, only slightly better than patients with metastatic pancreatic cancer, whereas patients with resectable pancreatic cancer have a much better prognosis with median survival of approximately 23 months and some patients being cured. If pamrevlumab in combination with chemotherapy continues to demonstrate an enhanced rate of conversion from unresectable cancer to resectable cancer, it may support the possibility that pamrevlumab could provide a substantial survival benefit for locally advanced pancreatic cancer patients.

Completed Clinical Trials of Pamrevlumab in Pancreatic Cancer

We completed an open-label Phase 1/2 (FGCL-MC3019-028) dose finding trial of pamrevlumab combined with gemcitabine plus erlotinib in patients with previously untreated locally advanced (stage 3) or metastatic (stage 4) pancreatic cancer. These study results were published in the Journal of Cancer Clinical Trials (Picozzi et al., J Cancer Clin Trials 2017, 2:123). Treatment continued until progression of the cancer or the patient withdrew for other reasons. Patients were then followed until death.

Seventy-five patients were enrolled in this study with 66 (88%) having stage 4 metastatic cancer. The study demonstrated a dose-related increase in survival. At the lowest doses, no patients survived for even one year while at the highest doses up to 31% of patients survived one year.

Effect of Pamrevlumab Dose on One Year Survival in Pancreatic Cancer

*QW = weekly; Q2W = two times per week

A post-hoc analysis found that there was a significant relationship between survival and trough levels of plasma pamrevlumab measured immediately before the second dose (Cmin), as illustrated below. Cmin greater than or equal to 150 µg/mL was associated with significantly improved progression-free survival (p=0.01) and overall survival (p=0.03) vs. those patients with Cmin less than 150 µg/mL. For patients with Cmin >150 µg/mL median survival was 9.0 months compared to median survival of 4.4 months for patients with Cmin <150 µg/mL. Similarly, 34.2% of patients with Cmin >150 µg/mL survived for longer than one year compared to 10.8% for patients with Cmin <150 µg/mL. These data suggest that sufficient blockade of CTGF requires pamrevlumab threshold blood levels of approximately 150 µg/mL in order to improve survival in patients with advanced pancreatic cancer.

Increased Pancreatic Cancer Survival Associated with Increased Plasma Levels of Pamrevlumab

The Kaplan-Meier plot provides a representation of survival of all patients in the clinical trial. Each vertical drop in the curve represents a recorded event (death) of one or more patients. When a patient's event cannot be determined either because he or she has withdrawn from the study or because the analysis is completed before the event has occurred, that patient is "censored" and denoted by a symbol ( ) on the curve at the time of the last reliable assessment of that patient.

In the study, the majority of adverse events were mild to moderate, and were consistent with those observed for erlotinib plus gemcitabine treatment without pamrevlumab. There were 99 TSAEs; six of which were assessed as possibly related by the principal investigator, and 93 as not related to study treatment. We did not identify any evolving dose-dependent pattern, and higher doses of pamrevlumab were not associated with higher numbers of SAEs or greater severity of the SAEs observed.

Pamrevlumab for Duchenne Muscular Dystrophy

Understanding DMD and the Limitations of Current Therapies

In the U.S., approximately one in every 5,000 boys have DMD, and approximately 20,000 children are diagnosed with DMD globally each year. There are currently no approved disease-modifying treatments. Despite taking steroids to mitigate progressive muscle loss, a majority of children with DMD are non-ambulatory by adolescence, and median survival is age 25.

DMD is an inherited disorder of one of the dystrophin genes resulting in absence of the dystrophin protein and abnormal muscle structure and function, leading to progressively diminished mobility as well as pulmonary function and cardiac function which result in early death. Constant myofiber breakdown results in persistent activation of myofibroblasts and altered production of ECM resulting in extensive fibrosis in skeletal muscles of DMD patients. Desguerre et al. (2009) showed that muscle fibrosis was the only myo-pathologic parameter that significantly correlated with poor motor outcome as assessed by quadriceps muscle strength, manual muscle testing of upper and lower limbs, and age at ambulation loss. Numerous pre-clinical studies including those in the mdx model of DMD suggest that CTGF contributes to the process by which muscle is replaced by fibrosis and fat and that CTGF may also impair muscle cell differentiation during muscle repair after injury.

Clinical Development of Pamrevlumab for DMD

All 21 non-ambulatory patients from our fully enrolled Phase 2 trial will have completed at least their first year of treatment in March 2019. Some patients from this study have been on treatment for over three years. The primary endpoint is change in pulmonary function as measured by change in FVC, percent predicted, from baseline. Other endpoints include muscle function, as measured by an upper limb muscle test, and measurement of cardiac function (ejection fraction measured by magnetic resonance imaging).

Other Potential Indications for Pamrevlumab

We believe that pamrevlumab has potential to be a treatment for cancers and a broad array of fibrotic disorders, including:

- Cancers — melanoma, breast cancer, hepatoma
- Liver — non-alcoholic steatohepatitis
- Lung — scleroderma lung disease
- Radiation induced fibrosis
- Muscular dystrophies other than DMD
- Kidney — diabetic nephropathy, focal segmental glomerular sclerosis
- Cardiovascular system — congestive heart failure, pulmonary arterial hypertension

Investigational New Drug and Clinical Trial Applications

Pamrevlumab is being studied in the U.S. for the treatment of IPF under an IND that we submitted to the FDA in August 2003. Pamrevlumab is being studied in the U.S. for the treatment of locally advanced or metastatic pancreatic cancer under an IND that we submitted to the FDA in September 2004. Pamrevlumab is being studied in the U.S. for the treatment of DMD under an IND that we submitted to the FDA in June 2015.

Commercialization Strategy for Pamrevlumab

Our goal, if pamrevlumab is successful, is to be a leader in the development and commercialization of novel approaches for inhibiting deep organ fibrosis and treating some forms of cancer. To date, we have retained exclusive worldwide rights for pamrevlumab. We plan to retain commercial rights to pamrevlumab in North America and will also continue to evaluate the opportunities to establish co-development partnerships for pamrevlumab as well as commercialization collaborations for territories outside of North America.

FG-5200 FOR THE TREATMENT OF CORNEAL BLINDNESS IN CHINA

Corneal blindness, defined as visual acuity of 3/60 or less, is caused by various factors, including scarring resulting from infections, such as herpes simplex, physical trauma, chemical injury and genetic diseases affecting the function of the cornea. In countries with sufficient tissue banks and skilled surgeons, the treatment for corneal blindness is the replacement of the damaged cornea with a corneal graft from donor corneas from human cadavers. Despite use of immunosuppressive drugs, graft rejection remains a serious problem, resulting in graft failure within five years in approximately 35% of cases in the U.S. We are developing FG-5200 for the treatment of corneal blindness resulting from partial thickness corneal damage.

In China, there are ethical or religious beliefs, cultural norms and significant infrastructure barriers that limit organ donation or tissue banking possibilities, resulting in an extreme shortage of cadaver corneas. In September 2017, the Chinese State Council issued a regulation banning the importation of human tissue which is expected to further diminish the availability of cadaver corneas for implantation in China. In April 2015, a subsidiary of China

Regenerative Medicine International Limited received approval for their acellular porcine cornea stroma medical device for the indication of repair of corneal ulcers in China. However, alternatives to cadaver corneas, such as synthetic corneas using collagen derived from porcine tissue or fish scales, are either experimental or to our knowledge, have not yielded satisfactory results for restoration of vision in patients with corneal blindness. In many cases of corneal blindness, infection and other factors lead to serious risks to the patient.

Market Opportunity

Approximately 48,000 corneal grafts were performed in the U.S. in 2017 using tissue from human cadavers. In contrast, while there are approximately four to five million patients in China with corneal blindness and an incidence of 200,000 cases of corneal blindness each year, there were only approximately 10,000 to 12,000 corneal grafts performed in China in 2017 using tissue from human cadavers. We believe the number of corneal grafts using cadaver tissue in China may decrease significantly due to recent changes in government policy.

FG-5200 as a Potential Solution to This Unmet Medical Need

FG-5200 Corneal Implant

Our expertise in fibrosis and ECM proteins has allowed us to develop processes for producing human collagen types I, II and III, as well as coordinate expression of several enzymes involved in assembly of collagen. We have successfully produced a proprietary version of recombinant human collagen III that is suitable for use in cornea repair.

FG-5200, a corneal implant medical device we are developing in China, is designed to serve as an immediately functional replacement cornea as well as a scaffold to allow for regeneration of the native corneal tissue for the primary purpose of restoration of vision. In contrast, cadaver graft tissue is never “turned over”; in fact, only limited integration occurs over the life of the graft. Our FG-5200 implant is made of recombinant human collagen that has been formed into a highly concentrated fibrillar matrix to provide physical characteristics optimal for corneal implantation.

In animal models, FG-5200 allows for native tissue to completely regrow in less than one year, including both epithelium (the outer cell layer of the cornea) and stroma. The stroma in these animal models is seen to be infiltrated with nerve fibers, leading to the reacquisition of the touch response critical to the avoidance of additional corneal damage.

Corneal implants using human donor tissue are currently being reimbursed by the government, and similar to many other implantable Class III devices in China (including stents and bone grafts), we would expect that FG-5200 could be added to the reimbursement list for medical devices, if approved.

Clinical Testing of FG-5200

An initial clinical study outside of China has been conducted to test the safety and feasibility of using a biosynthetic implant composed of our recombinant human collagen, and substantially similar to FG-5200, for the treatment of severe corneal damage as an alternative to human donor tissue. Ten patients with advanced keratoconus, or severe corneal scarring, were implanted with the recombinant collagen implants and have been followed for more than five years. Two-year follow-up data were reported in Science Translational Medicine (Fagerholm et al., (2010)) and four-year follow-up data were reported in Biomaterials (Fagerholm et al., Biomaterials (2014)). The patients showed excellent tolerance of the implant, with no recruitment of inflammatory dendritic cells into the biosynthetic implant area and no episodes of rejection (one episode of rejection was seen in the cadaver graft control group). Further, patients had a four-year mean corrected visual acuity of 20/54 and gained an average of more than five Snellen lines of vision on an eye chart. Nerve re-growth and touch sensitivity was closer to that of healthy corneas and significantly better than that seen with cadaver corneas with no need for long term immunosuppressive therapy.

FG-5200 Strategy

In January 2016, our subsidiary FibroGen (China) Medical Technology Development Co., Ltd. (“FibroGen Beijing”) received the NMPA’s written notice of classification of our FG-5200 corneal implant as a Domestic Class III medical device. This allows FibroGen to develop, and if approved, to market FG-5200 corneal implants fabricated in China without any prior reference approval outside of China.

We currently plan to manufacture FG-5200 preclinical and clinical trial material in our aseptic good manufacturing practices production suite located at our Beijing manufacturing plant. We completed the process technology transfer and the registration campaign in 2017. Materials from this campaign are being used in preclinical studies that are now complete. We expect to file a CTA for a pivotal clinical trial after final results of the preclinical studies and discussion with the NMPA.

We plan to develop FG-5200 in China first. If FG-5200 is successful in China, we believe there is a future opportunity to develop FG-5200 in other Asian countries where cadaver materials are in short supply, in part because cultural norms and infrastructure and other challenges in tissue banking limit tissue donations. We also believe there is an opportunity to obtain CE Marking to facilitate entry into other markets, such as Latin America. We may develop FG-5200 in the U.S. and Europe as well, where cadaver corneas are available but the required immunosuppressive therapy may make FG-5200 a potentially attractive alternative.

COLLABORATIONS

Our Collaboration Partnerships for Roxadustat

Astellas

We have two agreements with Astellas for the development and commercialization of roxadustat, one for Japan, and one for Europe, the Commonwealth of Independent States, the Middle East and South Africa. Under these agreements we provided Astellas the right to develop and commercialize roxadustat for anemia in these territories.

We share responsibility with Astellas for clinical development activities required for U.S. and EU regulatory approval of roxadustat, and share equally those development costs under the agreed development plan for such activities. Astellas will be responsible for clinical development activities and all associated costs required for regulatory approval in all other countries in the Astellas territories. Astellas will own and have responsibility for regulatory filings in its territories. We are responsible, either directly or through our contract manufacturers, for the manufacture and supply of all quantities of roxadustat to be used in development and commercialization under the agreements.

The Astellas agreements will continue in effect until terminated. Either party may terminate the agreements for certain material breaches by the other party. In addition, Astellas will have the right to terminate the agreements for certain specified technical product failures, upon generic sales reaching a particular threshold, upon certain regulatory actions, or upon our entering into a settlement admitting the invalidity or unenforceability of our licensed patents. Astellas may also terminate the agreements for convenience upon advance written notice to us. In the event of any termination of the agreements, Astellas will transfer and assign to us the regulatory filings for roxadustat and will assign or license us the relevant trademarks used with the products in the Astellas territories. Under certain terminations, Astellas is also obligated to pay us a termination fee.

Consideration under these agreements includes a total of $360.1 million in upfront and non-contingent payments, and milestone payments totaling $557.5 million, of which $542.5 million are development and regulatory milestones, and $15.0 million are commercial-based milestones. Total consideration, excluding development cost reimbursement and product sales-related payments, could reach $917.6 million. During the second quarter of 2018, Astellas reported positive results from the final phase 3 CKD-dialysis trial of roxadustat in Japan, indicating that Astellas was ready to make an NDA submission for the treatment of anemia with roxadustat in CKD-dialysis patients in 2018, which triggered $15.0 million milestone payment substantially all of which was recognized as revenue during the year ended December 31, 2018 from performance obligations satisfied or partially satisfied. The aggregate amount of such consideration received, including development cost reimbursement and product sales-related payments, through December 31, 2018 totals $487.6 million.

Additionally, under these agreements, Astellas pays 100% of the commercialization costs in their territories. Astellas will pay us a transfer price for our manufacture and delivery of roxadustat based on a calculation based on net sales of roxadustat in the low 20% range.

In addition, Astellas has separately invested $80.5 million in the equity of FibroGen, Inc. to date.

AstraZeneca

We also have two agreements with AstraZeneca for the development and commercialization of roxadustat for anemia, one for China (the “China Agreement”), and one for the U.S. and all other countries not previously licensed to Astellas (the “U.S./RoW Agreement”). Under these agreements we provided AstraZeneca the right to develop and commercialize roxadustat for anemia in these territories. We share responsibility with AstraZeneca for clinical development activities

required for U.S. regulatory approval of roxadustat.

In 2015, we reached the $116.5 million cap on our initial funding obligations (under which we shared 50% of the initial development costs), therefore all future development and commercialization costs for roxadustat for the treatment of anemia in CKD in the U.S., Europe, Japan and all other markets outside of China will be paid by Astellas and AstraZeneca.

In China, our subsidiary FibroGen Beijing will conduct the development work for CKD anemia and will hold all of the regulatory licenses issued by China regulatory authorities and be primarily responsible for regulatory, clinical and manufacturing. China development costs are shared 50/50. AstraZeneca is also responsible for 100% of development expenses in all other licensed territories outside of China. We are responsible, through our contract manufacturers, for the manufacture and supply of all quantities of roxadustat to be used in development and commercialization under the agreements.

Under the AstraZeneca agreements, we receive upfront and subsequent non-contingent payments totaling $402.2 million. Potential milestone payments under the agreements total $1.2 billion, of which $571.0 million are development and regulatory milestones, and $652.5 million are commercial-based milestones. Total consideration under the agreements, excluding development cost reimbursement, transfer price payments, royalties and profit share, could reach $1.6 billion. During the second quarter of 2016, we received an upfront payment of $62.0 million time based development milestone. On December 17, 2018, FibroGen (China) Medical Technology Development Co., Ltd. ("FibroGen China"), received marketing authorization from the NMPA for roxadustat, a first-in-class hypoxia-inducible factor prolyl hydroxylase inhibitor, for the treatment of anemia caused by CKD in patients on dialysis. This approval triggered a $6.0 million milestone payable to us by AstraZeneca. On December 29, 2018, FibroGen China received the First Manufacturing Approval for a Product in the Field in the Territory, which allows production for Phase IV clinical studies, patients' early experience programs, donation programs, as well as to supply products for testing and assessments required prior to launch. This approval triggered a $6.0 million milestone payable to us by AstraZeneca. Approximately $9.9 million of the total $12.0 million milestone payables was recognized as revenue during the fourth quarter of 2018 from performance obligations satisfied or partially satisfied. The aggregate amount of such consideration, including development cost reimbursement and product sales-related payments, received through December 31, 2018 totals 432.2 million.

Payments under these agreements include over $500 million in upfront, non-contingent and other payments received or expected to be received prior to the first U.S. approval, excluding development expense reimbursement.

AstraZeneca purchased 1,111,111 shares of our common stock at the initial public offering ("IPO") price for an aggregate purchase price of $20.0 million in a private placement concurrent with our IPO. In connection with the purchase of our shares of common stock in the private placement, AstraZeneca has also entered into a standstill agreement which provides that, until November 2019, neither AstraZeneca nor its representatives will, directly or indirectly, among other things, acquire any additional securities or assets of ours, solicit proxies for our securities, participate in a business combination involving us, or seek to influence our management or policies, except with the prior consent of our board of directors and in certain other specified circumstances involving a change of control of our company. In addition, AstraZeneca has agreed to vote its shares in favor of nominees to our board of directors, increases in the authorized capital stock of the company and amendments to our equity plans approved by the board of directors, in each case as recommended by a majority of our board of directors. AstraZeneca has also agreed, subject to specified exceptions, not to sell shares purchased by it in the private placement for the two-year period following such purchase and to limitations on the volume of its sales of such shares thereafter.

Under the U.S./RoW Agreement, AstraZeneca will pay for all commercialization costs in the U.S. and RoW, AstraZeneca will be responsible for the U.S. commercialization of roxadustat, with FibroGen undertaking specified promotional activities in the ESRD segment in the U.S. In addition, we will receive a transfer price for delivery of commercial product based on a percentage of net sales in the low- to mid-single digit range and AstraZeneca will pay us a tiered royalty on net sales of roxadustat in the low 20% range.

Under the China Agreement, which is conducted through FibroGen China Anemia Holdings, Ltd. ("FibroGen China"), the commercial collaboration is structured as a 50/50 profit share. AstraZeneca will conduct commercialization activities in China as well as serve as the master distributor for roxadustat and will fund roxadustat launch costs in China until FibroGen Beijing has achieved profitability. At that time, AstraZeneca will recoup 50% of their historical launch costs out of initial roxadustat profits in China.

AstraZeneca may terminate the U.S./RoW Agreement upon specified events, including our bankruptcy or insolvency, our uncured material breach, technical product failure, or upon 180 days prior written notice at will. If AstraZeneca terminates the U.S/RoW Agreement at will, in addition to any unpaid non-contingent payments, it will be responsible to pay for a substantial portion of the post-termination development costs under the agreed development plan until

regulatory approval.

AstraZeneca may terminate the China Agreement upon specified events, including our bankruptcy or insolvency, our uncured material breach, technical product failure, or upon advance prior written notice at will. If AstraZeneca terminates our China Agreement at will, it will be responsible to pay for transition costs as well as make a specified payment to FibroGen China.

In the event of any termination of the agreements, but subject to modification upon termination for technical product failure, AstraZeneca will transfer and assign to us any regulatory filings and approvals for roxadustat in the affected territories that they may hold under our agreements, grant us licenses and conduct certain transition activities.

Additional Information Related to Collaboration Agreements

Of the $1,113.5 million in development and regulatory milestones payable in the aggregate under our Astellas and AstraZeneca collaboration agreements, $425.0 million is payable upon achievement of milestones relating to the submission and approval of roxadustat in dialysis and non-dialysis CKD populations in the U.S. and Europe.

Information about collaboration partners that accounted for more than 10% of our total revenue or accounts receivable for the last three fiscal years is set forth in Note 14 to our consolidated financial statements under Item 8 of this Annual Report.

COMPETITION

The pharmaceutical and biotechnology industries are highly competitive, particularly in some of the indications we are developing drug candidates, including anemia in CKD, IPF, pancreatic cancer, and DMD. We face competition from multiple other pharmaceutical and biotechnology companies, many of which have significantly greater financial, technical and human resources and experience in product development, manufacturing and marketing. These potential advantages of our competitors are particularly a risk in IPF, pancreatic cancer, and DMD, where we do not currently have a development or commercialization partner.

We expect any products that we develop and commercialize to compete on the basis of, among other things, efficacy, safety, convenience of administration and delivery, price, the level of generic competition and the availability of reimbursement from government and other third-party payors.

If either of our lead product candidates is approved, they will compete with currently marketed products, and product candidates that may be approved for marketing in the future, for treatment of the following indications:

Roxadustat — Anemia in CKD

If roxadustat is approved for the treatment of anemia in patients with CKD and launched commercially, competing drugs are expected to include ESAs, particularly in those patient segments where ESAs are used. Currently available ESAs include epoetin alfa (EPOGEN® marketed by Amgen Inc. in the U.S., Procrit® and Erypo®/Eprex®, marketed by Johnson & Johnson, Inc. and Espo® marketed by Kyowa Hakko Kirin in Japan and China), darbepoetin (Amgen/Kyowa Hakko Kirin's Aranesp® and NESP®) and Mircera® marketed by Roche outside the U.S. and by Vifor Pharma ("Vifor"), a Roche licensee, in the U.S. and Puerto Rico, as well as biosimilar versions of these currently marketed ESA products. ESAs have been used in the treatment of anemia in CKD for more than 20 years, serving a significant majority of dialysis patients. While non-dialysis CKD patients who are not under the care of nephrologists, including those with diabetes and hypertension, do not typically receive ESAs and are often left untreated, some patients under nephrology care may be receiving ESA therapy. It may be difficult to encourage healthcare providers and patients to switch to roxadustat from products with which they have become familiar.

We may also face competition from potential new anemia therapies currently in clinical development, including in those patients segments not currently addressed by ESAs. Companies such as GlaxoSmithKline plc ("GSK"), Bayer Corporation ("Bayer"), Akebia Therapeutics, Inc. ("Akebia"), and Japan Tobacco, who are currently developing HIF-PH inhibitors for anemia in CKD indications. Akebia is currently conducting Phase 3 studies in CKD patients on dialysis and not on dialysis, as well as additional Phase 1 and Phase 2 studies. In Japan, Mitsubishi Tanabe Pharmaceutical Corporation, Akebia's collaboration partner, started a Japan Phase 3 development program in November 2017. GSK is also conducting global Phase 3 studies in in CKD patients on dialysis and not on dialysis as well as Japan Phase 3 studies. GSK and Kyowa Hakko Kirin announced in November 2018 that the two companies signed a strategic commercialization deal in Japan for daprodustat. Bayer has completed global Phase 2 studies and its HIF-PH inhibitor

is now in Phase 3 development in CKD populations on dialysis and not on dialysis in Japan. Japan Tobacco is also conducting Phase 3 studies in in CKD patients on dialysis and not on dialysis in Japan only. Some of these product candidates may enter the market prior to roxadustat.

In addition, there are other companies developing biologic therapies for the treatment of other anemia indications that we may also seek to pursue in the future, including anemia of MDS. For example, Acceleron Pharma, Inc., in partnership with Celgene Corporation, is in Phase 3 development of protein therapeutic candidates to treat anemia and associated complications in patients with ß-thalassemia and MDS, and has received orphan drug status from the EMA and FDA for these indications. We may face competition for patient recruitment and enrollment for clinical trials and potentially in commercial sales. There may also be new therapies for renal-related diseases that could limit the market or level of reimbursement available for roxadustat if and when it is commercialized.

In China, biosimilars of epoetin alfa are offered by Chinese pharmaceutical companies such as EPIAO marketed by 3SBio Inc. as well as more than 15 other local manufacturers. We may also face competition by HIF-PH inhibitors from other companies such as Akebia, Bayer, and GSK, which was authorized by the NMPA to conduct trials in China to support its ex-China regulatory filings, as well as Guandong Dongyangguang Pharmaceutical Co., Ltd, a domestic Chinese company, which was permitted by the NMPA to conduct clinical trials for CKD anemia patients both on and not on dialysis. Akebia announced in December 2015 that it has entered into a development and commercialization partnership with Mitsubishi Tanabe Pharmaceutical Corporation for its HIF-PH inhibitor vadadustat in Japan, Taiwan, South Korea, India and certain other countries in Asia, and announced in April 2017 an expansion of their U.S. collaboration with Otsuka to add markets, including China. 3SBio Inc. announced in 2016 its plan on beginning a Phase 1 clinical trial of a HIF-PH inhibitor for the China market.

The first biosimilar ESA, Pfizer's Retacrit® (epoetin zeta), entered the U.S. market in November 2018. Market penetration of Retacrit and the potential addition of other biosimilar ESAs currently under development may alter the competitive and pricing landscape of anemia therapy in CKD patients on dialysis under the ESRD bundle. The patents for Amgen's EPOGEN® (epoetin alfa) expired in 2004 in the EU, and the final material patents in the U.S. expired in May 2015. Several biosimilar versions of currently marketed ESAs are available for sale in the EU, China and other territories. In the U.S., a few ESA biosimilars are currently under development. Sandoz, a division of Novartis, markets Binocrit® (epoetin alfa) in Europe and may file a biosimilar Biologics License Application ("BLA") in the U.S.

The majority of the current CKD anemia market focuses on dialysis patients, who visit dialysis centers on a regular basis, typically three times a week, and anemia therapies are administered as part of the visit. Two of the largest operators of dialysis clinics in the U.S., DaVita Healthcare Partners Inc. ("DaVita"), and Fresenius Medical Care AG & Co. KGaA ("Fresenius"), collectively provide dialysis care to approximately 70% of U.S. dialysis patients, and therefore have historically won long-term contracts including rebate terms with Amgen. DaVita recently entered into a new six-year sourcing and supply agreement with Amgen effective through 2022. Fresenius' contract with Amgen expired in 2015, following which Fresenius is providing Roche's ESA Mircera® to a significant portion of its U.S. dialysis patients. Successful penetration in this market may require a significant agreement with Fresenius or DaVita, on favorable terms and on a timely basis.

Pamrevlumab

We are currently in Phase 2 development of pamrevlumab to treat DMD, and are initiating Phase 3 development of pamrevlumab in IPF and pancreatic cancer. Most of our competitors have significantly more resources and expertise in development, commercialization and manufacturing, particularly due to the fact that we have not yet established a co-development partnership for pamrevlumab. For example, both Roche and Boehringer Ingelheim, which market products for the treatment of IPF in the U.S., have successfully developed and commercialized drugs in various indications and have built sales organizations that we do not currently have; both have more resources and more established relationships when competing with us for patient recruitment and enrollment for clinical trials or, if we are approved, in the market.

Idiopathic Pulmonary Fibrosis

If approved to treat IPF, pamrevlumab is expected to compete with Roche's Esbriet® (pirfenidone), and Boehringer Ingelheim's Ofev® (nintedanib). We believe that if pamrevlumab can be shown to safely stabilize or reverse lung fibrosis, and thus stabilize or improve lung function in IPF patients, it can compete with pirfenidone and nintedanib for market share in IPF. However, it may be difficult to encourage treatment providers and patients to switch to pamrevlumab from a product they are already familiar with. We may also face competition from potential new IPF therapies.

Pamrevlumab is an injectable protein, which may be more expensive and less convenient than small molecules such as nintedanib and pirfenidone. Other potential competitive product candidates in various stages of development for IPF include Biogen-Idec's BG-00011, Galapagos NV's GLPG1690, Kadmon Holdings, Inc.'s KD025, Prometic Life Sciences Inc.'s PBI-4050, and Promedior, Inc.'s PRM-151.

Pancreatic Cancer

We are developing pamrevlumab to be used in combination with Abraxane® (nab-paclitaxel) and gemcitabine in pancreatic cancer. Celgene's Abraxane was launched in the U.S. and Europe in 2013 and 2014, respectively, and was the first drug approved in this disease in nearly a decade. In 2015, Merrimack Pharmaceuticals Inc. ("Merrimack") received FDA approval for the use of ONIVYDE (irinotecan liposome injection, now licensed to Eli Lilly) for the treatment of patients with metastatic adenocarcinoma of the pancreas after disease progression following gemcitabine-based therapy, and the combination therapy with Abraxane and gemcitabine became the first-line standard of care in these patients. As treatments for pancreatic cancer have shown limited success to date, combination therapies are expected, but the incremental cost may slow a new product adoption in the market, at least until the generic versions of Abraxane becomes available. In addition, we may also face competition from other agents seeking approval in conjunction with gemcitabine and Abraxane for patient recruitment and enrollment in our clinical trials, and potentially in commercialization. NewLink Genetics Corporation's indoximod and Merrimack's istiratumab are examples.

Duchenne Muscular Dystrophy

If approved and launched commercially to treat DMD, pamrevlumab is expected to face competition from drugs that were recently approved in major markets such as the U.S., EU, and Japan.

On September 19, 2016, the FDA approved Sarepta Therapeutics Inc.'s ("Sarepta") Exondys 51® (eteplirsen). This was the first drug approved to treat DMD. Exondys 51® is approved to treat patients who have a mutation of the dystrophin gene amenable to exon 51 skipping therapy. This mutation represents a subset of approximately 13% of patients with DMD. In Europe, Sarepta received a negative opinion for its marketing application for eteplirsen from the EMA in September 2018.

On February 9, 2017, the FDA approved Marathon Pharmaceuticals' ("Marathon") corticosteroid Emflaza® (deflazacort) for the treatment of patients five years and older with DMD. Although approved for other indications outside of the U.S., this was the first approval for deflazacort in the U.S. and the first approval in the U.S. for the use of a corticosteroid to treat DMD. On March 16, 2016, Marathon announced it had sold the commercialization rights of Emflaza® to PTC Therapeutics.

PTC Therapeutics' product Translarna™ received a conditional approval in Europe in 2014, which was renewed in November 2016 with a request for a new randomized placebo-controlled 18-month study by the Committee for Medicinal Products for Human Use of the EMA; however, the FDA informed the sponsor in a complete response letter in October 2017, as well as in its response to PTC Therapeutics' appeal, that the FDA is unable to approve the application in its current form. While Translarna ™ targets a different set of DMD patients from those targeted by Sarepta's Exondys 51®, it is also limited to a subset of patients who carry a specific mutation. Conversely, pamrevlumab is intended to treat DMD patients without limitation to type of mutation.

Pamrevlumab may also face competition from other drugs currently in clinical development in patient recruiting and enrollment in clinical trials, and, if approved, in commercialization. Examples of those compounds currently under clinical development are the drug candidates from Catabasis Pharmaceuticals ("Catabasis"), Santhera Pharmaceuticals ("Santhera") and Sarepta. Catabasis' edasalonexent was reported to have preserved muscle function and slowed the progression of DMD compared to rates of change in the control period prior to treatment with edasalonexent in a Phase 2 study, and is currently undergoing Phase 3 development. Sarepta's golodirsen, a new exon skipping agent, is also currently in Phase 3 development. Santhera's Raxone®/Catena® (idebenone) for treatment of DMD has been rejected by the EMA, and the FDA requested additional clinical data from the Phase 3 trial currently ongoing in the U.S. and Europe. Santhera offers compassionate use of idebenone in patients with DMD in U.S. and UK.

MANUFACTURE AND SUPPLY

We have historically and in the future plan to continue to enter into contractual arrangements with qualified third-party manufacturers to manufacture and package our products and product candidates for territories outside of China. We believe that this manufacturing strategy enables us to more efficiently direct financial resources to the research, development and commercialization of product candidates rather than diverting resources to establishing a significant internal manufacturing infrastructure, unless there is additional strategic value for establishing manufacturing capabilities, such as in China. As our product candidates proceed through development, we are discussing the timing of entry into longer term commercial supply agreements with key suppliers and manufacturers in order to meet the ongoing and planned clinical and commercial supply needs for ourselves and our partners. Our timing of entry into these agreements is based on the current development and commercialization plans for roxadustat, pamrevlumab and FG-5200.

Roxadustat

Roxadustat is a small-molecule drug manufactured from generally available commercial starting materials and chemical technologies and multi-purpose equipment available from many third party contract manufacturers. Outside of China we have used, and plan to continue to use, Shanghai SynTheAll Pharmaceutical Co., Ltd. (“WuXi STA”) and Catalent, Inc. (“Catalent”) to manufacture

roxadustat API and roxadustat drug product, respectively. WuXi STA is located in China and currently supplies our API globally except for China, for which it manufactures an intermediate to be further manufactured by FibroGen China. WuXi STA has passed inspections by several regulatory agencies, including the FDA and NMPA, and is Current Good Manufacturing Practice ("cGMP") compliant. Catalent is located in the U.S. and supplies our drug product tablets globally except for Japan, where they are manufactured by Astellas, and China, where they are manufactured by FibroGen China. Catalent has passed several regulatory inspections, including by the FDA, and manufactures commercial products for other clients.

To date, we believe that roxadustat has been manufactured under cGMP and in compliance with applicable regulatory requirements for the manufacture of drug substance and drug product used in clinical trials and we and Astellas have performed audits of the existing roxadustat manufacturers. The intended commercial manufacturing route outside of China has been successfully scaled up to multiple hundred kilogram scale and produced several metric tons of roxadustat drug substance. We are in discussions with multiple parties regarding longer term commercial supply arrangements.

In China, our Beijing facility received the Good Manufacturing Practice ("GMP") license for Drug Substance and Drug Product. We plan to use drug product from our FibroGen Beijing manufacturing facility for commercial supply. We expect our Cangzhou manufacturing facility to be qualified and licensed for manufacture of roxadustat API for the China market later this year. We may also qualify a third party manufacturer to produce commercial API under the Marketing Authorization Holder System program.

Irix Pharmaceuticals, Inc.

In July 2002, we and IRIX Pharmaceuticals, Inc. ("IRIX"), a third party manufacturer, entered into a Letter of Agreement for IRIX Pharmaceuticals Single Source Manufacturing Agreement (the "Letter of Agreement"), in connection with a contract manufacturing arrangement for clinical supplies of HIF-PH inhibitors, including roxadustat. The Letter of Agreement contained a service agreement that included terms and schedule for the delivery of clinical materials, and also included a term sheet for a single source agreement for the cGMP manufacture of HIF-PH inhibitors, including roxadustat. Specifically, pursuant to the Letter of Agreement, we and IRIX agreed to negotiate a single source manufacturing agreement that included a first right to negotiate a manufacturing contract for HIF-PH inhibitors, including roxadustat, provided that IRIX is able to match any third party bids within 5%, and the exclusive right to manufacture extends for five years after approval of an NDA. Any agreement would provide that no minimum amounts would be specified until appropriate by forecast, that we and our commercialization partner would have the rights to contract with independent third parties that exceed IRIX's internal capabilities or in the event that we or our commercialization partner determines for reasons of continuity and security that such a need exists, provided that IRIX would supply a majority of the product if it is able to meet the requirements and the schedule required by us and our partner. Subsequent to the Letter of Agreement, we and IRIX have entered into several additional service agreements. IRIX has requested in writing that we honor the Letter of Agreement with respect to the single source manufacturing agreement. To date, we have offered to IRIX opportunities to bid for the manufacture of HIF-PH inhibitors, including roxadustat. In 2015, Patheon Pharmaceuticals Inc., a business unit of DPx Holdings B.V., acquired IRIX.

Pamrevlumab

To date, pamrevlumab has been manufactured using specialized biopharmaceutical process techniques under an agreement with a qualified third party contract manufacturer, Boehringer Ingelheim. Our contract manufacturer is the sole source for the current clinical supply of the drug substance and drug product for pamrevlumab. Our contract manufacturer is only obligated to supply the amounts of pamrevlumab as agreed on pursuant to work orders that are executed from time to time under our agreement as we determine need for clinical material, and we are not required to

make fixed or minimum annual purchases. Our existing agreement allows us to transfer the cell line manufacturing process to another third party manufacturer at our expense, and our contractor is obligated to provide reasonable technology transfer assistance in the event of such a transfer.

FG-5200

The manufacture of FG-5200 requires three distinct steps under cGMP and involves three parties in three locations. Our proprietary recombinant human collagen is produced under contract by a third party in Finland. After quality assurance release, we freeze-dry the material in our U.S. facility. We are still determining any facility licensing requirements for this step. The final step is the production of FG-5200, which will be done in a qualified aseptic manufacturing suite at the FibroGen Beijing manufacturing facility. After completion of the final validation of the sterile process (currently in progress), implants will be manufactured there for product registration testing, clinical testing, as well as for commercial use in the future.

GOVERNMENT REGULATION

The clinical testing, manufacturing, labeling, storage, distribution, record keeping, advertising, promotion, import, export and marketing, among other things, of our product candidates are subject to extensive regulation by governmental authorities in the U.S. and other countries. The process of obtaining regulatory approvals and the subsequent compliance with appropriate federal, state, local and foreign statutes and regulations, including in Europe and China, requires the expenditure of substantial time and financial resources. Failure to comply with the applicable requirements at any time during the product development process, approval process or after approval may subject an applicant and/or sponsor to a variety of administrative or judicial sanctions, including refusal by the applicable regulatory authority to approve pending applications, withdrawal of an approval, imposition of a clinical hold, issuance of warning letters and other types of letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, refusals of government contracts, restitution, disgorgement of profits, or civil or criminal investigations and penalties brought by FDA and the Department of Justice, or other governmental entities.

U.S. Product Approval Process

In the U.S., the FDA regulates drugs and biological products, or biologics, under the Public Health Service Act, as well as the FDCA which is the primary law for regulation of drug products. Both drugs and biologics are subject to the regulations and guidance implementing these laws. Pharmaceutical products are also subject to regulation by other governmental agencies, such as the Federal Trade Commission, the Office of Inspector General of the U.S. Department of Health and Human Services, the Consumer Product Safety Commission and the Environmental Protection Agency. The clinical testing, manufacturing, labeling, storage, distribution, record keeping, advertising, promotion, import, export and marketing, among other things, of our product candidates are subject to extensive regulation by governmental authorities in the U.S. and other countries. The steps required before a drug or biologic may be approved for marketing in the U.S. generally include:

- Preclinical laboratory tests and animal tests conducted under Good Laboratory Practices.
- The submission to the FDA of an IND for human clinical testing, which must become effective before each human clinical trial commence.
- Adequate and well-controlled human clinical trials to establish the safety and efficacy of the product and conducted in accordance with Good Clinical Practices.
- The submission to the FDA of an NDA, in the case of a small molecule drug product, or a BLA, in the case of a biologic product.
- FDA acceptance, review and approval of the NDA or BLA, as applicable.
- Satisfactory completion of an FDA inspection of the manufacturing facilities at which the product is made to assess compliance with cGMPs.

The testing and approval process requires substantial time, effort and financial resources, and the receipt and timing of any approval is uncertain. The FDA may suspend clinical trials at any time on various grounds, including a finding that the subjects or patients are being exposed to a potentially unacceptable health risk.

Preclinical studies include laboratory evaluations of the product candidate, as well as animal studies to assess the potential safety and efficacy of the product candidate. Preclinical studies must be conducted in compliance with FDA regulations regarding GLPs. The results of the preclinical studies, together with manufacturing information and analytical data, are submitted to the FDA as part of the IND, which includes the results of preclinical testing and a protocol detailing, among other things, the objectives of the clinical trial, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated if the first phase or phases of the clinical trial lends themselves to an efficacy determination. The IND will become effective automatically 30 days after receipt by the FDA, unless the FDA raises concerns or questions about the conduct of the trials as outlined in the IND prior to that time. In this case,

the IND sponsor and the FDA must resolve any outstanding concerns before clinical trials can proceed. The IND must become effective before clinical trials may be commenced.

Clinical trials involve the administration of the product candidates to healthy volunteers, or subjects, or patients with the disease to be treated under the supervision of a qualified principal investigator. Clinical trials must be conducted under the supervision of one or more qualified principal investigators in accordance with GCPs and in accordance with protocols detailing the objectives of the applicable phase of the trial, dosing procedures, research subject selection and exclusion criteria and the safety and effectiveness criteria to be evaluated. Progress reports detailing the status of clinical trials must be submitted to the FDA annually. Sponsors must also timely report to the FDA serious and unexpected adverse events, any clinically important increase in the rate of a serious suspected adverse event over that listed in the protocol or investigator's brochure, or any findings from other studies or tests that suggest a significant risk in humans exposed to the product candidate. Further, the protocol for each clinical trial must be reviewed and approved by an independent institutional review board ("IRB"), either centrally or individually at each institution at which the clinical trial will be conducted. The IRB will consider, among other things, ethical factors, and the safety of human subjects and the possible liability of the institution.

Clinical trials are typically conducted in three sequential phases prior to approval, but the phases may overlap and different trials may be initiated with the same drug candidate within the same phase of development in similar or different patient populations. These phases generally include the following:

Phase 1. Phase 1 clinical trials represent the initial introduction of a product candidate into human subjects, frequently healthy volunteers. In Phase 1, the product candidate is usually tested for pharmacodynamic and pharmacokinetic properties such as safety, including adverse effects, dosage tolerance, absorption, distribution, metabolism and excretion.

Phase 2. Phase 2 clinical trials usually involve studies in a limited patient population to (1) evaluate the efficacy of the product candidate for specific indications, (2) determine dosage tolerance and optimal dosage and (3) identify possible adverse effects and safety risks.

Phase 3. If a product candidate is found to be potentially effective and to have an acceptable safety profile in Phase 2 studies, the clinical trial program will be expanded to Phase 3 clinical trials to further evaluate clinical efficacy, optimal dosage and safety within an expanded patient population at geographically dispersed clinical study sites.

Phase 4. Phase 4 clinical trials are conducted after approval to gain additional experience from the treatment of patients in the intended therapeutic indication and to document a clinical benefit in the case of drugs approved under accelerated approval regulations, or when otherwise requested by the FDA in the form of post-market requirements or commitments. Failure to promptly conduct any required Phase 4 clinical trials could result in withdrawal of approval.

The results of preclinical studies and clinical trials, together with detailed information on the manufacture, composition and quality of the product candidate, are submitted to the FDA in the form of an NDA (for a drug) or BLA (for a biologic), requesting approval to market the product. The application must be accompanied by a significant user fee payment. The FDA has substantial discretion in the approval process and may refuse to accept any application or decide that the data is insufficient for approval and require additional preclinical, clinical or other studies.

Review of Application

Once the NDA or BLA submission has been accepted for filing, which occurs, if at all, 60 days after submission, the FDA informs the applicant of the specific date by which the FDA intends to complete its review. This is typically 12 months from the date of submission. The review process is often extended by FDA requests for additional information or clarification. The FDA reviews NDAs and BLAs 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 identity, strength, quality and purity. Before approving an NDA or BLA, the FDA may inspect the facilities at which the product is manufactured and will not approve the product unless the manufacturing facility complies with cGMPs and will also inspect clinical trial sites for integrity of data supporting safety and efficacy. During the approval process, the FDA also will determine whether a risk evaluation and mitigation strategy ("REMS"), is necessary to assure the safe use of the product. If the FDA concludes a REMS is needed, the sponsor of the application must submit a proposed REMS; the FDA will not approve the application without an approved REMS, if required. A REMS can substantially increase the costs of obtaining approval. The FDA may also convene an advisory committee of external experts to provide input on certain review issues relating to risk, benefit and interpretation of clinical trial data. The FDA may delay approval of an NDA if applicable regulatory criteria are not satisfied and/or the FDA requires additional testing or information. The FDA may require post-marketing testing and surveillance to monitor safety or efficacy of a product. FDA will issue either an approval of the NDA or BLA or a complete response letter detailing the deficiencies and information required in order for reconsideration of the application.

Pediatric Exclusivity and Pediatric Use

Under the Best Pharmaceuticals for Children Act, certain drugs or biologics may obtain an additional six months of exclusivity in an indication, if the sponsor submits information requested in writing by the FDA ("Written Request"), relating to the use of the active moiety of the drug or biologic in children. The FDA may not issue a Written Request for studies on unapproved or approved indications or where it determines that information relating to the use of a drug or biologic in a pediatric population, or part of the pediatric population, may not produce health benefits in that population.

We have not received a Written Request for such pediatric studies with respect to our product candidates, although we may ask the FDA to issue a Written Request for studies in the future. To receive the six-month pediatric market exclusivity, we would have to receive a Written Request from the FDA, conduct the requested studies in accordance with a written agreement with the FDA or, if there is no written agreement, in accordance with commonly accepted scientific principles, and submit reports of the studies. A Written Request may include studies for indications that are not currently in the labeling if the FDA determines that such information will benefit the public health. The FDA will accept the reports upon its determination that the studies were conducted in accordance with and are responsive to the original Written Request, agreement, or commonly accepted scientific principles, as appropriate, and that the reports comply with the FDA's filing requirements.

In addition, the Pediatric Research Equity Act ("PREA") requires a sponsor to conduct pediatric studies for most drugs and biologicals, for a new active ingredient, new indication, new dosage form, new dosing regimen or new route of administration. Under PREA, original NDAs, BLAs and supplements thereto must contain a pediatric assessment unless the sponsor has received a deferral or waiver. The required assessment must include the evaluation of the safety and effectiveness of the product for the claimed indications in all relevant pediatric subpopulations and support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDA, on its own initiative or at the request of the sponsor, may request a deferral of pediatric studies for some or all of the pediatric subpopulations. A deferral may be granted by FDA if they believe that additional safety or effectiveness data in the adult population needs to be collected before the pediatric studies begin. After April 2013, the FDA must send a non-compliance letter to any sponsor that fails to submit the required assessment, keep a deferral current or fails to submit a request for approval of a pediatric formulation.

Post-Approval Requirements

Even after approval, drugs and biologics manufactured or distributed pursuant to FDA approvals are subject to continuous regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product 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.

The FDA may impose a number of post-approval requirements as a condition of approval of an NDA or BLA. For example, the FDA may require post-marketing testing, including Phase 4 clinical trials, and surveillance to further assess and monitor the product's safety and effectiveness after commercialization.

In addition, entities involved in the manufacture and distribution of approved drugs and biologics are required to register their establishments with the FDA and state agencies, and are subject to periodic unannounced inspections by the FDA and these state agencies for compliance with cGMP requirements. Changes to the manufacturing process are strictly regulated and often 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 the sponsor and any third-party manufacturers that the sponsor may decide to use. Accordingly, manufacturers must continue to expend time, money, and effort in the area of production and quality control to maintain cGMP compliance.

Once an approval is granted, the FDA may withdraw the 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 also result in revisions to the approved labeling to add new safety information; imposition of post-market studies or clinical trials to assess new safety risks; or imposition of distribution 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.
- Fines, warning letters or holds on post-approval clinical trials.

- Refusal of the FDA to approve pending NDAs or BLAs or supplements to approved NDAs or BLAs, or suspension or revocation of product license approvals.
- Product seizure or detention, or refusal to permit the import or export of products.
- 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 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 liability.

Prescription Drug Marketing Act

The distribution of pharmaceutical products is subject to the Prescription Drug Marketing Act ("PDMA"), which regulates the distribution of drugs and drug samples at the federal level and sets minimum standards for the registration and regulation of drug distributors at the state level. Under the PDMA and state law, states require the registration of manufacturers and distributors who provide pharmaceuticals in that state, including in certain states manufacturers and distributors who ship pharmaceuticals into the state even if such manufacturers or distributors have no place of business within the state. The PDMA and state laws impose requirements and limitations upon drug sampling to ensure accountability in the distribution of samples. The PDMA sets forth civil and criminal penalties for violations of these and other provisions.

Federal and State Fraud and Abuse and Data Privacy and Security and Transparency Laws and Regulations

In addition to FDA restrictions on marketing of pharmaceutical products, federal and state healthcare laws restrict certain business practices in the biopharmaceutical industry. These laws include, but are not limited to, anti-kickback, false claims, data privacy and security, and transparency statutes and regulations.

The federal Anti-Kickback Statute prohibits, among other things, knowingly and willfully offering, paying, soliciting or receiving remuneration, directly or indirectly, to induce, or in return for, purchasing, leasing, ordering or arranging for the purchase, lease or order of any good, facility, item or service reimbursable under Medicare, Medicaid or other federal healthcare programs. The term "remuneration" has been broadly interpreted to include anything of value, including for example, gifts, discounts, the furnishing of supplies or equipment, credit arrangements, payments of cash, waivers of payment, ownership interests and providing anything at less than its fair market value. The Anti-Kickback Statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on one hand and prescribers, purchasers and formulary managers on the other. Although there are a number of statutory exemptions and regulatory safe harbors protecting certain common activities from prosecution, the exemptions and safe harbors are drawn narrowly, and our practices may not in all cases meet all of the criteria for a statutory exception or safe harbor protection. Practices that involve remuneration that may be alleged to be intended to induce prescribing, purchases or recommendations may be subject to scrutiny if they do not qualify for an exception or safe harbor. Failure to meet all of the requirements of a particular applicable statutory exception or regulatory safe harbor does not make the conduct per se illegal under the Anti-Kickback Statute. Instead, the legality of the arrangement will be evaluated on a case-by-case basis based on a cumulative review of all of its facts and circumstances. Several courts have interpreted the statute's intent requirement to mean that if any one purpose of an arrangement involving remuneration is to induce referrals of federal healthcare covered business, the statute has been violated. The intent standard under the Anti-Kickback Statute was amended by the Patient Protection and Affordable Care Act as amended by the Health Care and Education Reconciliation Act of 2010 (collectively "PPACA"), to a stricter intent standard such that a person or entity no longer needs to have actual knowledge of this statute or the specific intent to violate it in order to have committed a violation. In addition, PPACA codified case law 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 civil False Claims Act (discussed below). Further, civil monetary penalties statute imposes penalties against any person or entity who, among other things, is determined to have presented or caused to be presented a claim to a federal health program that the person knows or should know is for an item or service that was not provided as claimed or is false or fraudulent.

The federal false claims laws prohibit, among other things, any person or entity from knowingly presenting, or causing to be presented, a false or fraudulent claim for payment or approval to the federal government or knowingly making, using or causing to be made or used a false record or statement material to a false or fraudulent claim to the federal government. As a result of a modification made by the Fraud Enforcement and Recovery Act of 2009, a claim includes "any request or demand" for money or property presented to the U.S. government. Recently, several pharmaceutical and other healthcare companies have been prosecuted under these laws for, among other things, allegedly providing free product to customers with the expectation that the customers would bill federal programs for the product. Other companies have been prosecuted for causing false claims to be submitted because of the companies' marketing of the product for unapproved, and thus non-reimbursable, uses. The federal Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), created new federal criminal statutes that prohibit knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program, including private third-party payors and knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false, fictitious or fraudulent statement in connection with the delivery of, or payment for, healthcare benefits, items or services.

In addition, we may be subject to data privacy and security regulation by both the federal government and the states in which we conduct our business. HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act ("HITECH"), and its implementing regulations, imposes certain requirements relating to the privacy, security and transmission of individually identifiable health information. Among other things, HITECH makes HIPAA's privacy and security standards directly applicable to business associates — independent contractors or agents of covered entities that receive or obtain protected health information in connection with providing a service on behalf of a covered entity. HITECH also created four new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorney's fees and costs associated with pursuing federal civil actions. In addition, state laws govern 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.

Additionally, the federal Physician Payments Sunshine Act within the PPACA, and its implementing regulations, require that certain manufacturers of drugs, devices, biologicals and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program (with certain exceptions) to report information related to certain payments or other transfers of value made or distributed to physicians and teaching hospitals, or to entities or individuals at the request of, or designated on behalf of, the physicians and teaching hospitals and to report annually certain ownership and investment interests held by physicians and their immediate family members.

Also, many states have similar healthcare statutes or regulations that apply to items and services reimbursed under Medicaid and other state programs, or, in several states, apply regardless of the payor. Some states require the posting of information relating to clinical studies. In addition, California requires pharmaceutical companies to implement a comprehensive compliance program that includes a limit on expenditures for, or payments to, individual medical or health professionals. If our operations are found to be in violation of any of the health regulatory laws described above or any other laws that apply to us, we may be subject to penalties, including potentially significant criminal, civil and/or administrative penalties, damages, fines, disgorgement, individual imprisonment, exclusion of products from reimbursement under government programs, contractual damages, reputational harm, administrative burdens, diminished profits and future earnings 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. To the extent that any of our products will be sold in a foreign country, we may be subject to similar foreign laws and regulations, which may include, for instance, applicable post-marketing requirements, including safety surveillance, anti-fraud and abuse laws and implementation of corporate compliance programs and reporting of payments or transfers of value to healthcare professionals.

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Pharmaceutical Coverage, Pricing and Reimbursement

In both domestic and foreign markets, our sales of any approved products will depend in part on the availability of coverage and adequate reimbursement from third-party payors. Third-party payors include government health administrative authorities, managed care providers, private health insurers and other organizations. Patients who are prescribed treatments for their conditions and providers performing the prescribed services generally rely on third-party payors to reimburse all or part of the associated healthcare costs. Patients are unlikely to use our products unless coverage is provided and reimbursement is adequate to cover a significant portion of the cost of our products. Sales of our products will therefore depend substantially, both domestically and abroad, on the extent to which the costs of our products will be paid by third-party payors. These third-party payors are increasingly focused on containing healthcare costs by challenging the price and examining the cost-effectiveness of medical products and services. In addition, significant uncertainty exists as to the coverage and reimbursement status of newly approved healthcare product candidates. The market for our products and product candidates for which we may receive regulatory approval will depend significantly on access to third-party payors' drug formularies, or lists of medications for which third-party payors provide coverage and reimbursement. The industry competition to be included in such formularies often leads to downward pricing pressures on pharmaceutical companies. Also, third-party payors may refuse to include a particular branded drug in their formularies or otherwise restrict patient access to a branded drug when a less costly generic equivalent or other alternative is available.

Because each third-party payor individually approves coverage and reimbursement levels, obtaining coverage and adequate reimbursement is a time-consuming, costly and sometimes unpredictable process. We may be required to provide scientific and clinical support for the use of any product to each third-party payor separately with no assurance that approval would be obtained, and we may need to conduct expensive pharmacoeconomic studies in order to demonstrate the cost-effectiveness of our products. This process could delay the market acceptance of any product and could have a negative effect on our future revenues and operating results. We cannot be certain that our products and our product candidates will be considered cost-effective. Because coverage and reimbursement determinations are made on a payor-by-payor basis, obtaining acceptable coverage and reimbursement from one payor does not guarantee that we will obtain similar acceptable coverage or reimbursement from another payor. If we are unable to obtain coverage of, and adequate reimbursement and payment levels for, our product candidates from third-party payors, physicians may limit how much or under what circumstances they will prescribe or administer them and patients may decline to purchase them. This in turn could affect our ability to successfully commercialize our products and impact our profitability, results of operations, financial condition and future success.

In addition, in many foreign countries, particularly the countries of the EU and China, the pricing of prescription drugs is subject to government control. In some non-U.S. jurisdictions, the proposed pricing for a drug must be approved before it may be lawfully marketed. The requirements governing drug pricing vary widely from country to country. For example, the EU provides options for its member states to restrict the range of medicinal products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. A member state may approve a specific price for the medicinal product or it may instead adopt a system of direct or indirect controls on the profitability of a company placing the medicinal product on the market. We may face competition for our product candidates from lower-priced products in foreign countries that have placed price controls on pharmaceutical products. In addition, there may be importation of foreign products that compete with our own products, which could negatively impact our profitability.

Healthcare Reform

In the U.S. and foreign jurisdictions, there have been, and we expect there will continue to be, a number of legislative and regulatory changes to the healthcare system that could affect our future results of operations as we begin to directly commercialize our products. In particular, there have been and continue to be a number of initiatives at the U.S. federal and state level that seek to reduce healthcare costs. If a drug product is reimbursed by Medicare or Medicaid, pricing and rebate programs must comply with, as applicable, the Medicaid rebate requirements of the Omnibus Budget Reconciliation Act of 1990, as amended, and the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (“MMA”). The MMA imposed new requirements for the distribution and pricing of prescription drugs for Medicare beneficiaries. Under Part D, Medicare beneficiaries may enroll in prescription drug plans offered by private entities that provide coverage of outpatient prescription drugs. Part D plans include both stand-alone prescription drug benefit plans and prescription drug coverage as a supplement to Medicare Advantage plans. Unlike Medicare Part A and B, Part D coverage is not standardized. Part D prescription drug plan sponsors are not required to pay for all covered Part D drugs, and each drug plan can develop its own drug formulary that identifies which drugs it will cover and at what tier or level. However, Part D prescription drug formularies must include drugs within each therapeutic category and class of covered Part D drugs, though not necessarily all the drugs in each category or class. Any formulary used by a Part D prescription drug plan must be developed and reviewed by a pharmacy and therapeutic committee. Government payment for some of the costs of prescription drugs may increase demand for our products for which we receive marketing approval. However, any negotiated prices for our future products covered by a Part D prescription drug plan will likely be lower than the prices we might otherwise obtain from non-governmental payors. Moreover, while the MMA applies only to drug benefits for Medicare beneficiaries, private payors often follow Medicare coverage policy and payment limitations in setting their own payment rates. Any reduction in payment that results from Medicare Part D may result in a similar reduction in payments from non-governmental payors.

Moreover, on November 27, 2013, the federal Drug Supply Chain Security Act was signed into law, which imposes new obligations on manufacturers of pharmaceutical products, among others, related to product tracking and tracing. Among the requirements of this new federal legislation, manufacturers will be required to provide certain information regarding the drug product to individuals and entities to which product ownership is transferred, label drug product with a product identifier, and keep certain records regarding the drug product. Further, under this new legislation, manufacturers will have drug product investigation, quarantine, disposition, and notification responsibilities related to counterfeit, diverted, stolen, and intentionally adulterated products, as well as products that are the subject of fraudulent transactions or which are otherwise unfit for distribution such that they would be reasonably likely to result in serious health consequences or death.

Furthermore, political, economic and regulatory influences are subjecting the healthcare industry in the U.S. to fundamental change. Initiatives to reduce the federal budget and debt and to reform healthcare coverage are increasing cost-containment efforts. We anticipate that Congress, state legislatures and the private sector will continue to review and assess alternative healthcare benefits, controls on healthcare spending through limitations on the growth of private health insurance premiums and Medicare and Medicaid spending, the creation of large insurance purchasing groups, price controls on pharmaceuticals and other fundamental changes to the healthcare delivery system. Any proposed or actual changes could limit or eliminate our spending on development projects and affect our ultimate profitability. In March 2010, PPACA was signed into law. PPACA has the potential to substantially change the way healthcare is financed by both governmental and private insurers. Among other cost containment measures, PPACA established: an annual, nondeductible fee on any entity that manufactures or imports certain branded prescription drugs and biologic agents; revised the methodology by which rebates owed by manufacturers to the state and federal government for covered outpatient drugs under the Medicaid Drug Rebate Program are calculated; increased the minimum Medicaid rebates owed by most manufacturers under the Medicaid Drug Rebate Program; and extended the Medicaid Drug Rebate program to utilization of prescriptions of individuals enrolled in Medicaid managed care organizations. In the

future, there may continue to be additional proposals relating to the reform of the U.S. healthcare system, some of which could further limit the prices we are able to charge for our products, or the amounts of reimbursement available for our products. If future legislation were to impose direct governmental price controls and access restrictions, it could have a significant adverse impact on our business. Managed care organizations, as well as Medicaid and other government agencies, continue to seek price discounts. Some states have implemented, and other states are considering, price controls or patient access constraints under the Medicaid program, and some states are considering price-control regimes that would apply to broader segments of their populations that are not Medicaid-eligible. Due to the volatility in the current economic and market dynamics, we are unable to predict the impact of any unforeseen or unknown legislative, regulatory, payor or policy actions, which may include cost containment and healthcare reform measures. Such policy actions could have a material adverse impact on our profitability.

Regulation in China

The pharmaceutical industry in China is highly regulated. The primary regulatory authority is the NMPA, including its provincial and local branches. As a developer, manufacturer and supplier of drugs, we are subject to regulation and oversight by the NMPA and its provincial and local branches. The Drug Administration Law of China provides the basic legal framework for the administration of the production and sale of pharmaceuticals in China and covers the manufacturing, distributing, packaging, pricing and advertising of pharmaceutical products. Its implementing regulations set forth detailed rules with respect to the administration of pharmaceuticals in China. In addition, we are, and we will be, subject to other Chinese laws and regulations that are applicable to business operators, manufacturers and distributors in general.

Pharmaceutical Clinical Development

A new drug must be approved by the NMPA before it can be manufactured and marketed for sale. To obtain NMPA approval, the applicant must conduct clinical trials, which must be approved by the NMPA and are subject to the NMPA's supervision and inspection. There are four phases of clinical trials. Application for registration of new drugs requires completion of Phase 1, 2 and 3 of clinical trials, similar to the U.S. In addition, the NMPA may require the conduct of Phase 4 studies as a condition to approval.

Phase 4 studies are post-marketing studies to assess the therapeutic effectiveness of and adverse reactions to the new drug, including an evaluation of the benefits and risks, when used among the general population or specific groups, with findings used to inform adjustments to dosage, among other things.

NDA and Approval to Market

China requires approval of the NDA as well as the manufacturing facility before a drug can be marketed in China. Approval and oversight are performed at national and provincial levels of the NMPA, involve multiple agencies and consist of various stages of approval.

Under the applicable drug registration regulations, drug registration applications are divided into three different types, namely Domestic NDA, Domestic Generic Drug Application, and Imported Drug Application. Drugs fall into one of three categories, namely chemical medicine, biological product or traditional Chinese or natural medicine.

FibroGen Beijing as a domestic entity has submitted a Domestic NDA under the Domestic Class 1 designation, which refers to a new drug which has never been marketed in any country.

In order to obtain market authorization, FibroGen Beijing has submitted to the NMPA an NDA package that contains information similar to what is necessary for a U.S. NDA, including preclinical data, clinical data, technical data on API and drug product, and related stability data. The stability data has been generated from a three-batch registration campaign that was conducted at our Beijing facility, from which samples were successfully tested by the National Institutes for Food and Drug Control.

The NDA package was found acceptable to the NMPA, and FibroGen Beijing was granted a New Drug License confirming the drug as suitable for marketing in December 2018. In addition, FibroGen Beijing was granted a Manufacturing License which lists the Drug Approval Code as well as the name and address of the Manufacturing License holder. Manufacturing further requires a PPP as well as cGMP certification. In 2014, we received a PPP certifying that our manufacturing facility and manufacturing process in that facility are suitable for the manufacture of a drug for clinical or commercial purposes, but we will need to apply for another PPP for our Cangzhou manufacturing facility currently under construction. A PPP requires demonstration that the facility has: (i) legally

qualified pharmaceutical and engineering professionals and necessary technical workers; (ii) the premises, facilities and hygienic environment required for drug manufacturing; (iii) institutions, personnel, instruments and equipment necessary to conduct quality control and testing for drugs to be produced; and (iv) rules and regulations to ensure the quality of drugs. The PPP is required prior to conducting the registration campaign for stability and other data for the NDA.

Shortly before NDA approval, FibroGen Beijing conducted a three-batch validation campaign, one of which was observed onsite by the NMPA. Following the successful completion of the validation campaign and associated inspection, FibroGen Beijing was granted a cGMP certification for the commercial production of roxadustat at our Beijing manufacturing facility. We plan to use drug product from our FibroGen Beijing manufacturing facility for commercial supply. We expect our Cangzhou manufacturing facility to be qualified and licensed for manufacture of roxadustat API for the China market later in 2019.

Pricing, Reimbursement, Hospital Listing, and Tendering

Please see the “Commercialization” discussion above in the section “Roxadustat for the Treatment of Anemia in Chronic Kidney Disease in China.”

Device Regulation

In China, medical devices are classified into three different categories, Class I, Class II and Class III, depending on the degree of risk associated with each medical device and the extent of control needed to ensure safety and effectiveness. Classification of a medical device is important because the class to which a medical device is assigned determines, among other things, whether a manufacturer needs to obtain a production permit and whether clinical trials are required. Classification of a medical device also determines the types of registration required and the level of regulatory authority involved in effecting the product registration. In January 2016, we received the NMPA's (then the China Food and Drug Administration) approval of our device classification application to designate FG-5200 corneal implants as a Domestic Class III medical device. Class III devices also require product registration and are regulated by the NMPA under the strictest regulatory control.

Before a Class III medical device can be manufactured for commercial distribution, a manufacturer must effect medical device registration by proving the safety and effectiveness of the medical device to the satisfaction of respective levels of the NMPA and clinical trials are required for registration of Class III medical devices. In order to conduct a clinical trial on a Class III medical device, the NMPA requires manufacturers to apply for and obtain in advance a favorable inspection result for the device from an inspection center jointly recognized by the NMPA and the State Administration of Quality Supervision, Inspection and Quarantine. The application for clinical trials involving a Class III medical device with high risk must be approved by the NMPA before the manufacturer may begin clinical trials. A registration application for a Class III medical device must provide required pre-clinical and clinical trial data and information about the medical device and its components regarding, among other things, device design, manufacturing and labeling. The NMPA must provide the application data to the technical evaluation institute for an evaluation opinion within three working days after its acceptance of the application package and decide, within twenty business days after its receipt of the evaluation opinion, whether the application for registration is approved. However, the time for conducting any detection, expert review and hearing process, if necessary, will not be counted in the abovementioned time limit. If the NMPA requires supplemental information, the approval process may take much longer. The registration is valid for five years and application is required for renewal upon expiration of the existing registration certificate. Once a device is approved, a manufacturer must possess a production permit from the provincial level food and drug administration before manufacturing Class III medical devices.

Foreign Regulation Outside of China

We are planning on seeking approval for roxadustat, and potentially for our other product candidates, in Europe, Japan and China as well as other countries. In order to market any product outside of the U.S., we would need to comply with numerous and varying regulatory requirements of other countries and jurisdictions regarding quality, safety and efficacy and governing, among other things, clinical trials, manufacturing, marketing authorization, commercial sales and distribution of our products. Whether or not we obtain FDA approval for a product, we would need to obtain the necessary approvals by the comparable foreign regulatory authorities before we can commence clinical trials or marketing of the product in foreign countries and jurisdictions. Although many of the issues discussed above with respect to the U.S. apply similarly in the context of other countries we are seeking approval in, including Europe and China, the approval process varies between countries and jurisdictions and can involve different amounts of product testing and additional administrative review periods. For example, in Europe, a sponsor must submit a CTA, much like an IND prior to the commencement of human clinical trials. A CTA must be submitted to each national health authority and an independent ethics committee.

For other countries outside of the EU, such as China and the countries in Eastern Europe, Latin America or Asia, the requirements governing the conduct of clinical trials, product licensing, pricing, and reimbursement vary from country to country. The time required to obtain approval in other countries and jurisdictions might differ from or be longer than that required to obtain FDA approval. Regulatory approval in one country or jurisdiction does not ensure

regulatory approval in another, but a failure or delay in obtaining regulatory approval in one country or jurisdiction may negatively impact the regulatory approval process in other countries.

Regulatory Exclusivity for Approved Products

U.S. Patent Term Restoration

Depending upon the timing, duration, and specifics of the FDA approval 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 Act. The Hatch-Waxman Act permits a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. The patent term restoration period is generally one-half the time between the effective date of an initial IND and the submission date of an NDA or BLA, plus the time between the submission date of the NDA or BLA and the approval of that product candidate application. Patent term restoration cannot, however, extend the remaining term of a patent beyond a total of 14 years from the product's approval date. In addition, 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 applications for any patent term extension or restoration. In the future, we expect to apply for restoration of patent term for patents relating to each of our product candidates in order to add patent life beyond the current expiration date of such patents, depending on the length of the clinical trials and other factors involved in the filing of the relevant NDA or BLA.

Market exclusivity provisions under the FDCA can also delay the submission or the approval of certain applications of companies seeking to reference another company's NDA or BLA. The Hatch-Waxman Act provides a 5-year period of exclusivity to any approved NDA for a product containing a NCE never previously approved by FDA either alone or in combination with another active moiety. No application or abbreviated NDA directed to the same NCE may be submitted during the 5-year exclusivity period, except that such applications may be submitted after four years if they contain a certification of patent invalidity or non-infringement of the patents listed with the FDA by the innovator NDA.

Biologic Price Competition and Innovation Act

The Biologics Price Competition and Innovation Act of 2009 ("BPCIA"), established an abbreviated pathway for the approval of biosimilar and interchangeable biological products. The abbreviated regulatory approval pathway establishes legal authority for the FDA to review and approve biosimilar biologics, including the possible designation of a biosimilar as "interchangeable" based on similarity to an existing branded product. Under the BPCIA, an application for a biosimilar product cannot be approved by the FDA until 12 years after the original branded product was approved under a BLA. However, an application may be submitted after four years if it contains a certification of patent invalidity or non-infringement to one of the patents listed with the FDA by the innovator BLA holder. The BPCIA is complex and is only beginning to be interpreted and implemented by the FDA. As a result, its ultimate impact, implementation, and interpretation are subject to uncertainty.

Orphan Drug Act

Pamrevlumab has received orphan drug designation in IPF in the U.S. Under the Orphan Drug Act, the FDA may grant orphan designation to a drug or biological product intended to treat a rare disease or condition, which is a disease or condition that affects fewer than 200,000 individuals in the U.S., or if it affects more than 200,000 individuals in the U.S. there is no reasonable expectation that the cost of developing and making a drug product available in the U.S. for this type of disease or condition will be recovered from sales of the product. Orphan product designation must be requested before submitting an NDA. After the FDA grants orphan product designation, the identity of the therapeutic agent and its potential orphan use are disclosed publicly by the FDA. Orphan product designation does not convey any advantage in or shorten the duration of the regulatory review and approval process.

If a product that has orphan designation subsequently receives the first FDA approval for the disease or condition for which it has such designation, the product is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications to market the same drug or biological product for the same indication for seven years, except in limited circumstances, such as a showing of clinical superiority to the product with orphan exclusivity. The designation of such drug also entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages and user-fee waivers. Competitors, however, may receive approval of different products for the indication for which the orphan product has exclusivity or obtain approval for the same product but for a different indication for which the orphan product has exclusivity. Orphan product exclusivity also could block the approval of one of our products for seven years if a competitor obtains approval of the same drug or biological product as defined by the FDA or if our drug candidate is determined to be contained within the competitor’s product for the same indication or disease. If a drug product designated as an orphan product receives marketing approval for an indication broader than what is designated, it may not be entitled to orphan product exclusivity in any indication.

Orphan designation status in the EU has similar but not identical benefits in that jurisdiction.

Products receiving orphan designation in the EU can receive ten years of market exclusivity, during which time no similar medicinal product for the same indication may be placed on the market. The ten-year market exclusivity may be reduced to six years if, at the end of the fifth year, it is established that the product no longer meets the criteria for orphan designation; for example, if the product is sufficiently profitable not to justify maintenance of market exclusivity. Additionally, marketing authorization may be granted to a similar product for the same indication at any time if the second applicant can establish that its product, although similar, is safer, more effective or otherwise clinically superior; the initial applicant consents to a second orphan medicinal product application; or the initial applicant cannot supply enough orphan medicinal product. An orphan product can also obtain an additional two years of market exclusivity in the EU for pediatric studies. No extension to any supplementary protection certificate can be granted on the basis of pediatric studies for orphan indications.

Foreign Country Data Exclusivity

The EU also provides opportunities for additional market exclusivity. For example, in the EU, upon receiving marketing authorization, an NCE generally receives eight years of data exclusivity and an additional two years of market exclusivity. If granted, data exclusivity prevents regulatory authorities in the EU from referencing the innovator's data to assess a generic application. During the additional two-year period of market exclusivity, a generic marketing authorization can be submitted, and the innovator's data may be referenced, but no generic product can be marketed until the expiration of the market exclusivity.

In China, there is also an opportunity for data exclusivity for a period of six years for data included in an NDA applicable to a NCE. According to the Provisions for Drug Registration, the Chinese government protects undisclosed data from drug studies and prevents the approval of an application made by another company that uses the undisclosed data for the approved drug. In addition, if an approved drug manufactured in China qualifies as an innovative drug, such as Domestic Class 1, and the NMPA determines that it is appropriate to protect public health with respect to the safety and efficacy of the approved drug, the NMPA may elect to monitor such drug for up to five years. During this post-marketing observation period, the NMPA will not grant approval to another company to produce, change dosage form of or import the drug while the innovative drug is under observation. The approved manufacturer is required to provide an annual report to the regulatory department of the province, autonomous region or municipality directly under the central government where it is located. Each of the data exclusivity period and the observation period runs from the date of approval for production of the NCE or innovative drug, as the case may be.

INTELLECTUAL PROPERTY

Our success depends in part upon our ability to obtain and maintain patent and other intellectual property protection for our product candidates including compositions-of-matter, dosages, and formulations, manufacturing methods, and novel applications, uses and technological innovations related to our product candidates and core technologies. We also rely on trade secrets, know-how and continuing technological innovation to further develop and maintain our competitive position.

Our policy is to seek to protect our proprietary position by, among other methods, filing U.S. and foreign patent applications related to our proprietary technologies, inventions and any improvements that we consider important to the development and implementation of our business and strategy. Our ability to maintain and solidify our proprietary position for our products and technologies will depend, in part, on our success in obtaining and enforcing valid patent claims. Additionally, we may benefit from a variety of regulatory frameworks in the U.S., Europe, China, and other territories that provide periods of non-patent-based exclusivity for qualifying drug products. Refer to "Government Regulation — Regulatory Exclusivity for Approved Products."

We cannot ensure that patents will be granted with respect to any of our pending patent applications or with respect to any patent applications that may be filed by us in the future, nor can we ensure that any of our existing or subsequently granted patents will be useful in protecting our drug candidates, technological innovations, and processes. Additionally, any existing or subsequently granted patents may be challenged, invalidated, circumvented or infringed. We cannot guarantee that our intellectual property rights or proprietary position will be sufficient to permit us to take advantage of current market trends or otherwise to provide or protect competitive advantages. Furthermore, our competitors may be able to independently develop and commercialize similar products, or may be able to duplicate our technologies, business model, or strategy, without infringing our patents or otherwise using our intellectual property.

Our extensive worldwide patent portfolio includes multiple granted and pending patent applications relating to roxadustat and pamrevlumab. Currently granted patents relating to composition-of-matter for roxadustat and for pamrevlumab are expected, for each product candidate, to expire in 2024 or 2025, in each case exclusive of any patent term extension that may be available. U.S. and foreign patents relating to crystalline forms of roxadustat are expected to expire in 2033, exclusive of any extension. Additional patents and patent applications relating to manufacturing processes, formulations, and various therapeutic uses, including treatment of specific indications and improvement of clinical parameters, provide further protection for product candidates.

The protection afforded by any particular patent depends upon many factors, including the type of patent, scope of coverage encompassed by the granted claims, availability of extensions of patent term, availability of legal remedies in the particular territory in which the patent is granted, and validity and enforceability of the patent. Changes in either patent laws or in the interpretation of patent laws in the U.S. and other countries could diminish our ability to protect our inventions and to enforce our intellectual property rights. Accordingly, we cannot predict with certainty the enforceability of any granted patent claims or of any claims that may be granted from our patent applications.

The biotechnology and pharmaceutical industries are characterized by extensive litigation regarding patents and other intellectual property rights. Our ability to maintain and solidify our proprietary position for our products and core technologies will depend on our success in obtaining effective claims and enforcing those claims once granted. We have been in the past and are currently involved in various administrative proceedings with respect to our patents and patent applications and may, as a result of our extensive portfolio, be involved in such proceedings in the future. Additionally, in the future, we may claim that a third party infringes our intellectual property or a third party may claim that we infringe its intellectual property. In any of the administrative proceedings or in litigation, we may incur significant expenses, damages, attorneys' fees, costs of proceedings and experts' fees, and management and employees may be required to spend significant time in connection with these actions.

Because of the extensive time required for clinical development and regulatory review of a product candidate we may develop, it is possible that any patent related to our product candidates may expire before any of our product candidates can be commercialized, or may remain in force for only a short period of time following commercialization, thereby reducing the advantage afforded by any such patent.

The patent positions for our most advanced programs are summarized below.

Roxadustat Patent Portfolio

Our roxadustat patent portfolio includes multiple granted U.S. patents offering protection for roxadustat, including protection for roxadustat composition-of-matter, for pharmaceutical compositions containing roxadustat, and for methods for treating anemia using roxadustat or its analogs. Exclusive of any patent term extension, the granted U.S. patents relating to the composition-of-matter of roxadustat are due to expire in 2024 or 2025, and granted foreign patents are due to expire in 2024. U.S. and foreign patents relating to crystalline forms of roxadustat are due to expire in 2033.

We believe that, if roxadustat is approved, a full five-year patent term extension under the Hatch-Waxman act will be available for a granted U.S. patent relating to roxadustat, which extension would expire in 2029 or 2030, depending on the patent extended. Refer to "Government Regulation — Regulatory Exclusivity for Approved Products — U.S. Patent Term Restoration."

We also hold various U.S. and foreign granted patents and pending patent applications directed to manufacturing processes, formulations, and methods for use of roxadustat.

Roxadustat China Patent Portfolio

Our roxadustat China patent portfolio includes granted patents covering roxadustat composition-of-matter, pharmaceutical compositions, methods of use, and manufacturing processes for roxadustat, as well as medicaments containing roxadustat for treating anemia and other conditions. Patents relating to roxadustat composition-of-matter and crystalline forms are due to expire in 2024 and 2033, respectively.

We believe that roxadustat, as a new chemical entity, would be eligible for six years of data exclusivity in China. Furthermore, upon approval as a new drug, roxadustat may receive up to five years of market exclusivity under a NMPA-imposed new drug monitoring period. Refer to “Government Regulation — Regulatory Exclusivity for Approved Products — Foreign Country Data Exclusivity.”

HIF Anemia-related Technologies Patent Portfolio

We also have an extensive worldwide patent portfolio providing broad protection for proprietary technologies relating to the treatment of anemia and associated conditions. This portfolio currently contains granted patents and pending patent applications providing exclusivity for use of compounds falling within various and overlapping classes of HIF-PH inhibitors to achieve various therapeutic effects.

This portfolio reflects a series of discoveries we made from the initial days of our HIF program through the present time. Our research efforts have resulted in progressive innovation, and the corresponding patents and patent applications reflect the success of our HIF program. Such discoveries include the ability of HIF-PH inhibitors:

- To induce endogenous EPO in anemic CKD patients.
- To increase efficacy of EPO signaling.
    - To enhance EPO responsiveness of the bone marrow, for example, by increasing EPO receptor expression.
- To overcome the suppressive and inhibitory effects of inflammatory cytokines, such as members of the interleukin-1 and IL-6 cytokine families, on EPO production and responsiveness.
- To increase effective metabolism of iron.
- To increase iron absorption and bioavailability, as measured using clinical parameters such as percent TSAT%.
- To overcome iron deficiency through effects on iron regulatory factors such as ferroportin and hepcidin.
- To provide coordinated erythropoiesis resulting in increased CHr and increased mean corpuscular volume.
- To improve kidney function.

The table below sets forth representative granted U.S. patents relating to these and other inventions, including the projected expiration dates of these patents.

PATENT NO.	TITLE	DUE TO EXPIRE
6,855,510	Pharmaceuticals and Methods for Treating Hypoxia and Screening Methods Therefor	July 2022
8,466,172	Stabilization of Hypoxia Inducible Factor (HIF) Alpha	December 2022
8,629,131	Enhanced Erythropoiesis and Iron Metabolism	June 2024
8,604,012	Enhanced Erythropoiesis and Iron Metabolism	June 2024
8,609,646	Enhanced Erythropoiesis and Iron Metabolism	June 2024
8,604,013	Enhanced Erythropoiesis and Iron Metabolism	June 2024
8,614,204	Enhanced Erythropoiesis and Iron Metabolism	June 2026
7,713,986	Compounds and Methods for Treatment of Chemotherapy-Induced Anemia	June 2026
8,318,703	Methods for Improving Kidney Function	February 2027

In addition to the U.S. patents listed above, our HIF anemia-related technologies portfolio includes corresponding foreign patents granted and patent applications pending in various territories worldwide.

Akebia and others have filed oppositions against certain European patents corresponding to some of the above-listed cases. In three of these proceedings, for FibroGen European Patent Nos. 1463823, 1633333, and 2322155, the European Patent Office has handed down decisions unfavorable to FibroGen. In the fourth of these proceedings, the European Patent Office issued a decision favorable to FibroGen, maintaining FibroGen European Patent No. 2322153. These decisions are currently under appeal, and these four patents are valid and enforceable pending resolution of the appeals. The ultimate outcomes of such proceedings remain uncertain, and ultimate resolution of such may take two to four years or longer. Akebia is also pursuing invalidation actions against corresponding patents in Canada and in Japan, and invalidation actions against corresponding patents in the United Kingdom have been initiated by GSK and by Akebia. While we believe these FibroGen patents will be upheld in relevant part, we note that narrowing or even revocation of any of these patents would not affect our exclusivity for roxadustat or our freedom-to-operate with respect to use of roxadustat for the treatment of anemia.

Pamrevlumab Patent Portfolio

Our pamrevlumab patent portfolio includes U.S. patents providing composition-of-matter protection for pamrevlumab and related antibodies, and for methods of using such in the treatment of fibroproliferative disorders, including IPF, liver fibrosis, and pancreatic cancer. Exclusive of any patent term extension, U.S. patents relating to pamrevlumab composition-of-matter are due to expire in 2024 or 2025. Corresponding foreign patents are due to expire, exclusive of any patent term extension, in 2024.

We believe that, if pamrevlumab is approved, a full five-year patent term extension under the Hatch-Waxman act will be available for a granted patent relating to pamrevlumab, which extension would expire in 2029 or 2030, depending on the patent extended . In addition, we believe that pamrevlumab, if approved under a BLA, should qualify for the 12-year period of exclusivity currently permitted by the BPCIA. Refer to “Government Regulation — Regulatory Exclusivity for Approved Products.”

We also hold additional granted U.S. and foreign patents and pending patent applications directed to the use of pamrevlumab to treat IPF, DMD, pancreatic cancer, liver fibrosis, and other disorders.

Trade Secrets and Know-How

In addition to patents, we rely upon proprietary trade secrets and know-how and continuing technological innovation to develop and maintain our competitive position. We seek to protect our proprietary information, in part, using confidentiality and other terms in agreements with our commercial partners, collaboration partners, consultants and employees. Such agreements are designed to protect our proprietary information, and may also grant us ownership of technologies that are developed through a relationship with a third party, such as through invention assignment provisions. Agreements may expire and we could lose the benefit of confidentiality, or our agreements 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 commercial partners, collaboration partners, employees and consultants 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.

In-Licenses

Dana-Farber Cancer Institute

Effective March 2006, we entered into a license agreement with the Dana-Farber Cancer Institute (“DFCI”), under which we obtained an exclusive license to certain patent applications, patents and biological materials for all uses. The patent rights relate to inhibition of prolyl hydroxylation of the alpha subunit of hypoxia-inducible factor (HIF), and include granted U.S. and foreign patents due to expire in 2022, exclusive of possible patent term extension. The licensed patents relate to use of HIF-PH inhibitors such as roxadustat.

Under the DFCI agreement, we are obligated to pay DFCI for past and ongoing patent prosecution expenses for the licensed patents. We are also obligated to pay DFCI annual maintenance fees, development milestone payments of up to $425,000, sales milestone payments of up to $3 million, and a sub-single-digit royalty on net sales by us or our affiliates or sublicensees of products that are covered by the licensed patents or incorporate the licensed biological materials. In addition, each sublicense we grant is subject to a one-time fixed amount payment to DFCI.

Unless earlier terminated, the agreement will continue in effect, on a country-by-country basis, until the expiration of all licensed patents in a country or, if there is no patent covering a licensed product incorporating the licensed biological materials, until 20 years after the effective date of the agreement. DFCI may terminate the agreement for our uncured material breach, if we cease to carry on our business and development activities with respect to all licensed products, if we fail to comply with our insurance obligations, or if we are convicted of a felony related to the manufacture, use, sale or importation of licensed products. We may terminate the agreement at any time on prior written notice to DFCI.

University of Miami

In May 1997, we entered into a license agreement with the University of Miami (the "University"), amended in July 1999, under which we obtained an exclusive, worldwide license to certain patent applications and patents for all uses. The current patent rights include U.S. and foreign patents that relate to biologically active fragments of CTGF, and corresponding nucleic acids, proteins, and antibodies, and are due to expire in 2019 and 2022, exclusive of any patent term extension or adjustment that may be available. The licensed patents relate to pamrevlumab and related products.

Under the University agreement, we are obligated to pay for all ongoing patent prosecution expenses for the licensed patents. We were also obligated to pay an upfront licensing fee of $21,500, all of which has been paid, and development milestone payments of up to $450,000, of which $50,000 has been paid, as well as an additional milestone payment, in the low hundreds of thousands of dollars, for each new indication for which we obtain approval for a licensed product, and a single digit royalty, subject to certain reductions, on net sales of licensed products by us or our affiliates or sublicensees.

Unless earlier terminated, the agreement will continue in effect, on a country-by-country basis, until the expiration of all licensed patents in a country. The University may terminate the agreement for our uncured material breach or bankruptcy. We may terminate the agreement for the University's uncured material breach or at any time on prior written notice to the University.

Bristol-Myers Squibb Company (Medarex, Inc.)

Effective July 9, 1998 and as amended on June 30, 2001 and January 28, 2002, we entered into a research and commercialization agreement with Medarex, Inc. and its wholly-owned subsidiary GenPharm International, Inc. (now, collectively, part of Bristol-Myers Squibb Company ("Medarex")) to develop fully human monoclonal antibodies for potential anti-fibrotic therapies. Under the agreement, Medarex was responsible for using its proprietary immunizable transgenic mice ("HuMAb-Mouse technology") during a specified research period ("the Research Period"), to produce fully human antibodies against our proprietary antigen targets, including CTGF, for our exclusive use.

The agreement granted us an option to obtain an exclusive worldwide, royalty-bearing, commercial license to develop antibodies derived from Medarex's HuMAb-Mouse technology, for use in the development and commercialization of diagnostic and therapeutic products. In December 2002, we exercised that option with respect to twelve antibodies inclusive of the antibody from which pamrevlumab is derived. We granted back to Medarex an exclusive, worldwide, royalty-free, perpetual, irrevocable license, with the right to sublicense, to certain inventions created during the parties' research collaboration, with such license limited to use by Medarex outside the scope of our licensed antibodies.

As a result of the exercise of our option to obtain the commercial license, Medarex is precluded from (i) knowingly using any technology involving immunizable transgenic mice containing unrearranged human immunoglobulin genes with any of our antigen targets that were the subject of the agreement, (ii) granting to a third party a commercial license that covers such antigen targets or those antibodies derived by Medarex during the Research Period, and (iii) using any antibodies derived by Medarex during the Research Period, except as permitted under the agreement for our benefit or to prosecute patent applications in accordance with the agreement.

Medarex retained ownership of the patent rights relating to certain mice, mice materials, antibodies and hybridoma cell lines used by Medarex in connection with its activities under the agreement, and Medarex also owns certain claims in patents covering inventions that arise during the Research Period, which claims are directed to (i) compositions of matter (e.g., an antibody) except formulations of antibodies for therapeutic or diagnostic use, or (ii) methods of production. We own the patent rights to any inventions that arise during the Research Period that relate to antigens, as well as claims in patents covering inventions directed to (a) methods of use of an antibody, or

(b) formulations of antibodies for therapeutic or diagnostic use. Upon exercise of our option to obtain the commercial license, we obtained the sole right but not obligation to control prosecution of patents relating solely to the licensed antibodies or products. Medarex has back-up patent prosecution rights in the event we decline to further prosecute or maintain such patents.

In addition to research support payments by us to Medarex during the Research Period, and an upfront commercial license fee in the form of 181,819 shares of FibroGen Series D Convertible Preferred Stock paid upon exercise of our option, we committed development-related milestone payments of up to $11 million per therapeutic product containing a licensed antibody, and we have paid a $1 million development-related milestone, in the form of 133,333 shares of FibroGen Series G Convertible Preferred Stock, for pamrevlumab to date. At our election, the remaining milestone payments may be paid in common stock of FibroGen, Inc., or cash.

With respect to our sales and sales by our affiliates, the agreement also requires us to pay Medarex low single-digit royalties for licensed therapeutic products and low double-digit royalties plus certain capped sales-based bonus royalties for licensed diagnostic products. With respect to sales of licensed products by a sublicensee, we may elect to pay the foregoing royalties based on our sublicensee's sales, or a percentage (in the high-teens) of all payments received by us from such sublicensee. We are also required to reimburse Medarex any pass-through royalties, if any, payable under Medarex's upstream license agreements with Medical Research Council and DNX. Royalties payable by us under the agreement are on a licensed product-by-licensed product and country-by-country basis and subject to reductions in specified circumstances, and royalties are payable for a period until either expiration of patents covering the applicable licensed product or a specified number of years following the first commercial sale of such product in the applicable country.

Unless earlier terminated, the agreement will continue in effect for as long as there are royalty payment obligations by us or our sublicensees. Either party may terminate the agreement for certain material breaches by the other party, or for bankruptcy, insolvency or similar circumstances. In addition, we may also terminate the agreement for convenience upon written notice.

Third Party Filings

Numerous U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in the fields in which we are developing products. Because patent applications can take many years to issue, there may be currently pending applications, unknown to us, which may later result in granted patents that use of our product candidates or proprietary technologies may infringe.

If a third party claims that we infringe its intellectual property rights, we may face a number of issues, including but not limited to, litigation expenses, substantial damages, attorney fees, injunction, royalty payments, cross-licensing of our patents, redesign of our products, or processes and related fees and costs.

We may be exposed to, or threatened with, future litigation by third parties having patent or other intellectual property rights alleging that our products, product candidates, and/or proprietary technologies infringe their intellectual property rights. If one of these patents were to be found to cover our products, product candidates, proprietary technologies, or their uses, we could be required to pay damages and could be restricted from commercializing our products, product candidates or using our proprietary technologies unless we obtain a license to the patent. A license may not be available to us on acceptable terms, if at all. In addition, during litigation, the patent holder might obtain a preliminary injunction or other equitable right, which could prohibit us from making, using or selling our products, technologies, or methods.

EMPLOYEES

As of January 31, 2019, we had 461 full-time employees, 135 of whom held Ph.D. or M.D. degrees, 359 of whom were engaged in research and development and 102 of whom were engaged in business development, finance, information systems, facilities, human resources or administrative support. None of our U.S. employees are represented by a labor union. The employees of FibroGen Beijing are represented by a labor union under the China Labor Union Law. None of our employees have entered into a collective agreement with us. We consider our employee relations to be good.

FACILITIES

Our corporate and research and development operations are located in San Francisco, California, where we lease approximately 234,000 square feet of office and laboratory space with approximately 35,000 square feet subleased.

The lease for our San Francisco headquarters expires in 2023. We also lease approximately 67,000 square feet of office and manufacturing space in Beijing, China. Our lease in China expires in 2021. We are constructing a commercial manufacturing facility of approximately 5,500 square meters in Cangzhou, China, on approximately 33,000 square meters of land. Our right to use such land expires in 2068. We believe our facilities are adequate for our current needs and that suitable additional or substitute space would be available if needed.

LEGAL PROCEEDINGS

We are not currently a party to any material legal proceedings.

FINANCIAL INFORMATION

Information regarding our revenues, net loss and total assets is contained in our consolidated financial statements under Item 8 of this Annual Report, which information is incorporated by reference here. For the specifics of our segment and geographic revenue, refer to Note 14 to our consolidated financial statements.

Research and development expenses for fiscal years ended December 31, 2018, 2017 and 2016 were $235.8 million, $196.5 million, and $187.2 million, respectively. We expect our research and development expenses to continue to increase in the future as we advance our product candidates through clinical trials and expand our product candidate portfolio.

Our revenue to date has been generated primarily from our collaboration agreements with Astellas and AstraZeneca for the development and commercialization of roxadustat. For fiscal years ended December 31, 2018, 2017 and 2016, substantially all of our revenue was related to our collaboration agreements.

AVAILABLE INFORMATION

Our internet website address is www.fibrogen.com. In addition to the information about us and our subsidiaries contained in this Annual Report, information about us can be found on our website. Our website and information included in or linked to our website are not part of this Annual Report.

Our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), are available free of charge through our website as soon as reasonably practicable after they are electronically filed with or furnished to the Securities and Exchange Commission ("SEC"). The public may read and copy the materials we file with the SEC at the SEC's Public Reference Room at 100 F Street, NE, Washington, DC 20549. The public may obtain information on the operation of the Public Reference Room by calling the SEC at 1-800-SEC-0330. Additionally the SEC maintains an internet site that contains reports, proxy and information statements and other information. The address of the SEC's website is www.sec.gov.

CORPORATE INFORMATION

We were incorporated in 1993 in Delaware. Our headquarters are located at 409 Illinois Street, San Francisco, California 94158 and our telephone number is (415) 978-1200. Our website address is www.FibroGen.com. The information contained on, or that can be accessed through, our website is not part of, and is not incorporated into, this Annual Report.

Our subsidiaries consist of the following: 1) FibroGen Europe Oy ("FibroGen Europe"), a majority owned entity incorporated in Finland in 1996; 2) Skin Sciences, Inc., a majority owned entity incorporated in the State of Delaware in 1995; 3) FibroGen International (Cayman) Limited, a wholly owned entity incorporated in the Cayman Islands in 2011; 4) FibroGen China Anemia Holdings Ltd., a majority owned entity incorporated in the Cayman Islands in 2012; 5) FibroGen International (Hong Kong) Limited, a majority owned entity incorporated in Hong Kong in 2011; and 6) FibroGen (China) Medical Technology Development Co., Ltd., a majority owned entity incorporated in China in 2011.

"FibroGen," the FibroGen logo and other trademarks or service marks of FibroGen, Inc. appearing in this Annual Report are the property of FibroGen, Inc. This Annual Report contains additional trade names, trademarks and service marks of others, which are the property of their respective owners. We do not intend our use of display of other companies' trade names, trademarks or service marks to imply a relationship with, or endorsement or sponsorship of us by, these other companies.

ITEM 1A. RISK FACTORS

Investing in our common stock involves a high degree of risk. You should carefully consider the risks described below in addition to the other information included or incorporated by reference in this Annual Report on Form 10-K, including our consolidated financial statements and the related notes and "Management's Discussion and Analysis of Financial Condition and Results of Operations," before deciding whether to invest in our common stock. The occurrence of any of the events or developments described below could harm our business, financial condition, results of operations and growth prospects. In such an event, the market price of our common stock could decline, and you may lose all or part of your investment. Although we have discussed all known material risks, the risks described below are not the only ones that we may face. Additional risks and uncertainties not presently known to us or that we currently deem immaterial may also impair our business operations.

Risks Related to Our Financial Condition and History of Operating Losses

We have incurred significant losses since our inception and anticipate that we will continue to incur losses for the foreseeable future and may never achieve or sustain profitability. We may require additional financings in order to fund our operations.

We are a clinical-stage biopharmaceutical company with two lead product candidates in clinical development, roxadustat in anemia in chronic kidney disease ("CKD") and myelodysplastic syndromes ("MDS"), and pamrevlumab (FG-3019) in idiopathic pulmonary fibrosis ("IPF"), pancreatic cancer and Duchenne muscular dystrophy ("DMD"). Pharmaceutical product development is a highly risky undertaking. To date, we have focused our efforts and most of our resources on hypoxia-inducible factor ("HIF") and fibrosis biology research, as well as developing our lead product candidates. We are not profitable and, other than in 2006 and 2007 due to income received from our Astellas Pharma Inc. ("Astellas") collaboration, have incurred losses each year since our inception. We have not generated any revenue based on commercial drug product sales to date. We continue to incur significant research and development and other expenses related to our ongoing operations. Our net loss for the year ended December 31, 2018 was approximately $86.4 million, and our net loss for the years ended December 31, 2017, and 2016, recast from amounts previously reported due to the adoption of the new revenue standards, were approximately $120.9 million and $58.1 million, respectively. As of December 31, 2018, we had an accumulated deficit of $715.8 million. As of December 31, 2018, we had capital resources consisting of cash, cash equivalents and short-term investments of $621.4 million plus $55.8 million of long-term investments classified as available for sale securities. Despite contractual development and cost coverage commitments from our collaboration partners, AstraZeneca AB ("AstraZeneca") and Astellas, and the potential to receive milestone and other payments from these partners, and despite our expectation to launch commercialization efforts in China for roxadustat for the treatment of anemia caused by CKD in dialysis patients, we anticipate we will continue to incur losses for the foreseeable future, and we anticipate these losses will increase as we continue our development of and seek regulatory approval for our product candidates and in our commercialization efforts. If we do not successfully develop and obtain regulatory approval for our existing or any future product candidates and effectively manufacture, market and sell any product candidates that are approved, we may never generate product sales, and even if we do generate product sales, we may never achieve or sustain profitability on a quarterly or annual basis. Our prior losses, combined with expected future losses, have had and will continue to have an adverse effect on our stockholders' equity and working capital. Our failure to become and remain profitable would 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 believe that we will continue to expend substantial resources for the foreseeable future as we continue late-stage clinical development of roxadustat, grow our operations in the People's Republic of China ("China"), expand our clinical development efforts on pamrevlumab, seek regulatory approval, prepare for the commercialization of our product candidates, and pursue additional indications. These expenditures will include costs associated with research and

development, conducting preclinical trials and clinical trials, obtaining regulatory approvals in various jurisdictions, and manufacturing and supplying products and product candidates for ourselves and our partners. In particular, in our planned Phase 3 clinical trial program for roxadustat, which we believe will be the largest Phase 3 program ever conducted for an anemia product candidate, we are expecting to enroll more than 8,000 patients for our U.S. and European programs alone. We are conducting this Phase 3 program in conjunction with Astellas and AstraZeneca, and we are substantially dependent on Astellas and AstraZeneca for the funding of this large program. The outcome of any clinical trial and/or regulatory approval process is highly uncertain and we are unable to fully estimate the actual costs necessary to successfully complete the development and regulatory approval process for our compounds in development and any future product candidates. We believe that the net proceeds from our 2017 public offerings, our existing cash and cash equivalents, short-term and long-term investments and accounts receivable, and expected third party collaboration revenues will allow us to fund our operating plans through at least the next 12 months. Our operating plans or third party collaborations may change as a result of many factors, which are discussed in more detail below, and other factors that may not currently be known to us, and we therefore may need to seek additional funds sooner than planned, through offerings of public or private securities, debt financings or other sources, such as royalty monetization or other structured financings. Such financings may result in dilution to stockholders, imposition of debt covenants and repayment obligations, or other restrictions that may adversely affect our business. We may also seek additional capital due to favorable market conditions or strategic considerations even if we currently believe that we have sufficient funds for our current or future operating plans.

Our future funding requirements will depend on many factors, including, but not limited to:

- the rate of progress in the development of our product candidates;
- the costs of development efforts for our product candidates, such as pamrevlumab, that are not subject to reimbursement from our collaboration partners;
- the costs necessary to obtain regulatory approvals, if any, for our product candidates in the United States ("U.S."), China and other jurisdictions, and the costs of post-marketing studies that could be required by regulatory authorities in jurisdictions where approval is obtained;
- the continuation of our existing collaborations and entry into new collaborations;
- the time and unreimbursed costs necessary to commercialize products in territories in which our product candidates are approved for sale;
- the revenues from any future sales of our products as well as revenue earned from profit share, royalties and milestones;
- the level of reimbursement or third party payor pricing available to our products;
- the costs of establishing and maintaining manufacturing operations and obtaining third party commercial supplies of our products, if any, manufactured in accordance with regulatory requirements;
- the costs we incur in maintaining domestic and foreign operations, including operations in China;
- regulatory compliance costs;
- the costs of our commercialization efforts for roxadustat for the treatment of anemia caused by CKD in dialysis patients in China; and
- the costs we incur in the filing, prosecution, maintenance and defense of our extensive patent portfolio and other intellectual property rights.

Additional funds may not be available when we require them, or on terms that are acceptable to us. If adequate funds are not available to us on a timely basis, we may be required to delay, limit, reduce or terminate our research and development efforts or other operations or activities that may be necessary to commercialize our product candidates.

All of our recent revenue has been earned from collaboration partners for our product candidates under development.

Substantially all of our revenues recognized in recent years have been from our collaboration partners.

We will require substantial additional capital to achieve our development and commercialization goals, which for our lead product candidate, roxadustat, is currently contemplated to be provided under our existing third party collaborations with Astellas and AstraZeneca.

If either or both of these collaborations were to be terminated, we could require significant additional capital in order to proceed with development and commercialization of our product candidates, including with respect to our expected commercialization for roxadustat for the treatment of anemia caused by CKD in dialysis patients in China, or we may require additional partnering in order to help fund such development and commercialization. If adequate funds or partners are not available to us on a timely basis or on favorable terms, we may be required to delay, limit, reduce or terminate our research and development efforts or other operations.

If we are unable to continue to progress our development efforts and achieve milestones under our collaboration agreements, our revenues may decrease and our activities may fail to lead to commercial products.

Substantially all of our revenues to date have been, and a significant portion of our future revenues are expected to be, derived from our existing collaboration agreements. Revenues from research and development collaborations depend upon continuation of the collaborations, reimbursement of development costs, the achievement of milestones and royalties and profits from our product sales, if any, derived from future products developed from our research. If we are unable to successfully advance the development of our product candidates or achieve milestones, revenues under

our collaboration agreements will be substantially less than expected.

Risks Related to the Development and Commercialization of Our Product Candidates

We are substantially dependent on the success of our lead product candidate, roxadustat, and our second compound in development, pamrevlumab.

To date, we have invested a substantial portion of our efforts and financial resources in the research and development of roxadustat and pamrevlumab. While we have received approval of our NDA for roxadustat in China for CKD anemia in dialysis patients, we will need to make substantial additional investments in both the development and commercialization of roxadustat worldwide and in various indications. Our near-term prospects, including maintaining our existing collaborations with Astellas and AstraZeneca, will depend heavily on successful Phase 3 development and commercialization of roxadustat, including the commercialization of roxadustat for anemia associated with CKD in dialysis dependent patients in China, expected during the second half of 2019.

Our other lead product candidate, pamrevlumab, is currently in clinical development for IPF, pancreatic cancer and DMD. Pamrevlumab requires substantial further development and investment. We do not have a collaboration partner for support of this compound, and, while we have promising open-label safety data and potential signals of efficacy, we would need to complete larger and more extensive controlled clinical trials to validate the results to date in order to continue further development of this product candidate. In addition, although there are many potentially promising indications beyond IPF, pancreatic cancer and DMD, we are still exploring indications for which further development of, and investment for, pamrevlumab may be appropriate. Accordingly, the costs and time to complete development and related risks are currently unknown. Moreover, pamrevlumab is a monoclonal antibody, which may require experience and expertise that we may not currently possess as well as financial resources that are potentially greater than those required for our small molecule lead compound, roxadustat.

The clinical and commercial success of roxadustat and pamrevlumab will depend on a number of factors, many of which are beyond our control, and we may be unable to complete the development or commercialization of roxadustat or pamrevlumab.

The clinical and commercial success of roxadustat and pamrevlumab will depend on a number of factors, including the following:

- the timely completion of data analyses from our Phase 3 clinical trials for roxadustat, which will depend substantially upon requirements for such trials imposed by the U.S. Food and Drug Administration (“FDA”) and other regulatory agencies and bodies and the continued commitment and coordinated and timely performance by our third party collaboration partners, AstraZeneca and Astellas;
- the timely initiation and completion of our Phase 2 and Phase 3 clinical trials for pamrevlumab, including in IPF, pancreatic cancer and DMD;
- our ability to demonstrate the safety and efficacy of our product candidates to the satisfaction of the relevant regulatory authorities;
- whether we are required by the FDA or other regulatory authorities to conduct additional clinical trials, and the scope and nature of such clinical trials, prior to approval to market our products;
- the timely receipt of necessary marketing approvals from the FDA and foreign regulatory authorities, including pricing and reimbursement determinations;
- the ability to successfully commercialize our product candidates, if approved, for marketing and sale by the FDA or foreign regulatory authorities, whether alone or in collaboration with others;
- our ability and the ability of our third party manufacturing partners to manufacture quantities of our product candidates at quality levels necessary to meet regulatory requirements and at a scale sufficient to meet anticipated demand at a cost that allows us to achieve profitability;
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our success in educating health care providers and patients about the benefits, risks, administration and use of our product candidates, if approved;

- acceptance of our product candidates, if approved, as safe and effective by patients and the healthcare community;
- the success of efforts to enter into relationships with large dialysis organizations involving the administration of roxadustat to dialysis patients;
- the achievement and maintenance of compliance with all regulatory requirements applicable to our product candidates;
- the maintenance of an acceptable safety profile of our products following any approval;
- the availability, perceived advantages, relative cost, relative safety, and relative efficacy of alternative and competitive treatments;

- our ability to obtain and sustain an adequate level of pricing or reimbursement for our products by third party payors;
- our ability to enforce successfully our intellectual property rights for our product candidates and against the products of potential competitors; and
- our ability to avoid or succeed in third party patent interference or patent infringement claims.

Many of these factors are beyond our control. Accordingly, we cannot assure you that we will ever be able to achieve profitability through the sale of, or royalties from, our product candidates. If we or our collaboration partners are not successful in obtaining approval for and commercializing our product candidates, or are delayed in completing those efforts, our business and operations would be adversely affected.

If our commercialization efforts for roxadustat in China are unsuccessful, our business, financial condition and results of operations will be materially harmed.

We have invested and continue to invest a significant portion of our efforts and financial resources in the development, approval and now commercialization of roxadustat for the treatment of anemia caused by CKD in dialysis patients in China, as well as in other indications and other geographic regions. With the marketing authorization received from the National Medical Products Administration ("NMPA") of roxadustat for the treatment of anemia caused by CKD in dialysis patients in China, we plan to launch commercialization efforts in China in the third quarter of 2019 with our commercialization partner AstraZeneca.

Our success of commercialization of roxadustat in China will depend on numerous factors in China, including:

- our success in the marketing, sales, and distribution of the product along with our collaboration partner AstraZeneca;
- our success in negotiating a cost effective reimbursed price with the government in China;
- acceptance of roxadustat by state-owned and state-controlled hospitals, physicians, patients and the healthcare community;
- acceptance of pricing and placement of roxadustat on China's Medical Insurance Catalogs. Refer to "Business – Government Regulation – Regulation in China";
- successfully establishing and maintaining commercial manufacturing with third parties;
- successfully manufacturing our drug substances and drug products through our subsidiary FibroGen (China) Medical Technology Development Co., Ltd. ("FibroGen Beijing");
- receiving market authorization for roxadustat for anemia caused by CKD in non-dialysis patients;
- our success in arranging for and passing the inspection of our clinical sites by the NMPA;
- whether AstraZeneca is able to recruit and retain adequate numbers of effective sales and marketing personnel for the sale of roxadustat;
- whether we can compete successfully as a new entrant in the treatment of anemia caused by CKD in dialysis patients in China; and
- whether we will maintain sufficient funding to cover the costs and expenses associated with creating and sustaining a capable sales and marketing organization and related commercial infrastructure.

Successful commercialization of roxadustat will require significant resources and time, and there is a risk that we may not successfully commercialize roxadustat. If we do not achieve one or more of these factors in a timely manner or at all, we could experience significant delays or an inability to successfully commercialize roxadustat and generate revenues, which would deprive us from additional working capital and would materially harm our business. If we do not successfully commercialize roxadustat in China, our collaboration partners and third parties may also lose confidence in our ability to execute in commercialization efforts and become less likely to collaborate with us, and our business may be harmed.

As a Company, we have no commercialization experience, and the time and resources to develop such experience are significant. If we fail to achieve and sustain commercial success for roxadustat in China, either directly or with AstraZeneca, our business would be harmed.

Commercializing roxadustat in China with AstraZeneca will require us to establish commercialization systems, including but not limited to, medical affairs, sales, pharmacovigilance, supply-chain, and distribution capabilities to perform our portion of the collaborative efforts. These efforts will require resources and time. In particular, significant resources may be necessary to successfully market, sell and distribute roxadustat to patients with anemia caused by CKD in dialysis patients. If we, along with AstraZeneca, are not successful in setting our marketing, pricing and reimbursement strategy, facilitating adoption by hospitals in China, recruiting sales and marketing personnel or in building a sales and marketing infrastructure, we will have difficulty commercializing roxadustat, which would adversely affect our business and financial condition.

As we evolve from a company primarily involved in research and development to a company potentially involved in commercialization, we may encounter difficulties in managing our growth and expanding our operations successfully.

If we are successful in advancing roxadustat and our other product candidates through the development stage towards commercialization, we will need to expand our organization, including adding marketing and sales capabilities or continuing to contract with third parties to provide these capabilities for us. As our operations expand, we expect that we will also need to manage our existing and additional relationships with various collaborative partners, suppliers and other third parties. Future growth will impose significant added responsibilities on our organization, in particular on management. Our future financial performance and our ability to commercialize roxadustat and our other product candidates and to compete effectively will depend, in part, on our ability to manage any future growth effectively. To that end, we may not be able to manage our growth efforts effectively, and hire, train and integrate additional management, administrative and sales and marketing personnel, and our failure to accomplish any of these activities could prevent us from successfully growing our company.

Although FibroGen Beijing obtained regulatory approval for roxadustat in China in December 2018, we may be unable to obtain regulatory approval for our product candidates in other countries, or such approval may be delayed or limited, due to a number of factors, many of which are beyond our control.

The clinical trials and the manufacturing of our product candidates are and will continue to be, and the marketing of our product candidates will be, subject to extensive and rigorous review and regulation by numerous government authorities in the U.S. and in other countries where we intend to develop and, if approved, market any product candidates. Before obtaining regulatory approval for the commercial sale of any product candidate, we must demonstrate through extensive preclinical trials and clinical trials that the product candidate is safe and effective for use in each indication for which approval is sought. The regulatory review and approval process is expensive and requires substantial resources and time, and in general very few product candidates that enter development receive regulatory approval. In addition, our collaboration partners for roxadustat have final control over development decisions in their respective territories and they may make decisions with respect to development or regulatory authorities that delay or limit the potential approval of roxadustat, or increase the cost of development or commercialization. Accordingly, we may be unable to successfully develop or commercialize roxadustat or pamrevlumab or any of our other product candidates.

Even though FibroGen Beijing obtained regulatory approval for roxadustat in China, we have not obtained regulatory approval for any of our product candidates in other countries and it is possible that roxadustat and pamrevlumab will never receive regulatory approval in other countries. Other regulatory authorities may take actions or impose requirements that delay, limit or deny approval of roxadustat or pamrevlumab for many reasons, including, among others:

- our failure to adequately demonstrate to the satisfaction of regulatory authorities that roxadustat is safe and effective in treating anemia in CKD or that pamrevlumab is safe and effective in treating IPF, pancreatic cancer or DMD;
- our failure to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;
- the determination by regulatory authorities that additional clinical trials are necessary to demonstrate the safety and efficacy of roxadustat or pamrevlumab, or that ongoing clinical trials need to be modified in design, size, conduct or implementation;
- our product candidates may exhibit an unacceptable safety signal as they advance through clinical trials, in particular controlled Phase 3 trials;
- the clinical research organizations ("CROs") that conduct clinical trials on our behalf may take actions outside of our control that materially adversely impact our clinical trials;
- we or third party contractors manufacturing our product candidates may not maintain current good manufacturing practices ("cGMP"), successfully pass inspection or meet other applicable manufacturing regulatory requirements;

- regulatory authorities may not agree with our interpretation of the data from our preclinical trials and clinical trials;
- collaboration partners may not perform or complete their clinical programs in a timely manner, or at all; or
- principal investigators may determine that one or more serious adverse events ("SAEs"), is related or possibly related to roxadustat, and any such determination may adversely affect our ability to obtain regulatory approval, whether or not the determination is correct.

Any of these factors, many of which are beyond our control, could jeopardize our or our collaboration partners' abilities to obtain regulatory approval for and successfully market roxadustat. Because our business and operations in the near-term are almost entirely dependent upon roxadustat, any significant delays or impediments to regulatory approval could have a material adverse effect on our business and prospects.

In China, the NMPA required that FibroGen Beijing conduct three clinical studies as a post-approval commitment: (i) a post-approval safety study in 2,000 patients; (ii) a drug-intensive monitoring study in 1,000 patients; and (iii) a dosing optimization study in approximately 300 patients on dialysis. Furthermore, in the U.S., we also expect to be required to perform additional clinical trials in order to obtain approval or as a condition to maintaining approval due to post-marketing requirements. If the FDA requires a risk evaluation and mitigation strategy ("REMS"), for any of our product candidates if approved, the substantial cost and expense of complying with a REMS or other post-marketing requirements may limit our ability to successfully commercialize our product candidates.

Preclinical, Phase 1 and Phase 2 clinical trial results may not be indicative of the results that may be obtained in larger, controlled Phase 3 clinical trials required for approval.

Clinical development is expensive and can take many years to complete, and its outcome is inherently uncertain. Failure can occur at any time during the clinical trial process. Success in preclinical and early clinical trials, which are often highly variable and use small sample sizes, may not be predictive of similar results in humans or in larger, controlled clinical trials, and successful results from early or small clinical trials may not be replicated or show as favorable an outcome, even if successful.

We have conducted a limited number of Phase 2 clinical trials with pamrevlumab. We have conducted a randomized placebo-controlled study in 103 IPF patients with sub-studies in an additional 57 IPF patients comparing pamrevlumab to one of two standards of care, an open-label Phase 2 dose escalation study of pamrevlumab for IPF in 89 patients and a randomized double-blind placebo controlled study for liver fibrosis in subjects with hepatitis B, and we are currently conducting an open-label randomized, active-control, neoadjuvant Phase 2 trial in pancreatic cancer combining pamrevlumab with nab-paclitaxel plus gemcitabine in 37 patients. We cannot be sure that the results we have received to date from these trials will be substantiated in larger, well-controlled Phase 3 clinical trials, that larger trials will demonstrate the safety and efficacy of pamrevlumab for these or other indications, that further studies will provide benefits over existing approved products or that new safety issues will not be uncovered in further trials. In addition, while we believe that the limited animal and human studies conducted to date suggest that pamrevlumab has the potential to arrest or reverse fibrosis and reduce tumor mass in some patients or diseases, we cannot be sure that these results will be indicative of the effects of pamrevlumab in larger human trials. In addition, the IPF and pancreatic cancer patient populations are extremely ill and routinely experience SAEs, including death, which may be attributed to pamrevlumab in a manner that negatively impacts the safety profile of our product candidate. If the additional clinical trials that we are planning or are currently conducting for pamrevlumab do not show favorable efficacy results or result in safety concerns, or if we do not meet our clinical endpoints with statistical significance, or demonstrate an acceptable risk-benefit profile, we may be prevented from or delayed in obtaining regulatory approval for pamrevlumab in one or both of these indications.

In the past we developed an earlier generation product candidate aimed at treating anemia in CKD that resulted in a clinical hold for a safety signal seen in that product in Phase 2 clinical trials. The clinical hold applied to that product candidate and roxadustat was lifted for both product candidates after submission of the requested information to the FDA. While we have not seen similar safety concerns involving roxadustat to date, some of the safety concerns associated with the treatment of patients with anemia in CKD using erythropoiesis stimulating agents ("ESAs") did not emerge for many years until placebo-controlled studies had been conducted in large numbers of patients. And while the data monitoring committee for our U.S. and Europe Phase 3 anemia trials has consistently determined that our trials should continue without modification to the protocol, safety issues may still be discovered upon review of unblinded major adverse cardiac event ("MACE") or other data. The biochemical pathways that we believe are affected by roxadustat are implicated in a variety of biological processes and disease conditions, and it is possible that the use of roxadustat to treat larger numbers of patients will demonstrate unanticipated adverse effects, including possible drug interactions, which may negatively impact the safety profile, use and market acceptance of roxadustat. We studied the potential interaction between roxadustat and three statins (atorvastatin, rosuvastatin and simvastatin), which are used to lower levels of lipids in the blood. An adverse effect associated with increased statin plasma concentration is myopathy, which typically presents in a form of myalgia. The studies indicated the potential for increased exposure to those statins when roxadustat is taken simultaneously with those statins and suggested the need for statin dose reductions for patients receiving higher statin doses. We performed additional clinical pharmacology studies to evaluate if the effect of any such interaction could be minimized or eliminated by a modification of the dosing schedule that would separate the administration of roxadustat and the statin by up to 10 hours, however, such studies showed no minimization of effect. It is possible that the potential for interaction between roxadustat and statins could lead to label provisions for statins or roxadustat relating, for example, to dose scheduling or recommended statin dose limitations. In CKD patients, statin therapy is often initiated earlier than treatment for anemia, and risks of myopathy have been shown to decrease with increased time on drug. While we believe the prior statin treatment history of such patients at established doses may reduce the risk of adverse effects from any interaction with roxadustat and facilitate any appropriate dose adjustments, we cannot be sure that this will be the case.

Our Phase 3 trials include a MACE safety endpoint, which is a composite endpoint designed to identify major safety concerns, in particular relating to cardiovascular events such as cardiovascular death, myocardial infarction and stroke. In addition, we expect that our Phase 3 clinical trials supporting approval in Europe will be required to include MACE+ as a safety endpoint which, in addition to the MACE endpoints, also incorporates measurements of hospitalization rates due to heart failure or unstable angina. As a result, our ongoing Phase 3 clinical trials may identify unanticipated safety concerns in the patient population under study. The FDA has also informed us that the MACE endpoint will need to be evaluated separately for our Phase 3 trials in non-dialysis dependent ("NDD")-CKD patients and our Phase 3 trials in dialysis dependent ("DD")-CKD patients. The MACE endpoint will be evaluated in pooled analysis across Phase 3 studies of similar study populations and requires demonstration of non-inferiority relative to comparator, which means that the MACE event rate in roxadustat-treated patients must have less than a specified probability of exceeding the rate in the comparator trial by a specified hazard ratio. The number of patients necessary in order to permit a statistical analysis with adequate ability to detect the relative risk of MACE or MACE+ events in different arms of the trial, referred to as statistical power, depends on a number of factors, including the rate at which MACE or MACE+ events occur per patient-year in the trial, treatment duration of the patients, the required hazard ratio, and the required statistical power and confidence intervals.

In addition, we cannot be sure that the potential advantages we believe roxadustat may have for treatment of patients with anemia in CKD, as compared to the use of ESAs, will be substantiated by our larger U.S. and European Phase 3 clinical trials, or that we will be able to include a discussion of such advantages in our labeling should we obtain approval. We believe that roxadustat may have certain benefits as compared to ESAs based on the data from our Phase 2 clinical trials and China Phase 3 trials conducted to date, including safety benefits, the absence of a hypertensive effect, the potential to lower cholesterol levels and the potential to correct anemia without the use of IV iron. However, our belief that roxadustat may offer those benefits is based on a limited amount of data from our

clinical trials to date, and our understanding of the likely mechanisms of action for roxadustat. Some of these benefits, such as those associated with the apparent effects on blood pressure and cholesterol, are not fully understood and, even if roxadustat receives marketing approval in additional countries beyond China, we do not expect that it will be approved for the treatment of high blood pressure or high cholesterol based on the data from our Phase 3 trials, and we may not be able to refer to any such benefits in the labeling. While the data from our Phase 2 trials suggests roxadustat may reduce low-density lipoprotein ("LDL"), and reduce the ratio of LDL to high-density lipoprotein ("HDL"), the data show it may also reduce HDL, which may be a risk to patients. In addition, causes of the safety concerns associated with the use of ESAs to achieve specified target hemoglobin levels have not been fully elucidated. While we believe that the issues giving rise to these concerns with ESAs are likely due to factors other than the hemoglobin levels achieved, we cannot be certain that roxadustat will not be associated with similar, or more severe, safety concerns.

Many companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in late-stage clinical trials after achieving positive results in early-stage development, and we may face similar setbacks. In addition, the CKD patient population has many afflictions that may cause severe illness or death, which may be attributed to roxadustat in a manner that negatively impacts the safety profile of our product candidate. The results of our completed Phase 3 clinical trials for roxadustat demonstrated efficacy, as all primary efficacy endpoints were met with statistical significance. The analysis of adverse events for reporting of MACE is ongoing; there may be unanticipated safety concerns or adverse events that prevent from or delay obtaining marketing approval for roxadustat, and even if we obtain marketing approval, any sales of roxadustat may suffer.

We do not know whether our ongoing or planned Phase 3 clinical trials in roxadustat or Phase 2 clinical trials in pamrevlumab will need to be redesigned based on interim results, be able to achieve sufficient enrollment or be completed on schedule, if at all.

Clinical trials can be delayed or terminated for a variety of reasons, including delay or failure to:

- address any physician or patient safety concerns that arise during the course of the trial;
- obtain required regulatory or institutional review board ("IRB") approval or guidance;
- reach timely agreement on acceptable terms with prospective CROs and clinical trial sites;
- recruit, enroll and retain patients through the completion of the trial;
- maintain clinical sites in compliance with clinical trial protocols;
- initiate or add a sufficient number of clinical trial sites; and
- manufacture sufficient quantities of product candidate for use in clinical trials.

In addition, we could encounter delays if a clinical trial is suspended or terminated by us, by the relevant IRBs at the sites at which such trials are being conducted, or by the FDA or other regulatory authorities. A suspension or termination of clinical trials may result from any 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, changes in laws or regulations, or a principal investigator's determination that a serious adverse event could be related to our product candidates. Any delays in completing our clinical trials will increase the costs of the trial, delay the product candidate development and approval process and jeopardize our ability to commence marketing and generate revenues. Any of these occurrences may materially and adversely harm our business and operations and prospects.

Our product candidates may cause or have attributed to them undesirable side effects or have other properties that delay or prevent their regulatory approval or limit their commercial potential.

Undesirable side effects caused by our product candidates or that may be identified as related to our product candidates by physician investigators conducting our clinical trials or even competing products in development that utilize a similar mechanism of action or act through a similar biological disease pathway could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in the delay or denial of regulatory approval by the FDA or other regulatory authorities and potential product liability claims. Adverse events and SAEs that emerge during treatment with our product candidates or other compounds acting through similar biological pathways may be deemed to be related to our product candidate and may result in:

- our Phase 3 clinical trial development plan becoming longer and more extensive;
- regulatory authorities increasing the data and information required to approve our product candidates and imposing other requirements; and
- our collaboration partners terminating our existing agreements.

The occurrence of any or all of these events may cause the development of our product candidates to be delayed or terminated, which could materially and adversely affect our business and prospects. Refer to “Business — Our Development Program for Roxadustat” and “Business — Pamrevlumab for the Treatment of Fibrosis and Cancer” for a discussion of the adverse events and SAEs that have emerged in clinical trials of roxadustat and pamrevlumab.

Clinical trials of our product candidates may not uncover all possible adverse effects that patients may experience.

Clinical trials are conducted in representative samples of the potential patient population, which may have significant variability. Clinical trials are by design based on a limited number of subjects and of limited duration for exposure to the product used to determine whether, on a potentially statistically significant basis, the planned safety and efficacy of any product candidate can be achieved. As with the results of any statistical sampling, we cannot be sure that all side effects of our product candidates may be uncovered, and it may be the case that only with a significantly larger number of patients exposed to the product candidate for a longer duration, that a more complete safety profile is identified. Further, even larger clinical trials may not identify rare serious adverse effects or the duration of such studies may not be sufficient to identify when those events may occur. There have been other products, including ESAs, for which safety concerns have been uncovered following approval by regulatory authorities. Such safety concerns have led to labeling changes or withdrawal of ESAs products from the market. While our most advanced product candidate is chemically unique from ESAs, it or any of our product candidates may be subject to similar risks. For example, roxadustat for use in anemia in CKD is being developed to address a very diverse patient population expected to have many serious health conditions at the time of administration of roxadustat, including diabetes, high blood pressure and declining kidney function.

To date we have not seen evidence of significant safety concerns with our product candidates currently in clinical trials. Patients treated with our products, if approved, may experience adverse reactions and it is possible that the FDA or other regulatory authorities may ask for additional safety data as a condition of, or in connection with, our efforts to obtain approval of our product candidates. If safety problems occur or are identified after our product candidates reach the market, we may, or regulatory authorities may require us to amend the labeling of our products, recall our products or even withdraw approval for our products.

We may fail to enroll a sufficient number of patients in our clinical trials in a timely manner, which could delay or prevent clinical trials of our product candidates.

Identifying and qualifying patients to participate in clinical trials of our product candidates is critical to our success. The timing of our clinical trials depends on the rate at which we can recruit and enroll patients in testing our product candidates. Patients may be unwilling to participate in clinical trials of our product candidates for a variety of reasons, some of which may be beyond our control:

- severity of the disease under investigation;
- availability of alternative treatments;
- size and nature of the patient population;
- eligibility criteria for and design of the study in question;
- perceived risks and benefits of the product candidate under study;
- ongoing clinical trials of competitive agents;
- physicians' and patients' perceptions of the potential advantages of our product candidates being studied in relation to available therapies or other products under development;
- our CRO's and our trial sites' efforts to facilitate timely enrollment in clinical trials;
- patient referral practices of physicians; and
- ability to monitor patients and collect patient data adequately during and after treatment.

Patients may be unwilling to participate in our clinical trials for roxadustat due to adverse events observed in other drug treatments of anemia in CKD, and patients currently controlling their disease with existing ESAs may be reluctant to participate in a clinical trial with an investigational drug. We may not be able to successfully initiate or continue clinical trials if we cannot rapidly enroll a sufficient number of eligible patients to participate in the clinical trials required by regulatory agencies. If we have difficulty enrolling a sufficient number of patients to conduct our clinical trials as planned, we may need to delay, limit or terminate on-going or planned clinical trials, any of which

could have a material and adverse effect on our business and prospects.

If we or third party manufacturers and other service providers on which we rely cannot manufacture sufficient quantities of our product candidates, or at sufficient quality, or perform other services we require, we may experience delays in development, regulatory approval, launch or commercialization.

Completion of our clinical trials and commercialization of our product candidates require access to, or development of, facilities to manufacture and manage our product candidates at sufficient yields and at commercial scale. Although we have entered into commercial supply agreements for the manufacture of some of our raw materials, we have not yet entered into commercial supply agreements with all of our third-party manufacturers. . We are continuing to negotiate and expect to enter into commercial supply agreements and other supply management agreements with third-party manufacturers, but we may not be able to enter into these agreements with satisfactory terms or on a timely manner.

We have limited experience manufacturing or managing third parties in manufacturing any of our product candidates in the volumes that are expected to be necessary to support large-scale clinical trials and sales. In addition, we have limited experience forecasting supply requirements or coordinating supply chain (including export management) for launch or commercialization, which is a complex process involving our third-party manufacturers and logistics providers, and for roxadustat, our collaboration partners. We may not be able to accurately forecast supplies for commercial launch, or do so in a timely manner and our efforts to establish these manufacturing and supply chain management capabilities may not meet our requirements as to quantities, scale-up, yield, cost, potency or quality in compliance with cGMP.

We have a limited amount of roxadustat and pamrevlumab in storage, limited capacity reserved at our third-party manufacturers, and there are long lead times required to manufacture and scale-up the manufacture of additional supply, as required for both late-stage clinical trials, post-approval trials, and commercial supply. If we are unable to forecast, order or manufacture sufficient quantities of roxadustat or pamrevlumab on a timely basis, it may delay our development, launch or commercialization in some or all indications we are currently pursuing. For example, prior to agreement with regulatory authorities on the scope of our Phase 3 IPF trial design, there is uncertainty as to whether our supply plans will meet our clinical requirements in a timely manner. Any delay or interruption in the supply of our product candidates or products could have a material adverse effect on our business and operations.

Our clinical trials must be conducted with product produced under applicable cGMP regulations. Failure to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory approval process. We and even an experienced third party manufacturer may encounter difficulties in production, which difficulties may include:

- costs and challenges associated with scale-up and attaining sufficient manufacturing yields, in particular for biologic products such as pamrevlumab, which is a monoclonal antibody;
- supply chain issues, including coordination of multiple contractors in our supply chain and securing necessary licenses (such as export licenses);
- the timely availability and shelf life requirements of raw materials and supplies;
- quality control and assurance;
- shortages of qualified personnel and capital required to manufacture large quantities of product;
- compliance with regulatory requirements that vary in each country where a product might be sold;
- capacity or forecasting limitations and scheduling availability in contracted facilities; and
- natural disasters, such as floods, storms, earthquakes, tsunamis, and droughts, or accidents such as fire, that affect facilities, possibly limit or postpone production, and increase costs.

Even if we are able to obtain regulatory approval of our product candidates, the label we obtain may limit the indicated uses for which our product candidates may be marketed.

With respect to roxadustat, we expect that regulatory approvals, if obtained at all, will limit the approved indicated uses for which roxadustat may be marketed, as ESAs have been subject to significant safety limitations on usage as directed by the "Black Box" warnings included in their labels. Refer to "Business — Roxadustat for the Treatment of Anemia in Chronic Kidney Disease — Limitations of the Current Standard of Care for Anemia in CKD". In addition, in the past, an approved ESA was voluntarily withdrawn due to serious safety issues discovered after approval. The safety concerns relating to ESAs may result in labeling for roxadustat containing similar warnings even if our Phase 3 clinical trials do not suggest that roxadustat has similar safety issues. Even if the label for roxadustat does not contain all of the warnings contained in the "Black Box" warning for ESAs, the label for roxadustat may contain other warnings that limit the market opportunity for roxadustat. These warnings could include warnings against exceeding specified hemoglobin targets and other warnings that derive from the lack of clarity regarding the basis for the safety issues associated with ESAs, even if our Phase 3 clinical trials do not themselves raise safety concerns.

As an organization, we have not successfully commercialized any drug product. Therefore, we may not be able to efficiently execute our development and commercialization plans.

We are currently conducting Phase 2 clinical trials for pamrevlumab and plan on initiating Phase 3 clinical trials for pamrevlumab in the future. We have initiated Phase 3 clinical trials of roxadustat. The conduct of Phase 3 clinical trials and the submission of a successful New Drug Application ("NDA") is a complicated process. As an organization, we have not completed a Phase 3 clinical trial before outside of China, where we received marketing authorization in December 2018 from the NMPA for the treatment of anemia caused by CKD in dialysis patients. We have limited experience in preparing, submitting and prosecuting regulatory filings, and have not received approval for an NDA before outside of China. Consequently, we may be unable to successfully and efficiently execute and complete necessary clinical trials in a way that leads to NDA submission and approval of roxadustat or for any other product candidate we are developing, even if our earlier stage clinical trials are successful. We may require more time and incur greater costs than our competitors and may not succeed in obtaining regulatory approvals of product candidates that we develop. Failure to commence or complete, or delays in, our planned clinical trials would prevent us from or delay us in commercializing roxadustat or any other product candidate we are developing.

In addition, in order for any Phase 3 clinical trial to support an NDA submission for approval, the FDA and foreign regulatory authorities require compliance with regulations and standards, including good clinical practices ("GCP") requirements for designing, conducting, monitoring, recording, analyzing, and reporting the results of clinical trials to ensure that the data and results from trials are credible and accurate and that the rights, integrity and confidentiality of trial participants are protected. Although we rely on third parties to conduct our clinical trials, we as the sponsor remain responsible for ensuring that each of these clinical trials is conducted in accordance with its general investigational plan and protocol under legal and regulatory requirements, including GCP. Regulatory authorities enforce these GCP requirements through periodic inspections of trial sponsors, principal investigators and trial sites. If we or any of our CROs, trial sites, principal investigators or other third parties fail to comply with applicable GCP requirements, the clinical data generated in our clinical trials may be deemed unreliable and the FDA or other regulatory authorities may require us to exclude the use of patient data from our clinical trials not conducted in compliance with GCP or perform additional clinical trials before approving our marketing applications. They may even reject our application for approval or refuse to accept our future applications for an extended time period. For example in China in March 2016, the State Drug Administration, now known as the NMPA issued guidance related to its clinical trial data integrity regulations. While trial sites and CROs bear liability for the accuracy and authenticity of data they are directly responsible for, the sponsor ultimately bears full responsibility for submitted clinical data and the drug application dossier. Fraudulent clinical data could result in a ban in China of a sponsor's product-related NDA applications for three years and other NDA applications for one year. We have taken extensive steps to ensure the integrity of our China clinical data. In China, the clinical site inspections confirmed our compliance with GCP regulations and supported our approval. However, we cannot assure you that upon inspection by a regulatory authority in other regions, such regulatory authority will determine that any of our clinical trials comply with GCP requirements or that our results will be deemed authentic or may be used in support of our regulatory submissions.

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

We do not have a sales or marketing infrastructure and have no experience in the sales, marketing or distribution of pharmaceutical products in any country. To achieve commercial success for any product for which we obtain marketing approval, we will need to establish sales and marketing capabilities or make and maintain our existing arrangements with third parties to perform these services at a level sufficient to support our commercialization efforts.

To the extent that we would undertake sales and marketing of any of our products directly, there are risks involved with establishing our own sales, marketing and distribution capabilities. Factors that may inhibit our efforts to commercialize our products on our own include:

- our inability to recruit, train and retain adequate numbers of effective sales and marketing personnel;
- the inability of sales personnel to obtain access to physicians or persuade adequate numbers of physicians to prescribe any future products;
- our inability to effectively manage geographically dispersed sales and marketing teams;
- the lack of complementary products to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines; and
- unforeseen costs and expenses associated with creating an independent sales and marketing organization.

With respect to roxadustat, we are dependent on the commercialization capabilities of our collaboration partners, AstraZeneca and Astellas. If either such partner were to terminate its agreement with us, we would have to commercialize on our own or with another third party. We will have limited or little control over the commercialization efforts of such third parties, and any of them may fail to devote the necessary resources and attention to sell and market our products, if any, effectively. If they are not successful in commercializing our product candidates, our business and financial condition would suffer.

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

The development and commercialization of new pharmaceutical products is highly competitive. Our future success depends on our ability to achieve and maintain a competitive advantage with respect to the development and commercialization of our product candidates. Our objective is to discover, develop and commercialize new products with superior efficacy, convenience, tolerability, and safety. We expect that in many cases, the products that we commercialize will compete with existing, market-leading products of companies that have large, established commercial organizations.

If roxadustat is approved and launched commercially, competing drugs are expected to include ESAs, particularly in those patient segments where ESAs are used. Currently available ESAs include epoetin alfa (EPOGEN ®, marketed by Amgen Inc. in the U.S., Procrit ® and Erypo ®/Eprex ®, marketed by Johnson & Johnson Inc., and Espo ® marketed by Kyowa Hakko Kirin in Japan and China), darbepoetin (Amgen/Kyowa Hakko Kirin's Aranesp® and NESP ®) and Mircera ® marketed by Hoffmann-La Roche ("Roche") outside of the U.S. and by Vifor Pharma ("Vifor"), a Roche licensee, in the U.S. and Puerto Rico, as well as biosimilar versions of these currently marketed ESA products. ESAs have been used in the treatment of anemia in CKD for more than 20 years, serving a significant majority of DD-CKD patients. While NDD-CKD patients who are not under the care of nephrologists, including those with diabetes and hypertension, do not typically receive ESAs and are often left untreated, some patients under nephrology care may be receiving ESA therapy. It may be difficult to encourage healthcare providers and patients to switch to roxadustat from products with which they have become familiar.

We may also face competition from potential new anemia therapies currently in clinical development, including in those patient segments not currently addressed by ESAs. Companies such as GlaxoSmithKline plc ("GSK"), Bayer Corporation ("Bayer"), Akebia Therapeutics, Inc. ("Akebia"), and Japan Tobacco, are currently developing HIF prolyl hydroxylase ("HIF-PH") inhibitors for anemia in CKD indications. Akebia is currently conducting Phase 3 studies in NDD–CKD and DD-CKD, as well as additional Phase 1 and Phase 2 studies. In Japan, Mitsubishi Tanabe Pharmaceutical Corporation, Akebia's collaboration partner, started a Phase 3 program in November 2017. GSK is conducting global Phase 3 studies in NDD-CKD and DD-CKD as well as Japan Phase 3 studies. GSK and Kyowa Hakko Kirin announced in November 2018 that the two companies signed a strategic commercialization deal in Japan for daprodustat. Bayer has completed global Phase 2 studies and announced in May 2017 its HIF-PH inhibitor is now in continued development in Japan only, and its Japan Phase 3 studies in NDD-CKD and DD-CKD are underway. Japan Tobacco is also conducting Phase 3 studies in NDD-CKD and DD-CKD in Japan only. Some of these product candidates may enter the market prior to roxadustat.

In addition, there are other companies developing biologic therapies for the treatment of other anemia indications that we may also seek to pursue in the future, including anemia of MDS. For example, Acceleron Pharma Inc., in partnership with Celgene Corporation ("Celgene"), is in Phase 3 development of protein therapeutic candidates to treat anemia and associated complications in patients with ß-thalassemia and MDS, and has received orphan drug status from the European Medicines Agency ("EMA") and FDA for these indications. Celgene announced in July 2018 that it plans to submit a marketing approval application for luspatercept in the U.S. and European Union ("EU") in the first half of 2019. There may also be new therapies for renal-related diseases that could limit the market or level of

reimbursement available for roxadustat if and when it is commercialized.

In China, biosimilars of epoetin alfa are offered by Chinese pharmaceutical companies such as EPIAO marketed by 3SBio Inc. as well as more than 15 other local manufacturers. We may also face competition by HIF-PH inhibitors from other companies such as Akebia, Bayer, and GSK, which was authorized by the NMPA to conduct trials in China to support its ex-China regulatory filings. Furthermore, while it is too early to understand how the NMPA will implement its recently approved guidelines to allow multinational companies to use their ex-China clinical data in their NDAs in China, these guidelines could in theory allow competitors to accelerate their NDA applications in China. Akebia announced in December 2015 that it has entered into a development and commercialization partnership with Mitsubishi Tanabe Pharmaceutical Corporation for its HIF-PH inhibitor vadadustat in Japan, Taiwan, South Korea, India, and certain other countries in Asia, and announced in April 2017 an expansion of their U.S. collaboration with Otsuka to add markets, including China. 3SBio Inc. also announced in 2016 its plan on beginning a Phase 1 clinical trial of a HIF-PH inhibitor for the China market.

The first biosimilar ESAs, Pfizer's Retacrit® (epoetin zeta), entered the U.S. market in November 2018. Market penetration of Retacrit® (epoetin zeta) and the potential addition of other biosimilar ESAs, currently under development, may alter the competitive and pricing landscape of anemia therapy in DD-CKD patients under the end stage renal disease bundle. The patents for Amgen's epoetin alfa, EPOGEN, expired in 2004 in the EU, and the final material patents in the U.S. expired in May 2015. Several biosimilar versions of currently marketed ESAs are available for sale in the EU, China and other territories. In the U.S., a few ESA biosimilars are currently under development. Sandoz, a division of Novartis, markets Binocrit ® (epoetin alfa) in Europe and may file a biosimilar Biologics License Application ("BLA") in the U.S.

The majority of the current CKD anemia market focuses on dialysis patients, who visit dialysis centers on a regular basis, typically three-times a week, and anemia therapies are administered as part of the visit. Two of the largest operators of dialysis clinics in the U.S., DaVita Healthcare Partners Inc. ("DaVita") and Fresenius Medical Care AG & Co. KGaA ("Fresenius"), collectively provide dialysis care to approximately 70% of U.S. dialysis patients, and therefore have historically won long-term contracts including rebate terms with Amgen. In January 2017, DaVita entered into a new 6-year sourcing and supply agreement with Amgen that is effective through 2022. Fresenius' contract with Amgen expired in 2015, and Fresenius is now administering Mircera® in a significant portion of its U.S. dialysis patients since Mircera was made available by Vifor. Successful penetration of this market may require a significant agreement with Fresenius or DaVita on favorable terms and on a timely basis.

If pamrevlumab is approved and launched commercially to treat IPF, competing drugs are expected to include Roche's Esbriet® (pirfenidone) and Boehringer Ingelheim Pharma GmbH & Co. KG's Ofev® (nintedanib). Nintedanib is also in development for non-small cell lung cancer and ovarian cancer. Other potential competitive product candidates in development for IPF include Biogen-Idec's BG-00011, Galapagos NV's GLPG1690, Kadmon Holdings, Inc.'s KD025, Prometic Life Sciences Inc.'s PBI-4050, and Promedior Inc.'s PRM-151. Galapagos initiated a Phase 3 study for GLPG 1690 in December 2018.

If pamrevlumab is approved and launched commercially to treat locally advanced pancreatic cancer patients who are not candidates for surgical resection, pamrevlumab may face competition from agents seeking approval in combination with gemcitibine and nab-paclitaxel from companies such as NewLink Genetics Corporation and Halozyme Therapeutics, Inc. Gemcitabine and/or nab-paclitaxel are the current standard of care in the first-line treatment of metastatic pancreatic cancer. Celgene Corporation's Abraxane® (nab-paclitaxel) was launched in the U.S. and Europe in 2013 and 2014, and was the first drug approved in this disease in nearly a decade.

If pamrevlumab is approved and launched commercially to treat DMD, pamrevlumab may face competition for some patients from Sarepta Therapeutics, Inc. ("Sarepta"), as well as PTC Therapeutics, Santhera Pharmaceuticals, and Catabasis Pharmaceuticals.

Sarepta is researching and developing clinical candidates for many of the specific mutations in the dystrophin gene and received accelerated approval in the U.S. for its first, drug Exondys 51® (eteplirsen) for patients who have a confirmed mutation in the DMD gene that is amenable to exon 51 skipping. This mutation represents a subset of approximately 13% of patients with DMD. Sarepta recently received a negative opinion from the EMA regarding its eteplirsen application in September 2018. In addition to etepliresen, Sarepta has two additional exon skipping programs in Phase 3 development, each of which targets approximately 8% of patients with DMD. Sarepta is also developing gene therapies for the treatment of DMD and reported positive preliminary results from a Phase 1/2a program in June 2018.

Marathon Pharmaceuticals received approval for its drug Emflaza (deflazacort) on February 9, 2017 and on March 16, 2017 announced that it had sold the commercialization rights to Emflaza to PTC Therapeutics.

PTC Therapeutics' product ataluren (Translarna™) received conditional approval in Europe in 2014, which was renewed in November 2016 with a request for a new randomized placebo-controlled 18-month study by the Committee for Medicinal Products for Human Use of the EMA, while the FDA stated in its complete response letter in October of 2017 that the FDA is unable to approve the application in its current form. Translarna targets a different set of DMD patients from those being targeted by Sarepta's existing exon-skipping therapeutic candidate; however, it is also limited to a subset of patients who carry a specific mutation.

While pamrevlumab and some other potential competitors are intended to treat DMD patients regardless of the specific mutation, there can be no assurance that clinical trials will support broadly treating DMD patients. For example, Santhera Pharmaceuticals reported positive Phase 3 data with its drug idebenone (Raxone ®/Catena ®) in a trial measuring changes in lung function for DMD patients, however the EMA rejected the application and the FDA has asked for additional data from an ongoing trial prior to considering Raxone for approval. Santhera is currently conducting the additional Phase 3 study in the U.S. and Europe.

Catabasis Pharmaceuticals reported in April 2018 positive Phase 2 data from its clinical trial candidate edasalonexent. Edasalonexent was reported to have preserved muscle function and slowed the progression of DMD compared to rates of change in the control period prior to treatment with edasalonexent. The company started a single placebo controlled Phase 3 trial in September 2018. Catabasis expects topline data from this trial in the second quarter of 2020.

The success of any or all of these potential competitive products may negatively impact the development and potential for success of pamrevlumab. In addition, any competitive products that are on the market or in development may compete with pamrevlumab for patient recruitment and enrollment for clinical trials or may force us to change our clinical trial design, including, in order to compare pamrevlumab against another drug, which may be the new standard of care.

If FG-5200 is approved and launched in China to treat corneal blindness resulting from partial thickness corneal damage without active inflammation and infection, it is likely to compete with other products designed to treat corneal damage. For example, in April 2015, a subsidiary of China Regenerative Medicine International Limited received approval for their acellular porcine cornea stroma medical device to treat patients in China with corneal ulcers and in April 2016, Guangzhou Yourvision Biotech Co. Ltd, a subsidiary of Guanhao Biotech, received approval for their acellular porcine cornea medical device to treat patients in China with infectious keratitis that does not respond to drug treatment.

Moreover, many of our competitors have significantly greater resources than we do. Large pharmaceutical companies, in particular, have extensive experience in clinical testing, obtaining regulatory approvals, recruiting patients, manufacturing pharmaceutical products, and commercialization. In the potential anemia market for roxadustat, for example, large and established companies such as Amgen and Roche, among others, compete aggressively to maintain their market shares. In particular, the currently marketed ESA products are supported by large pharmaceutical companies that have greater experience and expertise in commercialization in the anemia market, including in securing reimbursement, government contracts and relationships with key opinion leaders; conducting testing and clinical trials; obtaining and maintaining regulatory approvals and distribution relationships to market products; and marketing approved products. These companies also have significantly greater scale research and marketing capabilities than we do and may also have products that have been approved or are in later stages of development, and have collaboration agreements in our target markets with leading dialysis companies and research institutions. These competitors have in the past successfully prevented new and competing products from entering the anemia market, and we expect that their resources will represent challenges for us and our collaboration partners, AstraZeneca and Astellas. If we and our collaboration partners are not able to compete effectively against existing and potential competitors, our business and financial condition may be materially and adversely affected.

Our future commercial success depends upon attaining significant market acceptance of our product candidates, if approved, among physicians, patients, third party payors and others in the health care community.

Even if we obtain marketing approval for roxadustat, pamrevlumab or any other product candidates that we may develop or acquire in the future in all indications and geographic regions, these product candidates may not gain market acceptance among physicians, third party payors, patients and others in the health care community. Market acceptance of any approved product, including in roxadustat for the treatment of anemia caused by CKD in dialysis patients in China, depends on a number of other factors, including:

- the clinical indications for which the product is approved and the labeling required by regulatory authorities for use with the product, including any warnings that may be required in the labeling;
- acceptance by physicians and patients of the product as a safe and effective treatment and the willingness of the target patient population to try new therapies and of physicians to prescribe new therapies;
- the cost, safety, efficacy and convenience of treatment in relation to alternative treatments;

- the restrictions on the use of our products together with other medications, if any;
- the availability of adequate coverage and reimbursement or pricing by third party payors and government authorities;
- the ability of treatment providers, such as dialysis clinics, to enter into relationships with us without violating their existing agreement; and
- the effectiveness of our sales and marketing efforts.

No or limited reimbursement or insurance coverage of our approved products, if any, by third party payors may render our products less attractive to patients and healthcare providers.

Market acceptance and sales of any approved products will depend significantly on reimbursement or coverage of our products by the Chinese government or third party payors, and may be affected by existing and future healthcare reform measures or prices of related products for which the government or third party reimbursement applies. Coverage and reimbursement by the government or a third party payor may depend upon a number of factors, including the payor's determination that use of a product is:

- a covered benefit under its health plan;
- safe, effective and medically necessary;
- appropriate for the specific patient;
- cost-effective; and
- neither experimental nor investigational.

The review and publication cycle for the Chinese government to update their reimbursement lists (national or provincial) is unpredictable and is outside our control.

Obtaining coverage and reimbursement approval for a product from a government or other third party payor is a time consuming and costly process that could require us to provide supporting scientific, clinical and cost-effectiveness data for the use of our products to the payor, which we may not be able to provide. Furthermore, the reimbursement policies of third party payors may significantly change in a manner that renders our clinical data insufficient for adequate reimbursement or otherwise limits the successful marketing of our products. Even if we obtain coverage for our product candidates, third party payors may not establish adequate reimbursement amounts, which may reduce the demand for, or the price of, our products. If reimbursement is not available or is available only to limited levels, we may not be able to commercialize certain of our products.

Price controls may limit the price at which products such as roxadustat, if approved, are sold. For example, reference pricing is used by various EU member states and parallel distribution, or arbitrage between low-priced and high-priced member states, can further reduce prices. In some countries, we or our partner may be required to conduct a clinical trial or other studies that compare the cost-effectiveness of our product candidates to other available products in order to obtain or maintain reimbursement or pricing approval. Publication of discounts by third party payors or authorities may lead to further pressure on the prices or reimbursement levels within the country of publication and other countries. If reimbursement of our products is unavailable or limited in scope or amount, or if pricing is set at unacceptable levels, we or our partner may elect not to commercialize our products in such countries, and our business and financial condition could be adversely affected.

Risks Related to Our Reliance on Third Parties

If our collaborations with Astellas or AstraZeneca were terminated, or if Astellas or AstraZeneca were to prioritize other initiatives over their collaborations with us, whether as a result of a change of control or otherwise, our ability to successfully develop and commercialize our lead product candidate, roxadustat, would suffer.

We have entered into collaboration agreements with respect to the development and commercialization of our lead product candidate, roxadustat, with Astellas and AstraZeneca. These agreements provide for reimbursement of our development costs by our collaboration partners and also provide for commercialization of roxadustat throughout the major territories of the world.

Our agreements with Astellas and AstraZeneca provide each of them with the right to terminate their respective agreements with us, upon the occurrence of negative clinical results, delays in the development and commercialization

of our product candidates or adverse regulatory requirements or guidance. The termination of any of our collaboration agreements would require us to fund and perform the further development and commercialization of roxadustat in the affected territory, or pursue another collaboration, which we may be unable to do, either of which could have an adverse effect on our business and operations. In addition, each of those agreements provides our respective partners the right to terminate any of those agreements upon written notice for convenience. Moreover, if Astellas or AstraZeneca, or any successor entity, were to determine that their collaborations with us are no longer a strategic priority, or if either of them or a successor were to reduce their level of commitment to their collaborations with us, our ability to develop and commercialize roxadustat could suffer. In addition, some of our collaborations are exclusive and preclude us from entering into additional collaboration agreements with other parties in the area or field of exclusivity.

If we fail to establish and maintain strategic collaborations related to our product candidates, we will bear all of the risk and costs related to the development and commercialization of any such product candidate, and we may need to seek additional financing, hire additional employees and otherwise develop expertise at significant cost. This in turn may negatively affect the development of our other product candidates as we direct resources to our most advanced product candidates.

Conflicts with our collaboration partners could jeopardize our collaboration agreements and our ability to commercialize product candidates.

Our collaboration partners have certain rights to control decisions regarding the development and commercialization of our product candidates with respect to which they are providing funding. If we have a disagreement over strategy and activities, our plans for obtaining approval may be revised and negatively affect the anticipated timing and potential for success of our product candidates. Even if a product under a collaboration agreement is approved, we will remain substantially dependent on the commercialization strategy and efforts of our collaboration partners, and neither of our collaboration partners has experience in commercialization of a novel drug such as roxadustat in the dialysis market.

With respect to our collaboration agreements for roxadustat, there are additional complexities in that we and our collaboration partners, Astellas and AstraZeneca, must reach consensus on our Phase 3 development program. Multi-party decision-making is complex and involves significant time and effort, and there can be no assurance that the parties will cooperate or reach consensus, or that one or both of our partners will not ask to proceed independently in some or all of their respective territories or functional areas of responsibility in which the applicable collaboration partner would otherwise be obligated to cooperate with us. Any disputes or lack of cooperation with us by either Astellas or AstraZeneca may negatively impact the timing or success of our planned Phase 3 clinical studies.

We intend to conduct proprietary research programs in specific disease areas that are not covered by our collaboration agreements. Our pursuit of such opportunities could, however, result in conflicts with our collaboration partners in the event that any of our collaboration partners takes the position that our internal activities overlap with those areas that are exclusive to our collaboration agreements, and we should be precluded from such internal activities. Moreover, disagreements with our collaboration partners could develop over rights to our intellectual property. In addition, our collaboration agreements may have provisions that give rise to disputes regarding the rights and obligations of the parties. Any conflict with our collaboration partners could lead to the termination of our collaboration agreements, delay collaborative activities, reduce our ability to renew agreements or obtain future collaboration agreements or result in litigation or arbitration and would negatively impact our relationship with existing collaboration partners.

Certain of our collaboration partners could also become our competitors in the future. If our collaboration partners develop competing products, fail to obtain necessary regulatory approvals, terminate their agreements with us prematurely or fail to devote sufficient resources to the development and commercialization of our product candidates, the development and commercialization of our product candidates and products could be delayed.

We rely on third parties for the conduct of most of our preclinical and clinical trials for our product candidates, and if our third party contractors do not properly and successfully perform their obligations under our agreements with them, we may not be able to obtain or may be delayed in receiving regulatory approvals for our product candidates.

We rely heavily on university, hospital, dialysis centers and other institutions and third parties, including the principal investigators and their staff, to carry out our clinical trials in accordance with our clinical protocols and designs. We also rely on a number of third party CROs to assist in undertaking, managing, monitoring and executing our ongoing clinical trials, including those for roxadustat. We expect to continue to rely on CROs, clinical data management organizations, medical institutions and clinical investigators to conduct our development efforts in the future,

including our Phase 3 development program for roxadustat. We compete with many other companies for the resources of these third parties, and large pharmaceutical companies often have significantly more extensive agreements and relationships with such third party providers, and such third party providers may prioritize the requirements of such large pharmaceutical companies over ours. The third parties on whom we rely may terminate their engagements with us at any time, which may cause delay in the development and commercialization of our product candidates. If any such third party terminates its engagement with us or fails to perform as agreed, we may be required to enter into alternative arrangements, which would result in significant cost and delay to our product development program. Moreover, our agreements with such third parties generally do not provide assurances regarding employee turnover and availability, which may cause interruptions in the research on our product candidates by such third parties.

Moreover, while our reliance on these third parties for certain development and management activities will reduce our control over these activities, it will not relieve us of our responsibilities. For example, the FDA and foreign regulatory authorities require compliance with regulations and standards, including GCP requirements for designing, conducting, monitoring, recording, analyzing and reporting the results of clinical trials to ensure that the data and results from trials are credible and accurate and that the rights, integrity and confidentiality of trial participants are protected. Although we rely on third parties to conduct our clinical trials, we, as the sponsor, remain responsible for ensuring that each of these clinical trials is conducted in accordance with its general investigational plan and protocol under legal and regulatory requirements, including GCP. Regulatory authorities enforce these GCP requirements through periodic inspections of trial sponsors, principal investigators and trial sites.

If any of our CROs, trial sites, principal investigators or other third parties fail to comply with applicable GCP requirements, other regulations, trial protocol or other requirements under their agreements with us, the quality or accuracy of the data they obtain may be compromised or unreliable, and the trials of our product candidates may not meet regulatory requirements. If trials do not meet regulatory requirements or if these third parties need to be replaced, the development of our product candidates may be delayed, suspended or terminated, regulatory authorities may require us to exclude the use of patient data from our approval applications or perform additional clinical trials before approving our marketing applications. Regulatory authorities may even reject our application for approval or refuse to accept our future applications for an extended time period. We cannot assure you that upon inspection by a regulatory authority, such regulatory authority will determine that any of our clinical trials comply with GCP requirements or that our results may be used in support of our regulatory submissions. If any of these events occur, we may not be able to obtain regulatory approval for our product candidates on a timely basis, at a reasonable cost, or at all.

We currently rely, and expect to continue to rely, on third parties to conduct many aspects of our clinical studies and product manufacturing, and these third parties may not perform satisfactorily.

We do not have any operating manufacturing facilities at this time other than our roxadustat and FG-5200 manufacturing facility in China, and our current commercial manufacturing facility plans in China are not expected to satisfy the requirements necessary to support development and commercialization outside of China. Other than in and for China specifically, we do not expect to independently manufacture our products. We currently rely, and expect to continue to rely, on third parties to scale-up, manufacture and supply roxadustat and our other product candidates outside of China. Risks arising from our reliance on third party manufacturers include:

- reduced control and additional burdens of oversight as a result of using third party manufacturers for all aspects of manufacturing activities, including regulatory compliance and quality control and assurance;
- termination of manufacturing agreements, termination fees associated with such termination, or nonrenewal of manufacturing agreements with third parties may negatively impact our planned development and commercialization activities;
- the possible misappropriation of our proprietary technology, including our trade secrets and know-how; and
- disruptions to the operations of our third party manufacturers or suppliers unrelated to our product, including the merger, acquisition, or bankruptcy of a manufacturer or supplier or a catastrophic event affecting our manufacturers or suppliers.

Any of these events could lead to development delays or failure to obtain regulatory approval, or affect our ability to successfully commercialize our product candidates. Some of these events could be the basis for action by the FDA or another regulatory authority, including injunction, recall, seizure or total or partial suspension of production.

The facilities used by our contract manufacturers to manufacture our product candidates must pass inspections by the FDA and other regulatory authorities. Although, except for China, we do not control the manufacturing operations of, and expect to remain completely dependent on, our contract manufacturers for manufacture of drug substance and finished drug product, we are ultimately responsible for ensuring that our product candidates are manufactured in compliance with cGMP requirements. If our contract manufacturers cannot successfully manufacture material that conforms to our or our collaboration partners' specifications, or the regulatory requirements of the FDA or other regulatory authorities, we may not be able to secure and/or maintain regulatory approval for our product candidates and our development or commercialization plans may be delayed. In addition, we have no control over the ability of our contract manufacturers to maintain adequate quality control, quality assurance and qualified personnel. In addition, although our longer-term agreements are expected to provide for requirements to meet our quantity and quality requirements to manufacture our products candidates for clinical studies and commercial sale, we will have minimal direct control over the ability of our contract manufacturers to maintain adequate quality control, quality assurance and qualified personnel and we expect to rely on our audit rights to ensure that those qualifications are maintained to meet our requirements. If our contract manufacturers' facilities do not pass inspection by regulatory authorities, or if regulatory authorities do not approve these facilities for the manufacture of our products, or withdraw any such approval in the future, we would need to identify and qualify alternative manufacturing facilities, which would significantly impact our ability to develop, obtain regulatory approval for or market our products, if approved. Moreover, any failure of our third party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us or adverse regulatory consequences, including clinical holds, warnings or untitled letters, fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of product candidates or products, operating restrictions and criminal prosecutions, any of which would be expected to significantly and adversely affect supplies of our products to us and our collaboration partners.

Any of our third party manufacturers may terminate their engagement with us at any time and we have not yet entered into any commercial supply agreements for the manufacture of active pharmaceutical ingredients ("APIs") or drug products. With respect to roxadustat, AstraZeneca and Astellas have certain rights to assume manufacturing of roxadustat and the existence of those rights may limit our ability to enter into favorable long-term supply agreements, if at all, with other third party manufacturers. In addition, our product candidates and any products that we may develop may compete with other product candidates and products for access and prioritization to manufacture. Certain third party manufacturers may be contractually prohibited from manufacturing our product due to non-compete agreements with our competitors or a commitment to grant another party priority relative to our products. There are a limited number of third party manufacturers that operate under cGMP and that might be capable of manufacturing to meet our requirements. Due to the limited number of third party manufacturers with the contractual freedom, expertise, required regulatory approvals and facilities to manufacture our products on a commercial scale, identifying and qualifying a replacement third party manufacturer would be expensive and time-consuming and may cause delay or interruptions in the production of our product candidates or products, which in turn may delay, prevent or impair our development and commercialization efforts.

We have a letter agreement with IRIX Pharmaceuticals, Inc. ("IRIX"), a third party manufacturer that we have used in the past, pursuant to which we agreed to negotiate a single source manufacturing agreement that included a right of first negotiation for the cGMP manufacture of HIF-PH inhibitors, including roxadustat, provided that IRIX is able to match any third party bids within 5%. The exclusive right to manufacture extends for five years after approval of an NDA for those compounds, and any agreement would provide that no minimum amounts would be specified until appropriate by forecast and that we and a commercialization partner would have the rights to contract with independent third parties that exceed IRIX's internal manufacturing capabilities or in the event that we or our commercialization partner determines for reasons of continuity of supply and security that such a need exists, provided that IRIX would supply no less than 65% of the product if it is able to provide this level of supply. Subsequent to the letter agreement, we and IRIX have entered into several additional service agreements. IRIX has requested in writing that we honor the letter agreement with respect to the single source manufacturing agreement, and

if we were to enter into any such exclusive manufacturing agreement, there can be no assurance that IRIX will not assert a claim for right to manufacture roxadustat or that IRIX could manufacture roxadustat successfully and in accordance with applicable regulations for a commercial product and the specifications of our collaboration partners. In 2015, Patheon Pharmaceuticals Inc., a business unit of DPx Holdings B.V. (“Patheon”), acquired IRIX, and in 2017 ThermoFisher Scientific Inc. acquired Patheon.

If any third party manufacturer terminates its engagement with us or fails to perform as agreed, we may be required to find replacement manufacturers, which would result in significant cost and delay to our development programs. Although we believe that there are several potential alternative manufacturers who could manufacture our product candidates, we may incur significant delays and added costs in identifying, qualifying and contracting with any such third party or potential second source manufacturer. In any event, with any third party manufacturer we expect to enter into technical transfer agreements and share our know-how with the third party manufacturer, which can be time-consuming and may result in delays. These delays could result in a suspension or delay of marketing roxadustat.

Certain of the components of our product candidates are acquired from single-source suppliers and have been purchased without long-term supply agreements. The loss of any of these suppliers, or their failure to supply us with supplies of sufficient quantity and quality to complete our drug substance or finished drug product of acceptable quality and an acceptable price, would materially and adversely affect our business.

We do not have an alternative supplier of certain components of our product candidates. To date, we have used purchase orders for the supply of materials that we use in our product candidates. We may be unable to enter into long-term commercial supply arrangements with our vendors, or do so on commercially reasonable terms, which could have a material adverse impact upon our business. In addition, we currently rely on our contract manufacturers to purchase from third-party suppliers some of the materials necessary to produce our product candidates. We do not have direct control over the acquisition of those materials by our contract manufacturers. Moreover, we currently do not have any agreements for the commercial production of those materials.

The logistics of our supply chain, which include shipment of materials and intermediates from countries such as China and India add additional time and risk to the manufacture of our product candidates. While we have in the past maintained sufficient inventory of materials, API, and drug product to meet our and our collaboration partners' needs for roxadustat to date, the lead time and regulatory approvals required to source from and into countries outside of the U.S. increase the risk of delay and potential shortages of supply.

Risks Related to Our Intellectual Property

If our efforts to protect our proprietary technologies 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 contractual arrangements to protect the intellectual property related to our technologies. We will only be able to protect our products and proprietary information and technology by preventing unauthorized use by third parties to the extent that our patents, trade secrets, and contractual position allow us to do so. Any disclosure to or misappropriation by third parties of our trade secrets or confidential information could compromise our competitive position. Moreover, we are involved in, have in the past been involved in, and may in the future be involved in legal or administrative proceedings involving our intellectual property initiated by third parties, and which proceedings can result in significant costs and commitment of management time and attention. As our product candidates continue in development, third parties may attempt to challenge the validity and enforceability of our patents and proprietary information and technologies.

We also are involved in, have in the past been involved in, and may in the future be involved in initiating legal or administrative proceedings involving the product candidates and intellectual property of our competitors. These proceedings can result in significant costs and commitment of management time and attention, and there can be no assurance that our efforts would be successful in preventing or limiting the ability of our competitors to market competing products.

Composition-of-matter patents relating to the API are generally considered to be the strongest form of intellectual property protection for pharmaceutical products, as such patents provide protection not limited to any one method of use. Method-of-use patents protect the use of a product for the specified method(s), and do not prevent a competitor from making and marketing a product that is identical to our product for an indication that is outside the scope of the patented method. We rely on a combination of these and other types of patents to protect our product candidates, and there can be no assurance that our intellectual property will create and sustain the competitive position of our product candidates.

Biotechnology and pharmaceutical product patents involve highly complex legal and scientific questions and can be uncertain. Any patent applications that we own or license may fail to result in issued patents. Even if patents do successfully issue from our applications, third parties may challenge their validity or enforceability, which may result in such patents being narrowed, invalidated, or held unenforceable. Even if our patents and patent applications are not challenged by third parties, those patents and patent applications may not prevent others from designing around our claims and may not otherwise adequately protect our product candidates. If the breadth or strength of protection provided by the patents and patent applications we hold with respect to our product candidates is threatened, competitors with significantly greater resources could threaten our ability to commercialize our product candidates. Discoveries are generally published in the scientific literature well after their actual development, and patent applications in the U.S. and other countries are typically not published until 18 months after their filing, and in some cases are never published. Therefore, we cannot be certain that we or our licensors were the first to make the inventions claimed in our owned and licensed patents or patent applications, or that we or our licensors were the first to file for patent protection covering such inventions. Subject to meeting other requirements for patentability, for U.S. patent applications filed prior to March 16, 2013, the first to invent the claimed invention is entitled to receive patent protection for that invention while, outside the U.S., the first to file a patent application encompassing the invention is entitled to patent protection for the invention. The U.S. moved to a “first to file” system under the Leahy-Smith America Invents Act (“AIA”), effective March 16, 2013. This system also includes procedures for challenging issued patents and pending patent applications, which creates additional uncertainty. We may become involved in opposition or interference proceedings challenging our patents and patent applications or the patents and patent applications of others, and the outcome of any such proceedings are highly uncertain. An unfavorable outcome in any such proceedings could reduce the scope of or invalidate our patent rights, allow third parties to commercialize our technology and compete directly with us, or result in our inability to manufacture, develop or commercialize our product candidates without infringing the patent rights of others.

In addition to the protection afforded by patents, we seek to rely on trade secret protection and confidentiality agreements to protect proprietary know-how, information, or technology that is not covered by our patents. Although our agreements require all of our employees to assign their inventions to us, and we require all of our employees, consultants, advisors and any third parties who have access to our trade secrets, proprietary know-how and other confidential information and technology to enter into appropriate confidentiality agreements, we cannot be certain that our trade secrets, proprietary know-how and other confidential information and technology will not be subject to unauthorized disclosure or that our competitors will not otherwise gain access to or independently develop substantially equivalent trade secrets, proprietary know-how and other information and technology. Furthermore, the laws of some foreign countries, in particular, China, where we have operations, do not protect proprietary rights to the same extent or in the same manner as the laws of the U.S. As a result, we may encounter significant problems in protecting and defending our intellectual property globally. If we are unable to prevent unauthorized disclosure of our intellectual property related to our product candidates and technology to third parties, we may not be able to establish or maintain a competitive advantage in our market, which could materially adversely affect our business and operations.

Intellectual property disputes with third parties and competitors may be costly and time consuming, and may negatively affect our competitive position.

Our commercial success may depend on our avoiding infringement of the patents and other proprietary rights of third parties as well as on enforcing our patents and other proprietary rights against third parties. Pharmaceutical and biotechnology intellectual property disputes are characterized by complex, lengthy and expensive litigation over patents and other intellectual property rights. We may initiate or become party to or be threatened with future litigation or other proceedings regarding intellectual property rights with respect to our product candidates and competing products.

As our product candidates progress toward commercialization, we or our collaboration partners may be subject to patent infringement claims from third parties. We attempt to ensure that our product candidates do not infringe third party patents and other proprietary rights. However, the patent landscape in competitive product areas is highly complex, and there may be patents of third parties of which we are unaware that may result in claims of infringement. Accordingly, there can be no assurance that our product candidates do not infringe proprietary rights of third parties, and parties making claims against us may seek and obtain injunctive or other equitable relief, which could potentially block further efforts to develop and commercialize our product candidates including roxadustat or pamrevlumab. Any litigation involving defense against claims of infringement, regardless of the merit of such claims, would involve substantial litigation expense and would be a substantial diversion of management time.

We intend, if necessary, to vigorously enforce our intellectual property in order to protect the proprietary position of our product candidates, including roxadustat and pamrevlumab. Active efforts to enforce our patents may include litigation, administrative proceedings, or both, depending on the potential benefits that might be available from those actions and the costs associated with undertaking those efforts against third parties. We carefully review and monitor publicly available information regarding products that may be competitive with our product candidates and assert our intellectual property rights where appropriate. We previously prevailed in an administrative challenge initiated by a major biopharmaceutical company regarding our intellectual property rights, maintaining our intellectual property in all relevant scope, and will continue to protect and enforce our intellectual property rights. Moreover, third parties may continue to initiate new proceedings in the U.S. and foreign jurisdictions to challenge our patents from time to time.

We may consider administrative proceedings and other means for challenging third party patents and patent applications. An unfavorable outcome in any such challenge could require us to cease using the related technology and to attempt to license rights to it from the prevailing third party, which may not be available on commercially

reasonable terms, if at all, in which case our business could be harmed.

Third parties may also challenge our patents and patent applications, through interference, reexamination, inter partes review, and post-grant review proceedings before the U.S. Patent and Trademark Office ("USPTO") or through comparable proceedings in other territories. For example, Akebia and others have filed oppositions against certain European patents corresponding to some of the above-listed cases. In three of these proceedings, for FibroGen European Patent Nos. 1463823, 1633333, and 2322155, the European Patent Office has handed down decisions unfavorable to FibroGen. In the fourth of these proceedings, the European Patent Office issued a decision favorable to FibroGen, maintaining FibroGen European Patent No. 2322153. These decisions are currently under appeal, and these four patents are valid and enforceable pending resolution of the appeals. The ultimate outcomes of such proceedings remain uncertain, and ultimate resolution of such may take two to four years or longer. Akebia is also pursuing invalidation actions against corresponding patents in Canada and in Japan, and invalidation actions against corresponding patents in the United Kingdom have been initiated by GSK and by Akebia. While we believe these FibroGen patents will be upheld in relevant part, we note that narrowing or even revocation of any of these patents would not affect our exclusivity for roxadustat or our freedom-to-operate with respect to use of roxadustat for the treatment of anemia.

Furthermore, there is a risk that any public announcements concerning the status or outcomes of intellectual property litigation or administrative proceedings may adversely affect the price of our stock. If securities analysts or our investors interpret such status or outcomes as negative or otherwise creating uncertainty, our common stock price may be adversely affected.

Our reliance on third parties and agreements with collaboration partners requires us to share our trade secrets, which increases the possibility that a competitor may discover them or that our trade secrets will be misappropriated or disclosed.

Our reliance on third party contractors to develop and manufacture our product candidates is based upon agreements that limit the rights of the third parties to use or disclose our confidential information, including our trade secrets and know-how. Despite the contractual provisions, the need to share trade secrets and other confidential information increases the risk that such trade secrets and information are disclosed or used, even if unintentionally, in violation of these agreements. In the highly competitive markets in which our product candidates are expected to compete, protecting our trade secrets, including our strategies for addressing competing products, is imperative, and any unauthorized use or disclosure could impair our competitive position and may have a material adverse effect on our business and operations.

In addition, our collaboration partners are larger, more complex organizations than ours, and the risk of inadvertent disclosure of our proprietary information may be increased despite their internal procedures and contractual obligations in place with our collaboration partners. Despite our efforts to protect our trade secrets and other confidential information, a competitor’s discovery of such trade secrets and information could impair our competitive position and have an adverse impact on our business.

We have an extensive worldwide patent portfolio. The cost of maintaining our patent protection is high and maintaining our patent protection requires continuous review and compliance in order to maintain worldwide patent protection. We may not be able to effectively maintain our intellectual property position throughout the major markets of the world.

The USPTO and foreign patent authorities require maintenance fees and payments as well as continued compliance with a number of procedural and documentary requirements. Noncompliance may result in abandonment or lapse of the subject patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. Non-compliance may result in reduced royalty payments for lack of patent coverage in a particular jurisdiction from our collaboration partners or may result in competition, either of which could have a material adverse effect on our business.

We have made, and will continue to make, certain strategic decisions in balancing costs and the potential protection afforded by the patent laws of certain countries. As a result, we may not be able to prevent third parties from practicing our inventions in all countries throughout the world, or from selling or importing products made using our inventions in and into the U.S. or other countries. Third parties may use our technologies in territories in which we have not obtained patent protection to develop their own products and, further, may infringe our patents in territories which provide inadequate enforcement mechanisms, even if we have patent protection. Such third party products may compete with our product candidates, and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

The laws of some foreign countries do not protect proprietary rights to the same extent as do the laws of the U.S., and we may encounter significant problems in securing and defending our intellectual property rights outside the U.S.

Many companies have encountered significant problems in protecting and defending intellectual property rights in certain countries. The legal systems of certain countries, particularly certain developing countries such as China, do not always favor the enforcement of patents, trade secrets, and other intellectual property rights, particularly those relating to pharmaceutical and biotechnology products, which could make it difficult for us to stop infringement of our patents, misappropriation of our trade secrets, or marketing of competing products in violation of our proprietary rights. In China, our intended establishment of significant operations will depend in substantial part on our ability to effectively enforce our intellectual property rights in that country. Proceedings to enforce our intellectual property rights in foreign countries could result in substantial costs and divert our efforts and attention from other aspects of our business, and could put our patents in these territories at risk of being invalidated or interpreted narrowly, or our patent applications at risk of not being granted, and could provoke third parties to assert claims against us. We may not prevail in all legal or other proceedings that we may initiate and, if we were to prevail, 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.

Intellectual property rights do not address all potential threats to any competitive advantage we may have.

The degree of future protection afforded by our intellectual property rights is uncertain because intellectual property rights have limitations, and intellectual property rights may not adequately protect our business or permit us to maintain our competitive advantage. The following examples are illustrative:

- Others may be able to make compounds that are the same as or similar to our current or future product candidates but that are not covered by the claims of the patents that we own or have exclusively licensed.
- We or any of our licensors or strategic partners might not have been the first to make the inventions covered by the issued patent or pending patent application that we own or have exclusively licensed.
- We or any of our licensors or strategic partners might not have been the first to file patent applications covering certain of our inventions.
- Others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights.
- The prosecution of our pending patent applications may not result in granted patents.
- Granted patents that we own or have exclusively licensed may not provide us with any competitive advantages, or may be held invalid or unenforceable, as a result of legal challenges by our competitors.
- Patent protection on our product candidates may expire before we are able to develop and commercialize the product, or before we are able to recover our investment in the product.
- Our competitors might conduct research and development activities in the U.S. and other countries that provide a safe harbor from patent infringement claims for such activities, as well as in countries in which we do not have patent rights, and may then use the information learned from such activities to develop competitive products for sale in markets where we intend to market our product candidates.

Roxadustat is considered a Class 2 substance on the 2019 World Anti-Doping Agency Prohibited List which could limit sales and increase security and distribution costs for us and our partners, particularly in China.

Roxadustat is considered a Class 2 substance on the World Anti-Doping Agency (“WADA”) Prohibited List. There are enhanced security and distribution procedures we and our collaboration partners and third-party contractors will have to take to limit the risk of loss of product in the supply chain. As a result, our distribution, manufacturing and sales costs for roxadustat, as well as for our partners, will be increased which will reduce profitability. In addition there is a risk of reduced sales due to patient access to this drug. This is particularly the case in China where we will not be able to sell roxadustat in private pharmacies due to the WADA classification. While private pharmacies only represent approximately 10% of the market in China, this will negatively affect sales and therefore the profitability of roxadustat and the Company as a whole.

The existence of counterfeit pharmaceutical products in pharmaceutical markets may compromise our brand and reputation and have a material adverse effect on our business, operations and prospects.

Counterfeit products, including counterfeit pharmaceutical products, are a significant problem, particularly in China. Counterfeit pharmaceuticals are products sold or used for research under the same or similar names, or similar mechanism of action or product class, but which are sold without proper licenses or approvals. Such products may be used for indications or purposes that are not recommended or approved or for which there is no data or inadequate data with regard to safety or efficacy. Such products divert sales from genuine products, often are of lower cost, often are of lower quality (having different ingredients or formulations, for example), and have the potential to damage the reputation for quality and effectiveness of the genuine product. If counterfeit pharmaceuticals illegally sold or used for research result in adverse events or side effects to consumers, we may be associated with any negative publicity resulting from such incidents. Consumers may buy counterfeit pharmaceuticals that are in direct competition with our pharmaceuticals, which could have an adverse impact on our revenues, business and results of operations. In addition, the use of counterfeit products could be used in non-clinical or clinical studies, or could otherwise produce

undesirable side effects or adverse events that may be attributed to our products as well, which could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in the delay or denial of regulatory approval by the FDA or other regulatory authorities and potential product liability claims. With respect to China, although the government has recently been increasingly active in policing counterfeit pharmaceuticals, there is not yet an effective counterfeit pharmaceutical regulation control and enforcement system in China. As a result, we may not be able to prevent third parties from selling or purporting to sell our products in China. The proliferation of counterfeit pharmaceuticals has grown in recent years and may continue to grow in the future. The existence of and any increase in the sales and production of counterfeit pharmaceuticals, or the technological capabilities of counterfeiters, could negatively impact our revenues, brand reputation, business and results of operations.

Risks Related to Government Regulation

The regulatory approval process is highly uncertain and we may not obtain regulatory approval for the commercialization of our product candidates.

The time required to obtain approval by the FDA and comparable foreign regulatory authorities is unpredictable, but typically takes many years following the commencement of preclinical studies and clinical trials and depends upon numerous factors, including the substantial discretion of the 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. Except in China, We have not obtained regulatory approval for any product candidate, and it is possible that neither roxadustat nor pamrevlumab, nor any future product candidates we may discover, in-license or acquire and seek to develop in the future, will obtain regulatory approval in countries other than China.

Our product candidates could fail to receive regulatory approval from the FDA or other regulatory authorities for many reasons, including:

- disagreement over the design or implementation of our clinical trials;
- failure to demonstrate that a product candidate is safe and effective for its proposed indication;
- failure of clinical trials to meet the level of statistical significance required for approval;
- failure to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;
- disagreement over our interpretation of data from preclinical studies or clinical trials;
- disagreement over whether to accept efficacy results from clinical trial sites outside the U.S. where the standard of care is potentially different from that in the U.S.;
- the insufficiency of data collected from clinical trials of our present or future product candidates to support the submission and filing of an NDA or other submission or to obtain regulatory approval;
- disapproval of the manufacturing processes or facilities of either our manufacturing plant or third party manufacturers with whom we contract for clinical and commercial supplies; or
- changes in the approval policies or regulations that render our preclinical and clinical data insufficient for approval.

The FDA or other regulatory authorities may require more information, including additional preclinical or clinical data to support approval, which may delay or prevent approval and our commercialization plans, or we may decide to abandon the development program altogether. Even if we do obtain regulatory approval, our product candidates may be approved for fewer or more limited indications than we request, approval may be contingent on the performance of costly post-marketing clinical trials, or approval may require labeling that does not include the labeling claims necessary or desirable for the successful commercialization of that product candidate. In addition, if our product candidates produce undesirable side effects or safety issues, the FDA may require the establishment of REMS or other regulatory authorities may require the establishment of a similar strategy, that may restrict distribution of our approved products, if any, and impose burdensome implementation requirements on us. Any of the foregoing scenarios could materially harm the commercial prospects for our product candidates.

Even if we believe our current or planned clinical trials are successful, regulatory authorities may not agree that our completed clinical trials provide adequate data on safety or efficacy. Approval by one regulatory authority does not ensure approval by any other regulatory authority. However, a failure or delay in obtaining regulatory approval in one country may have a negative effect on the regulatory process in others. We may not be able to file for regulatory approvals and even if we file we may not receive the necessary approvals to commercialize our product candidates in any market.

If our product candidates obtain marketing approval, we will be subject to more extensive healthcare laws, regulation and enforcement and our failure to comply with those laws could have a material adverse effect on our results of operations and financial condition.

If we obtain approval in the U.S. for any of our product candidates, the regulatory requirements applicable to our operations, in particular our sales and marketing efforts, will increase significantly with respect to our operations and the potential for civil and criminal enforcement by the federal government and the states and foreign governments will increase with respect to the conduct of our business. The laws that may affect our operations in the U.S. 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 Health Insurance Portability and Accountability Act of 1996 ("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;
- HIPAA, as amended by Health Information Technology and Clinical Health Act, and its implementing regulations, which imposes certain requirements relating to the privacy, security, and transmission of individually identifiable health information;
- the federal physician sunshine requirements under the Patient Protection and Affordable Care Act ("PPACA"), which requires manufacturers of drugs, devices, biologics, and medical supplies to report annually to the Centers for Medicare and Medicaid Services ("CMS"), information related to payments and other transfers of value to physicians, other healthcare providers, and teaching hospitals, and ownership and investment interests held by physicians and other healthcare providers and their immediate family members;
- foreign and state law equivalents of each of the above federal laws, such as the U.S. Foreign Corrupt Practices Act ("FCPA"), anti-kickback and false claims laws that 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 applicable 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, thus complicating compliance efforts; and
- the Trade Agreements Act ("TAA"), which requires that drugs sold to the U.S. Government must be manufactured in the U.S. or in TAA approved and designated countries. Drugs manufactured in countries not approved under the TAA, may not be sold to the U.S. without specific regulatory approval. We have little experience with this regulation and there is a risk that drugs made from Chinese-made API may not be sold to an entity of the U.S. such as the Veterans Health Administration ("VA") due to our inability to obtain regulatory approval. While there have been recent VA policy changes that appear to allow for sale of drugs from non-TAA approved countries, this policy may change or there may be additional policies or legislation that affect our ability to sell drug to the U.S. Government.

The scope of these laws and our lack of experience in establishing the compliance programs necessary to comply with this complex and evolving regulatory environment increases the risks that we may unknowingly violate the applicable laws and regulations. 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 civil and criminal penalties, damages, fines, the curtailment or restructuring of our operations, the exclusion from participation in federal and state healthcare programs and imprisonment, any of which could materially adversely affect our ability to operate our business and our

financial results.

The impact of recent U.S. healthcare reform, its potential partial or full repeal, and other changes in the healthcare industry and in healthcare spending is currently unknown, and may adversely affect our business model.

The commercial potential for our approved products could be affected by changes in healthcare spending and policy in the U.S. and abroad. We operate in a highly regulated industry and new laws, regulations or judicial decisions, or new interpretations of existing laws, regulations or decisions, related to healthcare availability, the method of delivery or payment for healthcare products and services could negatively impact our business, operations and financial condition.

In the U.S., the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 ("MMA") altered Medicare coverage and payments for pharmaceutical products. The legislation expanded Medicare coverage for drug purchases by the elderly and introduced a new reimbursement methodology based on average sales prices for physician-administered drugs. The MMA also provided authority for limiting the number of drugs that will be covered in any therapeutic class and as a result, we expect that there will be additional pressure to reduce costs. For example, the CMS in implementing the MMA has enacted regulations that reduced capitated payments to dialysis providers. These cost reduction initiatives and other provisions of the MMA could decrease the scope of coverage and the price that may be received for any approved dialysis products and could seriously harm our business and financial condition. While the MMA applies only to drug benefits for Medicare beneficiaries, private payors often follow Medicare coverage policies and payment limitations in setting their own reimbursement rates, and any reduction in reimbursement that results from the MMA may cause a similar reduction in payments from private payors. Similar regulations or reimbursement policies have been enacted in many international markets which could similarly impact the commercial potential for our products.

Under the Medicare Improvements for Patients and Providers Act ("MIPPA"), a basic case-mix adjusted composite, or bundled, payment system commenced in January 2011 and transitioned fully by January 2014 to a single reimbursement rate for drugs and all services furnished by renal dialysis centers for Medicare beneficiaries with end-stage renal disease. Specifically, under MIPPA the bundle now covers drugs, services, lab tests and supplies under a single treatment base rate for reimbursement by the CMS based on the average cost per treatment, including the cost of ESAs and IV iron doses, typically without adjustment for usage. It is unknown whether roxadustat, if approved in the U.S., will be included in the payment bundle. Under MIPPA, agents that have no IV equivalent in the bundle are currently expected to be excluded from the bundle until 2025. If roxadustat were included in the bundle, it may reduce the price that could be charged for roxadustat, and therefore potentially limit our profitability. Based on roxadustat's differentiated mechanism of action and therapeutic effects, and discussions with our collaboration partner, we currently believe that roxadustat might not be included in the bundle. If roxadustat is reimbursed outside of the bundle, it may potentially limit or delay market penetration of roxadustat.

More recently, the PPACA was enacted in 2010 with a goal of reducing the cost of healthcare and substantially changing the way healthcare is financed by both government and private insurers. The PPACA, among other things, increases the minimum Medicaid rebates owed by manufacturers under the Medicaid Drug Rebate Program and extends the rebate program to individuals enrolled in Medicaid managed care organizations, establishes annual fees and taxes on manufacturers of certain branded prescription drugs, and creates a new Medicare Part D coverage gap discount program, in which manufacturers must agree to offer 50% point-of-sale discounts off negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period as a condition for the manufacturer's outpatient drugs to be covered under Medicare Part D. In addition, other legislative changes have been proposed and adopted in the U.S. since the PPACA 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 includes aggregate reductions of Medicare payments to providers of up to 2% per fiscal year, which went into effect

on April 1, 2013.

It is likely that federal and state legislatures within the U.S. and foreign governments will continue to consider changes to existing healthcare legislation. We cannot predict the reform initiatives that may be adopted in the future or whether initiatives that have been adopted will be repealed or modified. The continuing efforts of the government, insurance companies, managed care organizations and other payors of healthcare services to contain or reduce costs of healthcare may adversely affect:

- the demand for any products that may be approved for sale;
- the price and profitability of our products;
- pricing, coverage and reimbursement applicable to our products;
- the ability to successfully position and market any approved product; and
- the taxes applicable to our pharmaceutical product revenues.

Some of the provisions of the PPACA have yet to be fully implemented, while certain provisions have been subject to judicial and Congressional challenges. In January 2017, Congress voted to adopt a budget resolution for fiscal year 2017, that while not a law, is

widely viewed as the first step toward the passage of legislation that would repeal certain aspects of the PPACA. Further, on January 20, 2017, President Trump signed an Executive Order directing federal agencies with authorities and responsibilities under the Affordable Care Act to waive, defer, grant exemptions from, or delay the implementation of any provision of the Affordable Care Act that would impose a fiscal burden on states or a cost, fee, tax, penalty or regulatory burden on individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices. Congress also could consider subsequent legislation to replace elements of the Affordable Care Act that are repealed. Given these possibilities and others we may not anticipate, the full extent to which our business, results of operations and financial condition could be adversely affected by the recent proposed legislation and the Executive Order is uncertain. The implementation of cost containment measures or other healthcare reforms may prevent us from being able to generate revenue, attain profitability, or commercialize our drugs.

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

We may not be able to conduct, or contract others to conduct, animal testing in the future, which could harm our research and development activities.

Certain laws and regulations relating to drug development require us to test our product candidates on animals before initiating clinical trials involving humans. Animal testing activities have been the subject of controversy and adverse publicity. Animal rights groups and other organizations and individuals have attempted to stop animal testing activities by pressing for legislation and regulation in these areas and by disrupting these activities through protests and other means. To the extent the activities of these groups are successful, our research and development activities may be interrupted or delayed.

Our employees may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements, which could result in significant liability for us and harm our reputation.

We are exposed to the risk of employee fraud or other misconduct, including intentional failure to:

- comply with FDA regulations or similar regulations of comparable foreign regulatory authorities;
- provide accurate information to the FDA or comparable foreign regulatory authorities;
- comply with manufacturing standards we have established;
- comply with privacy laws protecting personal information;
- comply with federal and state healthcare fraud and abuse laws and regulations and similar laws and regulations established and enforced by comparable foreign regulatory authorities;
- comply with the FCPA and other anti-bribery laws;
- report financial information or data accurately;
- or disclose unauthorized activities to us.

Employee misconduct could also involve the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions, delays in clinical trials, or serious harm to our reputation. We have adopted a code of conduct for our directors, officers and employees, but it is not always possible to identify and deter employee misconduct. 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 harm our

business, results of operations, financial condition and cash flows, including through the imposition of significant fines or other sanctions.

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

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our operations involve the use of hazardous and flammable materials, including chemicals and biological materials. Our operations also produce hazardous waste products. We contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials. In the event of contamination or injury resulting from our use of hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties for failure to comply with such laws and regulations. We do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us in connection with our storage or disposal of biological, hazardous or radioactive materials.

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

Risks Related to Our International Operations

We are establishing international operations and seeking approval to commercialize our product candidates outside of the U.S., in particular in China, and a number of risks associated with international operations could materially and adversely affect our business.

We expect to be subject to a number of risks related with our international operations, many of which may be beyond our control. These risks include:

- different regulatory requirements for drug approvals in foreign countries;
- different standards of care in various countries that could complicate the evaluation of our product candidates;
- different U.S. and foreign drug import and export rules;
- reduced protection for intellectual property rights in certain countries;
- changes in tariffs, trade barriers and regulatory requirements;
- different reimbursement systems and different competitive drugs indicated to treat the indications for which our product candidates are being developed;
- economic weakness, including inflation, or political instability in particular foreign economies and markets;
- compliance with tax, employment, immigration and labor laws for employees living or traveling abroad;
- compliance with the FCPA, and other anti-corruption and anti-bribery laws;
- U.S. and foreign taxes, including withholding of payroll taxes;
- foreign currency fluctuations, which could result in increased operating expenses and reduced revenues, and other obligations incident to doing business in another country;
- workforce uncertainty in countries where labor unrest is more common than in the U.S.;
- production shortages resulting from any events affecting raw material supply or manufacturing capabilities abroad;
- a reliance on CROs, clinical trial sites, principal investigators and other third parties that may be less experienced with clinical trials or have different methods of performing such clinical trials than we are used to in the U.S.;
- potential liability resulting from development work conducted by foreign distributors; and
- business interruptions resulting from geopolitical actions, including war and terrorism, or natural disasters.

The pharmaceutical industry in China is highly regulated and such regulations are subject to change.

The pharmaceutical industry in China is subject to comprehensive government regulation and supervision, encompassing the approval, registration, manufacturing, packaging, licensing and marketing of new drugs. Refer to "Business — Government Regulation — Regulation in China" for a discussion of the regulatory requirements that are applicable to our current and planned business activities in China. In recent years, the regulatory framework in China regarding the pharmaceutical industry has undergone significant changes, and we expect that it will continue to undergo significant changes. Any such changes or amendments may result in increased compliance costs on our business or cause delays in or prevent the successful development or commercialization of our product candidates in China. For example, the NMPA recently adopted the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use guidelines, and accordingly imposed regulatory oversight earlier in our production process for roxadustat manufactured and sold in China. The change in regulatory starting material triggered an extension of the inspection to our contract manufacturer STA, which was successfully completed in October 2018. In addition, Chinese authorities have become increasingly vigilant in enforcing laws in the pharmaceutical industry, in some cases launching industry-wide investigations, oftentimes appearing to focus on foreign companies. The costs and time necessary to respond to an investigation can be material. Any failure by us or our partners to maintain compliance with applicable laws and regulations or obtain and maintain required licenses and permits may result in the suspension or termination of our business activities in China.

We are planning on using our own manufacturing facilities in China to produce roxadustat API, roxadustat drug product, and FG-5200 corneal implants. As an organization, we have limited experience in the construction, licensure, and operation of a manufacturing plant, and accordingly we cannot assure you we will be able to meet regulatory requirements to operate our plant and to sell our products.

We have two manufacturing facilities in China, with one located in Beijing and the other in Cangzhou, Hebei. In December 2018, we received the Manufacturing License for Drug Substance and Drug Product for roxadustat and GMP certification for our Beijing facility that allows us to manufacture limited commercial quantities of roxadustat capsules. We are currently planning on manufacturing commercial-scale API at our Cangzhou facility, and expect to receive a license to produce roxadustat API at that site in the second half of 2019. However, as an organization, we have limited experience licensing and operating commercial manufacturing facilities.

We will be obligated to comply with continuing cGMP requirements and there can be no assurance that we will receive and maintain all of the appropriate licenses required to manufacture our product candidates for clinical and commercial use in China. In addition, we and our product suppliers must continually spend time, money and effort in production, record-keeping and quality assurance and appropriate controls in order to ensure that any products manufactured in our facilities meet applicable specifications and other requirements for product safety, efficacy and quality and there can be no assurance that our efforts will succeed for licensure or continue to be successful in meeting these requirements.

We would require separate approval for the manufacture of FG-5200. In addition, we may convert the existing manufacturing process of FG-5200 to a semi-automated process, which may require us to show that implants from our new manufacturing process are comparable to the implants from our existing manufacturing process. There can be no assurance that we will successfully receive licensure and maintain approval for the manufacture of FG-5200, either of which would be expected to delay or preclude our ability to develop FG-5200 in China and may materially adversely affect our business and operations and prospects in China.

Manufacturing facilities in China are subject to periodic unannounced inspections by the NMPA and other regulatory authorities. We expect to depend on these facilities for our product candidates and business operations in China. Natural disasters or other unanticipated catastrophic events, including power interruptions, water shortages, storms,

fires, earthquakes, terrorist attacks, government appropriation of our facilities, and wars, could significantly impair our ability to operate our manufacturing facilities. Certain equipment, records and other materials located in these facilities would be difficult to replace or would require substantial replacement lead time that would impact our ability to successfully commercialize our product candidates in China. The occurrence of any such event could materially and adversely affect our business, financial condition, results of operations, cash flows and prospects.

In addition to manufacturing, we are responsible for pharmacovigilance, medical affairs, and management of the third party distribution logistics for roxadustat in China. We have no experience in these areas as a company, and accordingly we cannot assure you we will be able to meet regulatory requirements or operate in these capacities successfully.

We are responsible for commercial manufacturing, pharmacovigilance, medical affairs, and management of the third party distribution logistics for roxadustat commercial activities in China. While we have been increasing our staffing in these areas, as a company, we have no experience managing or operating these functions for a commercial product and there can be no guarantee that we will do so efficiently or effectively. Mistakes or delays in these areas could limit our ability to successfully commercialize roxadustat in China, could limit our eventual market penetration, sales and profitability, and could subject us to significant liability in China.

Our decision to launch roxadustat in China prior to approval in the U.S. or Europe is largely unprecedented and could be subject to significant risk, delay and expense.

Even though our subsidiary FibroGen Beijing has received marketing authorization for roxadustat for anemia caused by CKD in dialysis patients we have not yet received approval in non-dialysis patients, and are awaiting the Chinese authorities' routine inspection of our Phase 3 non-dialysis clinical trial sites. While we currently expect these site inspections to occur in the first half of 2019, the inspections could be delayed for a number of reasons, including if regulatory authorities are otherwise occupied inspecting other matters, such as certain vaccine, plasma, or other issues that may be pressing for the country.

We also must qualify and license our Cangzhou manufacturing facility for manufacture of roxadustat API prior to launch. We expect this to occur in the third quarter of 2019, however, delays or problems obtaining such licensure would delay launch.

In addition, negative safety data from the U.S. or European Phase 3 trials could affect the NMPA approval process or label for roxadustat. Any such developments could delay or limit our commercialization plans for roxadustat in China. It is possible that other unforeseen delays in the China regulatory process could have a material adverse effect on our development and commercialization of roxadustat in China.

In addition we will be required to conduct a 2,000 subject post-approval safety study to demonstrate the long-term safety of roxadustat, as well as provide period reporting to the authorities on GMP and quality compliance at our manufacturing facilities. If safety issues arise in this study, or generally after commercialization, our commercialization plans and profitability in China could be negatively impacted.

We and our collaboration partner in China, AstraZeneca, may experience difficulties in successfully generating sales of roxadustat in China.

We and AstraZeneca have a profit sharing arrangement with respect to roxadustat in China and any difficulties we may experience in generating sales will affect our bottom line. Difficulties may be related to our ability to obtain reasonable pricing, reimbursement, hospital listing, and tendering, or other difficulties related to distribution, marketing, and sales efforts in China. Sales of roxadustat in China may be limited due to the complex nature of the healthcare system, low average personal income, pricing controls, still developing infrastructure and potentially rapid competition from other products. In particular, if we are unable to obtain reimbursement for roxadustat through the 2019 update to the NRDL, we may have to wait a substantial period of time before the reimbursement drug list is updated again. Without government reimbursement, many patients will not be able to afford roxadustat, since private commercial health insurance is rare, and our business and operations could be adversely affected. Therefore reimbursement and obtaining hospital listing is critical to roxadustat's near-term commercial success in China.

The market for treatment of anemia in CKD in China is highly competitive.

Although we have now received approval for roxadustat for the treatment of anemia caused by CKD in dialysis patients in China, and even if roxadustat receives approval for anemia caused by CKD in non-dialysis patients, it faces intense competition in the market for treatment of anemia in CKD. Roxadustat would compete with ESAs, which are offered by established multinational pharmaceutical companies such as Kyowa Hakko Kirin China Pharmaceutical Co., Ltd., Roche and Chinese pharmaceutical companies such as 3SBio Inc. and Di'ao Group Chengdu Diao Jiuhong Pharmaceutical Factory. Many of these competitors have substantially greater name recognition, scientific, financial, and marketing resources, as well as established distribution capabilities. Many of our competitors have more resources to develop or acquire, and more experience in developing or acquiring, new products and in creating market awareness for those products. Many of these competitors have significantly more experience than we have in

navigating the Chinese regulatory framework regarding the development, manufacturing and marketing of drugs in China, as well as in marketing and selling anemia products in China. Additionally, we believe that most patients with anemia in CKD in China are currently being treated with traditional Chinese medicine, which is widely accepted and highly prevalent in China. Traditional Chinese medicine treatments are often oral and thus convenient and low-cost, and practitioners of traditional Chinese medicine are numerous and accessible in China. As a result, it may be difficult to persuade patients with anemia in CKD to switch from traditional Chinese medicine to roxadustat.

The Chinese government is implementing a new “Two Invoices” regulation which could affect the way we structure our distributorship relationships in China for roxadustat.

The Chinese government is implementing new regulations that impact distribution of pharmaceutical products in China. These regulations generally require that at most two invoices may be issued throughout the distribution chain. Failure to comply with the “Two-Invoices” regulations would prevent us from accessing the market in China. We are planning on modifying the distribution responsibilities under the China Agreement between AstraZeneca and FibroGen such that FibroGen would engage distributors and a third party logistics provider, and both companies will work together to manage the distribution network. FibroGen China has never managed distribution of pharmaceutical products, and this new distribution structure may impose higher costs or limit or delay our ability to sell products to our principal customers, and may limit the near term sales of our products.

There is no assurance that roxadustat will be included in the Medical Insurance Catalogs.

Eligible participants in the national basic medical insurance program in China, which consists of mostly urban residents, are entitled to reimbursement from the social medical insurance fund for up to the entire cost of medicines that are included in the Medical Insurance Catalogs. Refer to “Business — Government Regulation — Regulation in China.” We believe that the inclusion of a drug in the Medical Insurance Catalogs can substantially improve the sales of a drug in China. The Ministry of Labor and Social Security in China (“MLSS”) together with other government authorities, select medicines to be included in the Medical Insurance Catalogs based on a variety of factors, including treatment requirements, frequency of use, effectiveness and price. The MLSS also occasionally removes medicines from such catalogs. There can be no assurance that roxadustat will be included, and once included, remain in the Medical Insurance Catalogs. The exclusion or removal of roxadustat from the Medical Insurance Catalogs may materially and adversely affect sales of roxadustat.

Even if FG-5200 can be manufactured successfully and achieve regulatory approval, we may not achieve commercial success.

We have not yet received a license to manufacture FG-5200 in our Beijing manufacturing facility or at scale, and we will have to show that FG-5200 produced in our China manufacturing facility meets the applicable regulatory requirements. There can be no assurance that we can meet these requirements or that FG-5200 can be approved for development, manufacture and sale in China.

Even if we are able to manufacture and develop FG-5200 as a medical device in China, the size and length of any potential clinical trials required for approval are uncertain and we are unable to predict the time and investment required to obtain regulatory approval. Moreover, even if FG-5200 can be successfully developed for approval in China, our product candidate would require extensive training and investment in assisting physicians in the use of FG-5200.

The retail prices of any product candidates that we develop may be subject to control, including periodic downward adjustment, by Chinese government authorities.

The price for pharmaceutical products is highly regulated in China, both at the national and provincial level. Price controls may reduce prices to levels significantly below those that would prevail in less regulated markets, or limit the volume of products that may be sold, either of which may have a material and adverse effect on potential revenues from sales of roxadustat in China. Moreover, the process and timing for the implementation of price restrictions is unpredictable, which may cause potential revenues from the sales of roxadustat to fluctuate from period to period.

If our planned business activities in China fall within a restricted category under the China Catalog for Guidance for Foreign Investment, we will need to operate in China through a variable interest entity ("VIE") structure.

The China Catalog for Guidance for Foreign Investment sets forth the industries and sectors that the Chinese government encourages and restricts with respect to foreign investment and participation. The Catalog for Guidance for Foreign Investment is subject to revision from time to time by the China Ministry of Commerce. While we currently do not believe the development and marketing of roxadustat falls within a restricted category under the Catalog for Guidance for Foreign Investment, if roxadustat does fall under such a restricted category, we will need to operate in China through a VIE structure. A VIE structure involves a wholly foreign-owned enterprise that would control and receive the economic benefits of a domestic Chinese company through various contractual relationships. Such a structure would subject us to a number of risks that may have an adverse effect on our business, including that the Chinese government may determine that such contractual arrangements do not comply with applicable regulations, Chinese tax authorities may require us to pay additional taxes, shareholders of our VIEs may have potential conflicts of interest with us, and we may lose the ability to use and enjoy assets held by our VIEs that are important to the operations of our business if such entities go bankrupt or become subject to dissolution or liquidation proceedings. VIE structures in China have come under increasing scrutiny from accounting firms and the SEC staff. If we do attempt to use a VIE structure and are unsuccessful in structuring it so as to qualify as a VIE, we would not be able to consolidate the financial statements of the VIE with our financial statements, which could have a material adverse effect on our operating results and financial condition.

FibroGen Beijing would be subject to restrictions on paying dividends or making other payments to us, which may restrict our ability to satisfy our liquidity requirements.

We plan to conduct all of our business in China through FibroGen China Anemia Holdings, Ltd. and FibroGen Beijing. We may rely on dividends and royalties paid by FibroGen Beijing for a portion of our cash needs, including the funds necessary to service any debt we may incur and to pay our operating expenses. The payment of dividends by FibroGen Beijing is subject to limitations. Regulations in China currently permit payment of dividends only out of accumulated profits as determined in accordance with accounting standards and regulations in China. FibroGen Beijing is not permitted to distribute any profits until losses from prior fiscal years have been recouped and in any event must maintain certain minimum capital requirements. FibroGen Beijing is also required to set aside at least 10.0% of its after-tax profit based on Chinese accounting standards each year to its statutory reserve fund until the cumulative amount of such reserves reaches 50.0% of its registered capital. Statutory reserves are not distributable as cash dividends. In addition, if FibroGen Beijing incurs debt on its own behalf in the future, the agreements governing such debt may restrict its ability to pay dividends or make other distributions to us. As of December 31, 2018, approximately $5.7 million of our cash and cash equivalents is held in China.

Any capital contributions from us to FibroGen Beijing must be approved by the Ministry of Commerce in China, and failure to obtain such approval may materially and adversely affect the liquidity position of FibroGen Beijing.

The Ministry of Commerce in China or its local counterpart must approve the amount and use of any capital contributions from us to FibroGen Beijing, and there can be no assurance that we will be able to complete the necessary government registrations and obtain the necessary government approvals on a timely basis, or at all. If we fail to do so, we may not be able to contribute additional capital to fund our Chinese operations, and the liquidity and financial position of FibroGen Beijing may be materially and adversely affected.

We may be subject to currency exchange rate fluctuations and currency exchange restrictions with respect to our operations in China, which could adversely affect our financial performance.

If roxadustat is approved for sale in China, most of our product sales will occur in local Chinese currency and our operating results will be subject to volatility from currency exchange rate fluctuations. To date, we have not hedged against the risks associated with fluctuations in exchange rates and, therefore, exchange rate fluctuations could have an adverse impact on our future operating results. Changes in value of the Renminbi against the U.S. dollar, Euro and other currencies is affected by, among other things, changes in China’s political and economic conditions. Currently, the Renminbi is permitted to fluctuate within a narrow and managed band against a basket of certain foreign currencies. Any significant currency exchange rate fluctuations may have a material adverse effect on our business and financial condition.

In addition, the Chinese government imposes controls on the convertibility of the Renminbi into foreign currencies and the remittance of foreign currency out of China for certain transactions. Shortages in the availability of foreign currency may restrict the ability of FibroGen Beijing to remit sufficient foreign currency to pay dividends or other payments to us, or otherwise satisfy their foreign currency-denominated obligations. Under existing Chinese foreign exchange regulations, payments of current account items, including profit distributions, interest payments and balance of trade, can be made in foreign currencies without prior approval from the State Administration of Foreign Exchange (“SAFE”) by complying with certain procedural requirements. However, approval from SAFE or its local branch is required where Renminbi is to be converted into foreign currency and remitted out of China to pay capital expenses such as the repayment of loans denominated in foreign currencies. The Chinese government may also at its discretion restrict access in the future to foreign currencies for current account transactions. If the foreign exchange control system prevents us from obtaining sufficient foreign currency to satisfy our operational requirements, our liquidity and financial position may be materially and adversely affected.

Because FibroGen Beijing's funds are held in banks that do not provide insurance, the failure of any bank in which FibroGen Beijing deposits its funds could adversely affect our business.

Banks and other financial institutions in China do not provide insurance for funds held on deposit. As a result, in the event of a bank failure, FibroGen Beijing may not have access to funds on deposit. Depending upon the amount of money FibroGen Beijing maintains in a bank that fails, its inability to have access to cash could materially impair its operations.

We may be subject to tax inefficiencies associated with our offshore corporate structure.

The tax regulations of the U.S. and other jurisdictions in which we operate are extremely complex and subject to change. New laws, new interpretations of existing laws, such as the Base Erosion Profit Shifting project initiated by the Organization for Economic Co-operation and Development and any legislation proposed by the relevant taxing authorities, or limitations on our ability to structure our operations and intercompany transactions may lead to inefficient tax treatment of our revenue, profits, royalties and distributions, if any are achieved.

In addition, we and our foreign subsidiaries have various intercompany transactions. We may not be able to obtain certain benefits under relevant tax treaties to avoid double taxation on certain transactions among our subsidiaries. If we are not able to avail ourselves of the tax treaties, we could be subject to additional taxes, which could adversely affect our financial condition and results of operations.

On December 22, 2017, the U.S. enacted the Tax Cuts and Jobs Act ("Tax Act") that instituted fundamental changes to the taxation of multinational corporations. The Tax Act includes changes to the taxation of foreign earnings by implementing a dividend exemption system, expansion of the current anti-deferral rules, a minimum tax on low-taxed foreign earnings and new measures to deter base erosion. The Tax Act also includes a permanent reduction in the corporate tax rate to 21%, repeal of the corporate alternative minimum tax, expensing of capital investment, and limitation of the deduction for interest expense. Furthermore, as part of the transition to the new tax system, a one-time transition tax is imposed on a U.S. shareholder's historical undistributed earnings of foreign affiliates. Although the Tax Act is generally effective January 1, 2018, GAAP requires recognition of the tax effects of new legislation during the reporting period that includes the enactment date, which was December 22, 2017.

As a result of the impacts of the Tax Act, the SEC provided guidance that allows us to record provisional amounts for those impacts, with the requirement that the accounting be completed in a period not to exceed one year from the date of enactment. As of December 31, 2018, we completed our analysis of the accounting for the tax effects of the Tax Act and no material adjustments were recognized as of December 31, 2018. The primary impact of the Tax Act relates to the re-measurement of deferred tax assets and liabilities resulting from the change in the corporate tax rate ("Corporate Tax Rate Change"), which was recorded as of December 2017. Developing interpretations of the provisions of the Tax Act, changes to U.S. Treasury regulations, administrative interpretations or court decisions interpreting the Tax Act in the future periods may require further adjustments to our analysis.

Our foreign operations, particularly those in China, are subject to significant risks involving the protection of intellectual property.

We seek to protect the products and technology that we consider important to our business by pursuing patent applications in China and other countries, relying on trade secrets or pharmaceutical regulatory protection or employing a combination of these methods. We note that the filing of a patent application does not mean that we will be granted a patent, or that any patent eventually granted will be as broad as requested in the patent application or will be sufficient to protect our technology. There are a number of factors that could cause our patents, if granted, to become invalid or unenforceable or that could cause our patent applications not to be granted, including known or unknown prior art, deficiencies in the patent application, or lack of originality of the technology. Furthermore, the terms of our patents are limited. The patents we hold and the patents that may be granted from our currently pending patent applications have, absent any patent term adjustment or extension, a twenty-year protection period starting from the date of application.

Intellectual property rights and confidentiality protections in China may not be as effective as those in the U.S. or other countries for many reasons, including lack of procedural rules for discovery and evidence, low damage awards, and lack of judicial independence. Implementation and enforcement of China intellectual property laws have

historically been deficient and ineffective and may be hampered by corruption and local protectionism. Policing unauthorized use of proprietary technology is difficult and expensive, and we may need to resort to litigation to enforce or defend patents issued to us or to determine the enforceability and validity of our proprietary rights or those of others. The experience and capabilities of China courts in handling intellectual property litigation varies and outcomes are unpredictable. An adverse determination in any such litigation could materially impair our intellectual property rights and may harm our business.

We are subject to laws and regulations governing corruption, which will require us to develop, maintain, and implement costly compliance programs.

We must comply with a wide range of laws and regulations to prevent corruption, bribery, and other unethical business practices, including the FCPA, anti-bribery and anti-corruption laws in other countries, particularly China. The creation and implementation of international business practices compliance programs is costly and such programs are difficult to enforce, particularly where reliance on third parties is required.

Anti-bribery laws prohibit us, our employees, and some of our agents or representatives from offering or providing any personal benefit to covered government officials to influence their performance of their duties or induce them to serve interests other than the missions of the public organizations in which they serve. Certain commercial bribery rules also prohibit offering or providing any personal benefit to employees and representatives of commercial companies to influence their performance of their duties or induce them to serve interests other than their employers. The FCPA also obligates companies whose securities are listed in the U.S. to comply with certain accounting provisions requiring us to maintain books and records that accurately and fairly reflect all transactions of the corporation, including international subsidiaries, and devise and maintain an adequate system of internal accounting controls for international operations. The anti-bribery provisions of the FCPA are enforced primarily by the Department of Justice. The SEC is involved with enforcement of the books and records provisions of the FCPA.

Compliance with these anti-bribery laws is expensive and difficult, particularly in countries in which corruption is a recognized problem. In addition, the anti-bribery laws present particular challenges in the pharmaceutical industry because in many countries including China, hospitals are state-owned or operated by the government, and doctors and other hospital employees are considered foreign government officials. Furthermore, in certain countries (China in particular), hospitals and clinics are permitted to sell pharmaceuticals to their patients and are primary or significant distributors of pharmaceuticals. Certain payments to hospitals in connection with clinical studies, procurement of pharmaceuticals and other work have been deemed to be improper payments to government officials that have led to vigorous anti-bribery law enforcement actions and heavy fines in multiple jurisdictions, particularly in the U.S. and China.

It is not always possible to identify and deter violations, 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.

In the pharmaceutical industry, corrupt practices include, among others, acceptance of kickbacks, bribes or other illegal gains or benefits by the hospitals and medical practitioners from pharmaceutical manufacturers, distributors or their third party agents in connection with the prescription of certain pharmaceuticals. If our employees, affiliates, distributors or third party marketing firms violate these laws or otherwise engage in illegal practices with respect to their sales or marketing of our products or other activities involving our products, we could be required to pay damages or heavy fines by multiple jurisdictions where we operate, which could materially and adversely affect our financial condition and results of operations. The Chinese government has also sponsored anti-corruption campaigns from time to time, which could have a chilling effect on any future marketing efforts by us to new hospital customers. There have been recent occurrences in which certain hospitals have denied access to sales representatives from pharmaceutical companies because the hospitals wanted to avoid the perception of corruption. If this attitude becomes widespread among our potential customers, our ability to promote our products to hospitals may be adversely affected.

As we expand our operations in China and other jurisdictions internationally, we will need to increase the scope of our compliance programs to address the risks relating to the potential for violations of the FCPA and other anti-bribery and anti-corruption laws. Our compliance programs will need to include policies addressing not only the FCPA, but also the provisions of a variety of anti-bribery and anti-corruption laws in multiple foreign jurisdictions, including

China, provisions relating to books and records that apply to us as a public company, and include effective training for our personnel throughout our organization. The creation and implementation of anti-corruption compliance programs is costly and such programs are difficult to enforce, particularly where reliance on third parties is required. Violation of the FCPA and other anti-corruption laws can result in significant administrative and criminal penalties for us and our employees, including substantial fines, suspension or debarment from government contracting, prison sentences, or even the death penalty in extremely serious cases in certain countries. The SEC also may suspend or bar us from trading securities on U.S. exchanges for violation of the FCPA's accounting provisions. Even if we are not ultimately punished by government authorities, the costs of investigation and review, distraction of our personnel, legal defense costs, and harm to our reputation could be substantial and could limit our profitability or our ability to develop or commercialize our product candidates. In addition, if any of our competitors are not subject to the FCPA, they may engage in practices that will lead to their receipt of preferential treatment from foreign hospitals and enable them to secure business from foreign hospitals in ways that are unavailable to us.

Uncertainties with respect to the China legal system could have a material adverse effect on us.

The legal system of China is a civil law system primarily based on written statutes. Unlike in a common law system, prior court decisions may be cited for reference but are not binding. Because the China legal system continues to rapidly evolve, the interpretations of many laws, regulations and rules are not always uniform and enforcement of these laws, regulations and rules involve uncertainties, which may limit legal protections available to us. Moreover, decision makers in the China judicial system have significant discretion in interpreting and implementing statutory and contractual terms, which may render it difficult for FibroGen Beijing to enforce the contracts it has entered into with our business partners, customers and suppliers. Different government departments may have different interpretations of certain laws and regulations, and licenses and permits issued or granted by one government authority may be revoked by a higher government authority at a later time. Navigating the uncertainty and change in the China legal system will require the devotion of significant resources and time, and there can be no assurance that our contractual and other rights will ultimately be enforced.

Changes in China's economic, political or social conditions or government policies could have a material adverse effect on our business and operations.

Chinese society and the Chinese economy continue to undergo significant change. Adverse changes in the political and economic policies of the Chinese government could have a material adverse effect on the overall economic growth of China, which could adversely affect our ability to conduct business in China. The Chinese government continues to adjust economic policies to promote economic growth. Some of these measures benefit the overall Chinese economy, but may also have a negative effect on us. For example, our financial condition and results of operations in China may be adversely affected by government control over capital investments or changes in tax regulations. As the Chinese pharmaceutical industry grows and evolves, the Chinese government may also implement measures to change the structure of foreign investment in this industry. We are unable to predict the frequency and scope of such policy changes, any of which could materially and adversely affect FibroGen Beijing's liquidity, access to capital and its ability to conduct business in China. Any failure on our part to comply with changing government regulations and policies could result in the loss of our ability to develop and commercialize our product candidates in China.

As part of a sweeping and ongoing government restructuring effort, China's highest legislative body, the National People's Congress, approved a plan to establish a State Administration for Market Regulation ("SAMR"), which will merge and undertake the responsibilities previously held by the State Administration for Industry and Commerce, the General Administration of Quality Supervision, Inspection and Quarantine, the Certification and Accreditation Administration, the Standardization Administration of China, and the NMPA, as well as anti-monopoly responsibilities previously held by the National Development and Reform Commission, Ministry of Commerce, and the Anti-Monopoly Office under the State Council. The restructuring also established the NMPA which has taken over much of the functions of the NMPA and will be supervised by the SAMR, while maintaining branches at the provincial level. A major government restructuring such as this one could cause significant delays and cost increases to our development, manufacturing, approval, and commercialization timelines in China. There has been turnover in government leadership and officials may be further assigned new roles and responsibilities, which may create delays and possibly new policies and priorities, and existing rules may be interpreted differently. It will take time for the restructuring to be fully implemented and the new structure to operate efficiently. As a result, our existing plans could be delayed or modified due to changes in regulations, policies or personnel decisions, all of which could have a material adverse impact on our operating results and business prospects.

Our operations in China subject us to various Chinese labor and social insurance laws, and our failure to comply with such laws may materially and adversely affect our business, financial condition and results of operations.

We are subject to China Labor Contract Law, which provides strong protections for employees and imposes many obligations on employers. The Labor Contract Law places certain restrictions on the circumstances under which employers may terminate labor contracts and require economic compensation to employees upon termination of employment, among other things. In addition, companies operating in China are generally required to contribute to labor union funds and the mandatory social insurance and housing funds. Any failure by us to comply with Chinese labor and social insurance laws may subject us to late fees, fines and penalties, or cause the suspension or termination of our ability to conduct business in China, any of which could have a material and adverse effect on business, results of operations and prospects.

Recent developments relating to the United Kingdom's referendum vote in favor of leaving the EU could adversely affect us.

The United Kingdom held a referendum on June 23, 2016 in which a majority voted for the United Kingdom's withdrawal from the EU, commonly referred to as "Brexit". As a result of this vote, negotiations are expected to commence to determine the terms of the United Kingdom's withdrawal from the EU as well as its relationship with the EU going forward, including the terms of trade between the United Kingdom and the EU. The effects of the United Kingdom's withdrawal from the EU, and the perceptions as to its impact, are expected to be far-reaching and may adversely affect business activity and economic conditions in Europe and globally and could continue to contribute to instability in global financial markets, including foreign exchange markets. The United Kingdom's withdrawal from the EU could also have the effect of disrupting the free movement of goods, services and people between the United Kingdom and the EU and could also lead to legal uncertainty and potentially divergent national laws and regulations as the United Kingdom determines which EU laws to replace or replicate, including laws that could impact our ability, or our collaborator's ability in the case of roxadustat, to obtain approval of our products or sell our products in the United Kingdom. However, the full effects of such withdrawal are uncertain and will depend on any agreements the United Kingdom may make to retain access to EU markets. Lastly, as a result of the United Kingdom's withdrawal from the EU, other European countries may seek to conduct referenda with respect to their continuing membership with the EU. Given these possibilities and others we may not anticipate, as well as the lack of comparable precedent, the full extent to which our business, results of operations and financial condition could be adversely affected by the United Kingdom's withdrawal from the EU is uncertain.

Risks Related to the Operation of Our Business

We may encounter difficulties in managing our growth and expanding our operations successfully.

As we seek to advance our product candidates through clinical trials and commercialization, we will need to expand our development, regulatory, manufacturing, commercialization and administration capabilities or contract with third parties to provide these capabilities for us. As our operations expand and we continue to undertake the efforts and expense to operate as a public reporting company, we expect that we will need to increase the responsibilities on members of management in order to manage any future growth effectively. Our failure to accomplish any of these steps could prevent us from successfully implementing our strategy and maintaining the confidence of investors in our company.

If we fail to attract and keep senior management and key personnel, in particular our chief executive officer, we may be unable to successfully develop our product candidates, conduct our clinical trials and commercialize our product candidates.

We are highly dependent on our chief executive officer, Thomas B. Neff, and other members of our senior management team. The loss of the services of Mr. Neff or any of these other individuals would be expected to significantly negatively impact the development and commercialization of our product candidates, our existing collaborative relationships and our ability to successfully implement our business strategy.

Recruiting and retaining qualified commercial, development, scientific, clinical, and manufacturing personnel are and will continue to be critical to our success, particularly as we expand our commercialization operations. Furthermore, replacing executive officers and key employees may be difficult and may take an extended period of time because of the limited number of individuals in our industry with the breadth of skills and experience required to successfully develop, gain regulatory approval of and commercialize product candidates. We may be unable to hire, train, retain or motivate these key personnel on acceptable terms given the intense competition among numerous biopharmaceutical companies for similar personnel.

There is also significant competition, in particular in the San Francisco Bay Area, for the hiring of experienced and qualified personnel, which increases the importance of retention of our existing personnel. If we are unable to continue to attract and retain personnel with the quality and experience applicable to our product candidates, our ability to pursue our strategy will be limited and our business and operations would be adversely affected.

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

We face an inherent risk of product liability as a result of the clinical testing, manufacturing and commercialization of our product candidates. Any such product liability claims may include allegations of defects in manufacturing, defects in design, a failure to warn of dangers inherent in a product, negligence, strict liability or breach of warranty. Claims could also be asserted under state consumer protection acts. If we are unable to obtain insurance coverage at levels that are appropriate to maintain our business and operations, or if we are unable to successfully defend ourselves against product liability claims, we may incur substantial liabilities or otherwise cease operations. Product liability claims may result in:

- termination of further development of unapproved product candidates or significantly reduced demand for any approved products;
- material costs and expenses to defend the related litigation;
- a diversion of time and resources across the entire organization, including our executive management;
- product recalls, withdrawals or labeling restrictions;
- termination of our collaboration relationships or disputes with our collaboration partners; and
- reputational damage negatively impacting our other product candidates in development.

If we fail to obtain and retain sufficient product liability insurance at an acceptable cost to protect against potential product liability claims, we may not be able to continue to develop our product candidates. We maintain product liability insurance in a customary amount for the stage of development of our product candidates. Although we believe that we have sufficient coverage based on the advice of our third party advisors, there can be no assurance that such levels will be sufficient for our needs. Moreover, our insurance policies have various exclusions, and we may be in a dispute with our carrier as to the extent and nature of our coverage, including whether we are covered under the applicable product liability policy. If we are not able to ensure coverage or are required to pay substantial amounts to settle or otherwise contest the claims for product liability, our business and operations would be negatively affected.

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

Despite the implementation of security measures, our internal computer systems, and those of our CROs, collaboration partners, and other third parties on which we rely, are vulnerable to damage from computer viruses, unauthorized access, natural disasters, fire, terrorism, war and telecommunication and electrical failures. We upgraded our disaster and data recovery capabilities in June 2017, however, to the extent that any disruption or security breach, in particular with our partners' operations, results in a loss of, or damage to, our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability and it could result in a material disruption and delay of our drug development programs. For example, the loss of clinical trial data from completed, ongoing or planned clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data.

We depend on sophisticated information technology systems to operate our business and a cyber-attack or other breach of these systems could have a material adverse effect on our business.

We rely on information technology systems to process, transmit and store electronic information in our day-to-day operations. The size and complexity of our information technology systems makes them vulnerable to a cyber-attack, malicious intrusion, breakdown, destruction, loss of data privacy or other significant disruption. While we have recently upgraded our disaster data recovery program, a successful attack could result in the theft or destruction of intellectual property, data, or other misappropriation of assets, or otherwise compromise our confidential or proprietary information and disrupt our operations. Cyber-attacks are becoming more sophisticated and frequent. We have invested in our systems and the protection and recoverability of our data to reduce the risk of an intrusion or

interruption, and we monitor and test our systems on an ongoing basis for any current or potential threats. There can be no assurance that these measures and efforts will prevent future interruptions or breakdowns. If we fail to maintain or protect our information technology systems and data integrity effectively or fail to anticipate, plan for or manage significant disruptions to these systems, we could have difficulty preventing, detecting and controlling such cyber-attacks and any such attacks could result in losses described above as well as disputes with physicians, patients and our partners, regulatory sanctions or penalties, increases in operating expenses, expenses or lost revenues or other adverse consequences, any of which could have a material adverse effect on our business, results of operations, financial condition, prospects and cash flows.

Our headquarters and data storage facilities are located near known earthquake fault zones. The occurrence of an earthquake, fire or any other catastrophic event could disrupt our operations or the operations of third parties who provide vital support functions to us, which could have a material adverse effect on our business, results of operations and financial condition.

We and some of the third party service providers on which we depend for various support functions, such as data storage, are vulnerable to damage from catastrophic events, such as power loss, natural disasters, terrorism and similar unforeseen events beyond our control. Our corporate headquarters and other facilities are located in the San Francisco Bay Area, which in the past has experienced severe earthquakes and fires.

We do not carry earthquake insurance. Earthquakes or other natural disasters could severely disrupt our operations, and have a material adverse effect on our business, results of operations, financial condition and prospects.

If a natural disaster, power outage or other event occurred that prevented us from using all or a significant portion of our headquarters, damaged critical infrastructure, or otherwise disrupted operations, it may be difficult or, in certain cases, impossible for us to continue our business for a substantial period of time. The disaster recovery and business continuity plans we have in place are unlikely to provide adequate protection in the event of a serious disaster or similar event. We may incur substantial expenses as a result of the limited nature of our disaster recovery and business continuity plans, which, particularly when taken together with our lack of earthquake insurance, could have a material adverse effect on our business.

Furthermore, integral parties in our supply chain are operating from single sites, increasing their vulnerability to natural disasters or other sudden, unforeseen and severe adverse events. If such an event were to affect our supply chain, it could have a material adverse effect on our business.

Risks Related to Our Common Stock

The market price of our common stock may be highly volatile, and you may not be able to resell your shares at or above your purchase price.

In general, pharmaceutical, biotechnology and other life sciences company stocks have been highly volatile in the current market. The volatility of pharmaceutical, biotechnology and other life sciences company stocks is sometimes unrelated to the operating performance of particular companies and biotechnology and life science companies stocks often respond to trends and perceptions rather than financial performance. In particular, the market price of shares of our common stock could be subject to wide fluctuations in response to the following factors:

- results of clinical trials of our product candidates, including roxadustat and pamrevlumab;
- the timing of the release of results of and regulatory updates regarding our clinical trials;
- the level of expenses related to any of our product candidates or clinical development programs;
- results of clinical trials of our competitors' products;
- safety issues with respect to our product candidates or our competitors' products;
- regulatory actions with respect to our product candidates and any approved products or our competitors' products;
- fluctuations in our financial condition and operating results, which will be significantly affected by the manner in which we recognize revenue from the achievement of milestones under our collaboration agreements;
- adverse developments concerning our collaborations and our manufacturers;
- the termination of a collaboration or the inability to establish additional collaborations;
- the publication of research reports by securities analysts about us or our competitors or our industry or negative recommendations or withdrawal of research coverage by securities analysts;
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- the inability to obtain adequate product supply for any approved drug product or inability to do so at acceptable prices;
- disputes or other developments relating to proprietary rights, including patents, litigation matters and our ability to obtain patent protection for our technologies;
- the ineffectiveness of our internal controls;
- our failure or the failure of our competitors to meet analysts' projections or guidance that we or our competitors may give to the market;
- additions and departures of key personnel;

- announced strategic decisions by us or our competitors;
- changes in legislation or other regulatory developments affecting our product candidates or our industry;
- fluctuations in the valuation of the biotechnology industry and particular companies perceived by investors to be comparable to us;
- sales of our common stock by us, our insiders or our other stockholders;
- speculation in the press or investment community;
- announcement or expectation of additional financing efforts;
- announcements of investigations or regulatory scrutiny of our operations or lawsuits filed against us;
- changes in accounting principles;
- activities of the government of China, including those related to the pharmaceutical industry as well as industrial policy generally;
- performance of other U.S. publicly traded companies with significant operations in China;
- terrorist acts, acts of war or periods of widespread civil unrest;
- natural disasters such as earthquakes and other calamities;
- changes in market conditions for biopharmaceutical stocks;
- changes in general market and economic conditions; and
- the other factors described in this “Risk Factors” section.

As a result of fluctuations caused by these and other factors, comparisons of our operating results across different periods may not be accurate indicators of our future performance. Any fluctuations that we report in the future may differ from the expectations of market analysts and investors, which could cause the price of our common stock to fluctuate significantly. Moreover, securities class action litigation has often been initiated against companies following periods of volatility in their stock price. This type of litigation could result in substantial costs and divert our management’s attention and resources, and could also require us to make substantial payments to satisfy judgments or to settle litigation.

We have broad discretion in the use of the net proceeds from our underwritten public offerings of common stock completed on April 11, 2017 (the “April 2017 Offering”) and August 24, 2017 (the “August 2017 Offering”) and may not use them effectively.

The net proceeds from the April 2017 Offering is intended to be used to fund the expansion of product development in China, including developing roxadustat in additional indications beyond CKD, manufacturing and commercialization activities, as well as for general corporate purposes. The net proceeds from the August 2017 Offering is intended to be used to fund the expansion of product development, including our development of pamrevlumab beyond current Phase 2 programs, manufacturing and commercialization activities, as well as for general corporate purposes. These general corporate purposes, may include, among other things, funding research and development, clinical trials, vendor payables, potential regulatory submissions, hiring additional personnel and capital expenditures. However, we have no current commitments or obligations to use the net proceeds in the manner described above. Our management has broad discretion in the application of the balance of the net proceeds from the April 2017 Offering and the August 2017 Offering, and could spend the proceeds in ways our stockholders may not agree with or that fails to improve our business or enhance the value of our common stock. The failure by our management to use these funds effectively could result in financial losses that could harm our business, cause the price of our common stock to decline and delay the development of our product candidates.

If securities or industry analysts do not continue to publish research or reports about our business, or if they change their recommendations regarding our stock adversely, our stock price and trading volume could decline.

The trading market for our common stock will be influenced by the research and reports that industry or securities analysts publish about us or our business. If one or more of the analysts who cover us downgrade our stock, our stock price would likely decline. If one or more of these analysts cease coverage of our company or fail to regularly publish

reports on us, we could lose visibility in the financial markets, which in turn could cause our stock price or trading volume to decline.

Our principal stockholders and management own a significant percentage of our stock and will be able to exercise significant influence over matters subject to stockholder approval.

As of January 31, 2019, our executive officers, directors and principal stockholders, together with their respective affiliates, owned approximately 39.79% of our common stock, including shares subject to outstanding options that are exercisable within 60 days after such date and shares issuable upon settlement of restricted stock units that will vest within 60 days after such date. This percentage is based upon information supplied by officers, directors and principal stockholders and Schedules 13D and 13G, if any, filed with the SEC, which information may not be accurate as of October 31, 2018. Accordingly, these stockholders will be able to exert a significant degree of influence over our management and affairs and over matters requiring stockholder approval, including the election of our board of directors and approval of significant corporate transactions. The interests of this group may differ from those of other stockholders and they may vote their shares in a way that is contrary to the way other stockholders vote their shares. This concentration of ownership could have the effect of entrenching our management and/or the board of directors, delaying or preventing a change in our control or otherwise discouraging a potential acquirer from attempting to obtain control of us, which in turn could have a material and adverse effect on the fair market value of our common stock.

Additional remedial measures that may be imposed in the proceedings instituted by the SEC against five China based accounting firms, including the Chinese affiliate of our independent registered public accounting firm, could result in our consolidated financial statements being determined to not be in compliance with the requirements of the Exchange Act.

In late 2012, the SEC commenced administrative proceedings under Rule 102(e) of its Rules of Practice and also under the Sarbanes-Oxley Act of 2002 against the Chinese affiliates of the “big four” accounting firms, including PricewaterhouseCoopers Zhong Tian CPAs Limited, the Chinese affiliate of our independent registered public accounting firm. The Rule 102(e) proceedings initiated by the SEC relate to these firms’ failure to produce documents, including audit work papers, in response to the request of the SEC pursuant to Section 106 of the Sarbanes-Oxley Act of 2002, as the auditors located in China are not in a position lawfully to produce documents directly to the SEC because of restrictions under Chinese law and specific directives issued by the China Securities Regulatory Commission (“CSRC”). The issues raised by the proceedings are not specific to our auditors or to us.

In January 2014, an administrative law judge reached an initial decision that the Chinese affiliates of the “big four” accounting firms should be barred from practicing before the SEC for a period of six months. In February 2015, the Chinese affiliates of the “big four” accounting firms each agreed to a censure and to pay a fine to the SEC to settle the dispute and avoid suspension of their ability to practice before the SEC and audit U.S.-listed companies. The settlement required the firms to follow detailed procedures and to seek to provide the SEC with access to Chinese firms’ audit documents via the CSRC. If future document productions fail to meet specified criteria, the SEC retains authority to impose a variety of additional remedial measures on the firms depending on the nature of the failure.

We cannot predict if the SEC will further review the four firms’ compliance with specified criteria or if such further review would result in the SEC imposing additional penalties such as suspensions or commencing any further administrative proceedings. Although it does not play a substantial role (as defined under PCAOB standards) in the audit of our consolidated financial statements, if PricewaterhouseCoopers Zhong Tian CPAs Limited were denied, temporarily, the ability to practice before the SEC, our ability to produce audited consolidated financial statements for our company could be affected and we could be determined not to be in compliance with the requirements of the Exchange Act. Such a determination could ultimately lead to the delisting of our shares from the Nasdaq Global Select Market or deregistration from the SEC, or both, which would substantially reduce or effectively terminate the trading of our stock.

We may engage in future acquisitions that could disrupt our business, cause dilution to our stockholders and harm our business, results of operations, financial condition and cash flows and future prospects.

While we currently have no specific plans to acquire any other businesses, we may, in the future, make acquisitions of, or investments in, companies that we believe have products or capabilities that are a strategic or commercial fit with our present or future product candidates and business or otherwise offer opportunities for our company. In connection with these acquisitions or investments, we may:

- issue stock that would dilute our existing stockholders' percentage of ownership;
- incur debt and assume liabilities; and
- incur amortization expenses related to intangible assets or incur large and immediate write-offs.

We may not be able to complete acquisitions on favorable terms, if at all. If we do complete an acquisition, we cannot assure you that it will ultimately strengthen our competitive position or that it will be viewed positively by customers, financial markets or investors. Furthermore, future acquisitions could pose numerous additional risks to our operations, including:

- problems integrating the purchased business, products or technologies, or employees or other assets of the acquisition target;
- increases to our expenses;
- disclosed or undisclosed liabilities of the acquired asset or company;
- diversion of management's attention from their day-to-day responsibilities;
- reprioritization of our development programs and even cessation of development and commercialization of our current product candidates;
- harm to our operating results or financial condition;
- entrance into markets in which we have limited or no prior experience; and
- potential loss of key employees, particularly those of the acquired entity.

We may not be able to complete any acquisitions or effectively integrate the operations, products or personnel gained through any such acquisition.

Provisions in our charter documents and Delaware law may have anti-takeover effects that could discourage an acquisition of us by others, even if an acquisition would be beneficial to our stockholders, and may prevent attempts by our stockholders to replace or remove our current directors or management.

Provisions in our amended and restated certificate of incorporation and amended and restated bylaws contain provisions that may have the effect of discouraging, delaying or preventing a change in control of us or changes in our management. These provisions could also limit the price that investors might be willing to pay in the future for shares of our common stock, thereby depressing the market price of our common stock. In addition, because our board of directors is responsible for appointing the members of our management team, these provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors. Among other things, these provisions:

- authorize "blank check" preferred stock, which could be issued by our board of directors without stockholder approval and may contain voting, liquidation, dividend and other rights superior to our common stock;
- create a classified board of directors whose members serve staggered three-year terms;
- specify that special meetings of our stockholders can be called only by our board of directors pursuant to a resolution adopted by a majority of the total number of directors;
- prohibit stockholder action by written consent;
- 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;
- provide that our directors may be removed prior to the end of their term 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;
- require a supermajority vote of the holders of our common stock or the majority vote of our board of directors to amend our bylaws; and
- require a supermajority vote of the holders of our common stock to amend the classification of our board of directors into three classes and to amend certain other provisions of our certificate of incorporation.

These provisions, alone or together, could delay or prevent hostile takeovers and changes in control or changes in our 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.

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Moreover, because we are incorporated in Delaware, we are governed by certain anti-takeover provisions under Delaware law which may discourage, delay or prevent someone from acquiring us or merging with us whether or not it is desired by or beneficial to our stockholders. We are subject to the provisions of Section 203 of the Delaware General Corporation Law, which prohibits a person who owns in excess of 15% of our outstanding voting stock from merging or combining with us for a period of three years after the date of the transaction in which the person acquired in excess of 15% of our outstanding voting stock, unless the merger or combination is approved in a prescribed manner.

Any provision of our amended and restated certificate of incorporation, our amended and restated bylaws or Delaware law that has the effect of delaying or deterring a change in control could limit the opportunity for our stockholders to receive a premium for their shares of our common stock, and could also affect the price that some investors are willing to pay for our common stock.

Changes in our tax provision or exposure to additional tax liabilities could adversely affect our earnings and financial condition.

As a multinational corporation, we are subject to income taxes in the U.S. and various foreign jurisdictions. Significant judgment is required in determining our global provision for income taxes and other tax liabilities. In the ordinary course of a global business, there are intercompany transactions and calculations where the ultimate tax determination is uncertain. Our income tax returns are subject to audits by tax authorities. Although we regularly assess the likelihood of adverse outcomes resulting from these examinations to determine our tax estimates, a final determination of tax audits or tax disputes could have an adverse effect on our results of operations and financial condition.

We are also subject to non-income taxes, such as payroll, sales, use, value-added, net worth, property, gross receipts, and goods and services taxes in the U.S., state and local, or various foreign jurisdictions. We are subject to audit and assessments by tax authorities with respect to these non-income taxes and may have exposure to additional non-income tax liabilities which could have an adverse effect on our results of operations and financial condition.

On December 22, 2017, the U.S. enacted the Tax Act that instituted fundamental changes to the taxation of multinational corporations. The Tax Act includes changes to the taxation of foreign earnings by implementing a dividend exemption system, expansion of the current anti-deferral rules, a minimum tax on low-taxed foreign earnings and new measures to deter base erosion. The Tax Act also includes a permanent reduction in the corporate tax rate to 21%, repeal of the corporate alternative minimum tax, expensing of capital investment, and limitation of the deduction for interest expense. Furthermore, as part of the transition to the new tax system, a one-time transition tax is imposed on a U.S. shareholder’s historical undistributed earnings of foreign affiliates. Although the Tax Act is generally effective January 1, 2018, GAAP requires recognition of the tax effects of new legislation during the reporting period that includes the enactment date, which was December 22, 2017.

As a result of the impacts of the Tax Act, the SEC provided guidance that allows us to record provisional amounts for those impacts, with the requirement that the accounting be completed in a period not to exceed one year from the date of enactment. As of December 31, 2018, we completed our analysis of the accounting for the tax effects of the Tax Act and no material adjustments were recognized as of December 31, 2018. The primary impact of the Tax Act relates to the re-measurement of deferred tax assets and liabilities resulting from the Corporate Tax Rate Change, which was recorded as of December 31, 2017. Developing interpretations of the provisions of the Tax Act, changes to U.S. Treasury regulations, administrative interpretations or court decisions interpreting the Tax Act in the future periods may require further adjustments to our analysis.

Our amended and restated certificate of incorporation designates the state or federal courts located in the State of Delaware as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers or employees.

Our amended and restated certificate of incorporation provides that, subject to limited exceptions, the state and federal courts located in the State of Delaware will be the sole and exclusive forum for (1) any derivative action or proceeding brought on our behalf, (2) any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders, (3) any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law, our amended and restated certificate of incorporation or our amended and restated by-laws, or (4) any other action asserting a claim against us that is governed by the internal affairs doctrine. Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and to have consented to the provisions of our amended and restated certificate of incorporation described above. This choice of forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage such lawsuits against us and our directors, officers and employees. Alternatively, if a court were to find these provisions of our amended and restated certificate of incorporation inapplicable to, or unenforceable in respect of, one or more of the specified types of actions or proceedings, we may incur additional costs associated with resolving such matters in other jurisdictions, which could adversely affect our business and financial condition.

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

You should not rely on an investment in our common stock to provide dividend income. We do not anticipate that we will pay any cash dividends to holders of our common stock in the foreseeable future and investors seeking cash dividends should not purchase our common stock. We plan to retain any earnings to invest in our product candidates and maintain and expand our operations. Therefore, capital appreciation, or an increase in your stock price, which may never occur, may be the only way to realize any return on your investment.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Our corporate and research and development operations are located in San Francisco, California, where we lease approximately 234,000 square feet of office and laboratory space with approximately 35,000 square feet subleased. The lease for our San Francisco headquarters expires in 2023. We also lease approximately 67,000 square feet of office and manufacturing space in Beijing, China. Our lease in China expires in 2021. We are constructing a commercial manufacturing facility of approximately 5,500 square meters in Cangzhou, China, on approximately 33,000 square meters of land. Our right to use such land expires in 2068. We believe our facilities are adequate for our current needs and that suitable additional or substitute space would be available if needed.

ITEM 3. LEGAL PROCEEEDINGS

We are not currently a party to any material legal proceedings.

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 for Common Stock

Our common stock has been listed on the NASDAQ Global Select Market ("NASDAQ") since November 14, 2014, under the symbol "FGEN." Prior to our initial public offering, there was no public market for our common stock.

The following table sets forth for the indicated periods the high and low closing sales prices of our common stock as reported on the NASDAQ.

	High	Low
2018:		
Quarter ended March 31, 2018	$61.65	$45.35
Quarter ended June 30, 2018	64.95	44.90
Quarter ended September 30, 2018	67.25	56.30
Quarter ended December 31, 2018	60.16	37.97
2017:		
Quarter ended March 31, 2017	$26.45	$21.30
Quarter ended June 30, 2017	32.55	22.95
Quarter ended September 30, 2017	53.90	32.55
Quarter ended December 31, 2017	60.10	41.95

Stock Price Performance Graph

The following graph illustrates a comparison of the total cumulative stockholder return for our common stock since November 14, 2014, which is the date our common stock first began trading on the NASDAQ Global Select Market, to two indices: the NASDAQ Composite Index and the NASDAQ Biotechnology Index. The graph assumes an initial investment of $100 on November 14, 2014, in our common stock, the stocks comprising the NASDAQ Composite Index, and the stocks comprising the NASDAQ Biotechnology Index. The stockholder return shown in the graph below is not necessarily indicative of future performance, and we do not make or endorse any predictions as to future stockholder returns.

The above Stock Price Performance Graph and related information shall not be deemed “soliciting material” or to be “filed” with the Securities and Exchange Commission, nor shall such information be incorporated by reference into any future filing under the Securities Actor Exchange Act, except to the extent that we specifically incorporate it by reference into such filing.

Dividend Policy

We have never declared or paid any cash dividends on our capital stock. We currently intend to retain all available funds and any future earnings to support our operations and finance the growth and development of our business. We do not intend to pay cash dividends on our common stock for the foreseeable future. Any future determination related to our dividend policy will be made at the discretion of our board of directors and will depend on then-existing conditions, including our financial condition, operating results, contractual restrictions, capital requirements, business prospects and other factors our board of directors may deem relevant.

Stockholders

As of January 31, 2019, there were 154 registered stockholders of record for our common stock. This number of registered stockholders does not include stockholders whose shares are held in street name by brokers and other nominees, or may be held in trust by other entities. Therefore, the actual number of stockholders is greater than this number of registered stockholders of record.

Use of Proceeds from Initial Public Offering of Common Stock

On November 13, 2014, our Registration Statement on Form S-1, as amended (Reg. Nos. 333-199069 and 333-200189) was declared effective in connection with the initial public offering of our common stock. There has been no material change in the planned use of proceeds from our initial public offering as described in our final prospectus filed with the SEC pursuant to Rule 424(b) under the Securities Act on November 14, 2014.

Recent Sales of Unregistered Securities

During the year ended December 31, 2016, warrants to purchase 1,600 shares and 1,108 shares of our common stock were net exercised at a per share price of $4.38 and $15.00, respectively.

During the year ended December 31, 2015, warrants to purchase 72,000 shares, 49,842 shares, 26,880 shares and 17,256 shares of our common stock were net exercised at a per share price of $4.38, $15.00, $3.13 and $4.38, respectively.

These shares issued pursuant to the warrants were not registered under the Securities Act of 1933, as amended, in reliance upon the exemption set forth in Section 4(a)(2) of such Act for transactions not involving a public offering.

Purchases of Equity Securities by the Issuer and Affiliated Purchasers

None.

ITEM 6. SELECTED FINANCIAL DATA

The selected consolidated results of operations data for the years ended December 31, 2018, 2017 and 2016, and the consolidated balance sheet data as of December 31, 2018 and 2017 should be read together with Part II, Item 7 “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and in conjunction with the consolidated financial statements, related notes, and other financial information included elsewhere in this Annual Report. The selected consolidated results of operations data for the years ended December 31, 2015 and 2014 and the consolidated balance sheet data as of December 31, 2016, 2015 and 2014 have been derived from audited financial statements not included herein. Our historical results are not necessarily indicative of the results to be expected in the future.

	Years Ended December 31,				
	2018	2017 (1)	2016 (1)	2015 (1)	2014 (1)
	(in thousands, except for per share data)				
Result of Operations					
Revenue:					
License revenue (1)	$22,269	$9,933	$50,607	$89,401	$80,792
Development and other revenue (1)	125,913	121,063	132,582	82,985	46,429
Product revenue (1)	64,776	—	—	—	—
Total revenue (1)	212,958	130,996	183,189	172,386	127,221
Operating expenses:					
Research and development (2)	235,839	196,517	187,206	214,089	150,794
General and administrative (2)	63,812	51,760	46,025	44,364	36,909
Total operating expenses	299,651	248,277	233,231	258,453	187,703
Loss from operations	(86,693)	(117,281)	(50,042)	(86,067)	(60,482)
Interest and other, net:					
Interest expense	(10,991)	(9,706)	(10,725)	(11,033)	(11,108)
Interest income and other, net	11,568	6,433	2,628	3,121	1,706
Total interest and other, net	577	(3,273)	(8,097)	(7,912)	(9,402)
Loss before income taxes	(86,116)	(120,554)	(58,139)	(93,979)	(69,884)
Provision for (benefit from) income taxes	304	321	(71)	242	—
Net loss	$(86,420)	$(120,875)	$(58,068)	$(94,221)	$(69,884)
Net loss per share - basic and diluted	$(1.03)	$(1.66)	$(0.93)	$(1.56)	$(3.72)
Weighted-average number of common shares used in net loss per share - basic and diluted	84,062	72,987	62,744	60,337	18,775

(1) Revenue for the years ended December 31, 2017, 2016, 2015 and 2014 were recast to reflect the adoption of the new revenue standards. See Note 2 to the consolidated financial statements.

(2) Stock-based compensation expense included in our results of operations:

	Years Ended December 31,				
	2018	2017	2016	2015	2014
	(in thousands)				
Research and development	$30,491	$21,807	$19,070	$16,987	$10,893

General and administrative	21,651	15,732	13,062	10,694	7,805
Total stock-based compensation expense	$52,142	$37,539	$32,132	$27,681	$18,698

	December 31,				
	2018	2017 (1)	2016 (1)	2015 (1)	2014 (1)
	(in thousands)				
Balance Sheet Data:					
Cash and cash equivalents	$89,258	$673,658	$173,782	$153,324	$165,455
Short-term and long-term investments	587,964	72,566	150,407	159,567	158,633
Working capital (1)	600,982	663,010	192,806	131,468	134,314
Total assets	880,598	898,650	469,552	470,574	483,528
Deferred revenue (1)	149,880	154,911	154,737	141,511	105,416
Lease financing obligations	98,105	98,476	97,856	97,445	97,221
Accumulated deficit (1)	(715,827)	(630,657)	(509,782)	(451,714)	(357,493)
Total stockholders' equity (1)	509,199	528,467	115,798	133,902	186,194
Non-controlling interests	19,271	19,271	19,271	19,271	19,271
Total equity (deficit) (1)	$528,470	$547,738	$135,069	$153,173	$205,465

(1) Deferred revenue and accumulated deficit as of December 31, 2017, 2016, 2015 and 2014 were recast to reflect the adoption of

the new revenue standards. See Note 2 to the consolidated financial statements.

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

You should read the following discussion and analysis of our financial condition and results of operations together with our consolidated financial statements and related notes and other financial information included in Item 15 of this Annual Report on Form 10-K. Some of the information contained in this discussion and analysis or set forth elsewhere in this Annual Report, including information with respect to our plans and strategy for our business, international operations and product candidates, includes forward-looking statements that involve risks and uncertainties. You should review the "Risk Factors" section of this Annual Report for a discussion of important factors that could cause our actual results to differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis.

BUSINESS OVERVIEW

We were incorporated in 1993 in Delaware and are a leading biopharmaceutical company discovering and developing a pipeline of first-in-class therapeutics. We have applied our pioneering expertise in hypoxia-inducible factor ("HIF") and connective tissue growth factor ("CTGF") biology to develop innovative medicines for the treatment of anemia, fibrotic disease, and cancer. Roxadustat (FG-4592), our most advanced product candidate, is an oral small molecule inhibitor of HIF prolyl hydroxylase ("HIF-PH") activity. Roxadustat has received approval of its New Drug Application ("NDA") in anemia associated with chronic kidney disease ("CKD") in dialysis-dependent ("DD") patients from the National Medical Products Administration ("NMPA") of the People's Republic of China ("China"). In conjunction with our collaboration partners, AstraZeneca AB ("AstraZeneca") and Astellas Pharma Inc. ("Astellas"), we have completed the Phase 3 trials of roxadustat intended to support our NDA in the United States ("U.S.") and Marketing Authorization Application ("MAA") in the European Union ("EU") for the treatment of anemia in CKD. We and our partners are in the process of preparing an NDA for submission to the U.S. Food and Drug Administration ("FDA") and an MAA for submission to the European Medicines Agency this year. Both the U.S. NDA and European MAA for roxadustat are expected to cover anemia associated with dialysis-dependent CKD and non-dialysis-dependent CKD. In Japan, our partner Astellas has filed an NDA for roxadustat for the treatment of anemia in dialysis patients with the Pharmaceuticals and Medical Devices Agency ("PMDA"). We are also in Phase 3 clinical development for the treatment of anemia associated with myelodysplastic syndromes ("MDS"). Pamrevlumab, a human monoclonal antibody that inhibits the activity of CTGF, is advancing towards Phase 3 clinical development for the treatment of idiopathic pulmonary fibrosis ("IPF") and pancreatic cancer, and is currently in a Phase 2 trial for Duchenne muscular dystrophy ("DMD").

Financial Highlights

	Years Ended December 31,		
	2018	2017 *	2016 *
	(in thousands, except for per share data)		
Result of Operations			
Revenue	$212,958	$130,996	$ 183,189
Operating expenses	299,651	248,277	233,231
Net loss	(86,420)	(120,875)	(58,068)
Net loss per share - basic and diluted	$(1.03)	$(1.66)	$ (0.93)

	December 31, 2018	December 31, 2017
	(in thousands)	
Balance Sheet		
Cash and cash equivalents	$89,258	$ 673,658
Short-term and long-term investments	$587,964	$ 72,566
Accounts receivable	$63,684	$ 8,452

*Recast to reflect the adoption of the new revenue standards. See Note 2 to the consolidated financial statements.

Our revenue for the year ended December 31, 2018 increased compared to the prior year primarily due to the $64.8 million product revenue for API delivered during 2018, under the amendment to the collaboration agreement with Astellas for roxadustat for the treatment of anemia in Japan ("Japan Agreement"), to conduct commercial scale manufacturing validation for roxadustat drug product in anticipation of commercial launch in Japan. In addition, we recognized substantially the entire $15.0 million regulatory milestone associated with an NDA submission during 2018 in Japan that was included in the transaction price and allocated to performance obligations under the Japan Agreement in the second quarter of 2018. Moreover, during the fourth quarter of 2018, a $6.0 million milestone payable was triggered under the collaboration agreements with AstraZeneca upon our receipt of marketing authorization from the NMPA for roxadustat, a first-in-class hypoxia-inducible factor prolyl hydroxylase inhibitor, for the treatment of anemia caused by CKD in patients on dialysis. Another $6.0 million milestone payable was triggered under the collaboration agreement with AstraZeneca upon our receipt of First Manufacturing Approval for a Product in the Field in the Territory, which allows production for Phase IV clinical studies, patients' early experience programs, donation programs, as well as to supply products for testing and assessments required prior to launch. Approximately $9.9 million of the total $12.0 million milestone payables was recognized as revenue during the fourth quarter of 2018 from performance obligations satisfied or partially satisfied. Comparatively, we received a $15.0 million milestone revenue recorded under our collaboration agreements with AstraZeneca, during the fourth quarter of 2017, $11.5 million of which was recognized during 2017.

Operating expenses increased for the year ended December 31, 2018 compared to the prior year primarily due to $22.4 million higher drug development expenses associated with drug substance manufacturing activities related to pamrevlumab, $14.6 million higher stock-based compensation due to the cumulative impact of stock option grant activities, $12.9 million higher employee-related expenses resulting from higher average compensation level and higher headcount, and $8.4 million higher facility related expenses relative to the prior period in which our property taxes were reduced as a result of a final settlement received for historical property tax payments, as well as higher property management and maintenance costs during the current year. The increases were partially offset by $11.3 million lower clinical trial activities related to roxadustat and pamrevlumab.

Our research and development expenses were $235.8 million, $196.5 million and $187.2 million for the years ended December 31, 2018, 2017 and 2016, respectively. Since inception and through December 31, 2018, we have incurred a total of $1,752.0 million in research and development expenses, a majority of which relates to the development of roxadustat, pamrevlumab and other HIF-PH inhibitors. We expect to continue to incur significant expenses and operating losses over at least the next several years and we expect our research and development expenses to continue to increase in the future as we advance our product candidates through clinical trials and expand our product candidate portfolio. In addition, we expect to incur significant expenses relating to seeking regulatory approval for our product candidates and commercializing those products in various markets, including China. We consider the active management and development of our clinical pipeline to be particularly crucial to our long-term success. The process of conducting the necessary clinical research to obtain regulatory approval is costly and time consuming.

The actual probability of success for each of our product candidates and clinical programs, and our ability to generate product revenue and become profitable, depends upon a variety of factors, including the quality of the product candidate, clinical results, investment in the program, competition, manufacturing capability, commercial viability, and our and our partners' ability to successfully execute our development and commercialization plans. For a description of the numerous risks and uncertainties associated with product development, refer to "Risk Factors."

During the year ended December 31, 2018, we had a net loss of $86.4 million, or net loss per basic and diluted share of $1.03, as compared to a net loss of $120.9 million, or net loss per basic and diluted share of $1.66 for the prior year, primarily due to an increase in revenue, partially offset by an increase in operating expenses.

Cash and cash equivalents, investments and accounts receivable totaled $740.9 million at December 31, 2018, a decrease of $13.8 million from December 31, 2017, primarily due to cash used in operations.

Programs

Roxadustat, our most advanced product candidate, has received approval of its NDA in anemia associated with CKD in dialysis-dependent patients from the NMPA of China. In conjunction with our collaboration partners, we have completed the Phase 3 trials of roxadustat intended to support our NDA in the U.S. and MAA in the EU for the treatment of anemia in CKD. In Japan, Astellas submitted an NDA for the treatment of anemia in CKD patients on dialysis in September 2018, which is currently under review by the PMDA. Beyond anemia in CKD, roxadustat is in Phase 3 clinical development in the U.S. and Europe and in Phase 2/3 development in China for anemia associated with MDS.

Pamrevlumab, a human monoclonal antibody that inhibits the activity of CTGF, is advancing towards Phase 3 clinical development for the treatment of IPF and pancreatic cancer, and is currently in a Phase 2 trial for DMD.

Collaboration Partnerships for Roxadustat

Our current and future research, development, manufacturing and commercialization efforts with respect to roxadustat and our other product candidates currently in development depend on funds from our collaboration agreements with Astellas and AstraZeneca as described below.

Astellas

In June 2005, we entered into the Japan Agreement with Astellas for roxadustat for the treatment of anemia in Japan. In April 2006, we entered into the Europe Agreement with Astellas for roxadustat for the treatment of anemia in Europe, the Commonwealth of Independent States, the Middle East, and South Africa. Under these agreements, we provide Astellas the right to develop and commercialize roxadustat for anemia indications in these territories.

We share responsibility with Astellas for clinical development activities required for the U.S. and the EU regulatory approval of roxadustat, and share equally those development costs under the agreed development plan for such activities. Astellas will be responsible for clinical development activities and all associated costs required for regulatory approval in all other countries in the Astellas territories. Astellas will own and have responsibility for regulatory filings in its territories. We are responsible, either directly or through our contract manufacturers, for the manufacture and supply of all quantities of roxadustat to be used in development and commercialization under the agreements.

The Astellas agreements will continue in effect until terminated. Either party may terminate the agreements for certain material breaches by the other party. In addition, Astellas will have the right to terminate the agreements for certain specified technical product failures, upon generic sales reaching a particular threshold, upon certain regulatory actions, or upon our entering into a settlement admitting the invalidity or unenforceability of our licensed patents. Astellas may also terminate the agreements for convenience upon advance written notice to us. In the event of any termination of the agreements, Astellas will transfer and assign to us the regulatory filings for roxadustat and will assign or license to us the relevant trademarks used with the products in the Astellas territories. Under certain terminations, Astellas is also obligated to pay us a termination fee.

Consideration under these agreements includes a total of $360.1 million in upfront and non-contingent payments, and milestone payments totaling $557.5 million, of which $542.5 million are development and regulatory milestones and $15.0 million are commercial-based milestones. Total consideration, excluding development cost reimbursement and product sales-related payments, could reach $917.6 million. The aggregate amount of such consideration received, including development cost reimbursement and product sales-related payments, through December 31, 2018 totals $487.6 million.

During 2016, we recognized $10.0 million of revenue as a result of the initiation by Astellas of the first Phase 3 clinical study in Japan of roxadustat for treatment of anemia associated with CKD in patients on dialysis. During the second quarter of 2018, Astellas reported positive results from the final Phase 3 CKD-dialysis trial of roxadustat in Japan, indicating that Astellas was ready to make an NDA submission for the treatment of anemia with roxadustat in CKD-dialysis patients in 2018. We evaluated the regulatory milestone payment associated with NDA submission in Japan based on variable consideration requirements under the current revenue standards and concluded that this milestone became probable of being achieved in the second quarter of 2018. Accordingly, the consideration of $15.0 million associated with this milestone was included in the transaction price and allocated to performance obligations under the Japan Agreement, substantially all of which was recognized as revenue in 2018.

On November 30, 2018, FibroGen and Astellas entered into an amendment to the Japan Agreement that will allow Astellas to manufacture roxadustat drug product for commercialization in Japan (the “Japan Amendment”). Under this

amendment, FibroGen would continue to manufacture and deliver to Astellas roxadustat API. The commercial terms of the Japan Agreement relating to the transfer price for roxadustat for commercial use remain substantially the same, reflecting an adjustment for the manufacture of drug product by Astellas rather than FibroGen. This amendment obligates Astellas to purchase API from FibroGen, of which $20.9 million was delivered to Astellas in the second quarter of 2018 under a material transfer agreement to conduct commercial scale manufacturing validation for roxadustat drug product in anticipation of commercial launch in Japan. The remaining $43.9 million of API was delivered to Astellas in December 2018.

In the fourth quarter of 2018, we were engaged in the final stages of review with our partners over the proposed development of roxadustat for the treatment of chemotherapy induced anemia (“CIA”). AstraZeneca and Astellas approved the program in December 2018 and January 2019, respectively. Costs associated with the development of this indication are shared 50-50 between our two partners. For revenue recognition purposes, the Company concluded that this new indication represents a modification to the Europe agreements and will be accounted for separately, meaning the development costs associated with the new indications are distinct from the original development costs. The development service period for roxadustat for the treatment of CIA under the Europe Agreement is estimated to continue through the end of 2023 to allow for development of this indication.

Additionally, under these agreements, Astellas pays 100% of the commercialization costs in its territories. Astellas will pay us a transfer price, based on net sales, in the low 20% range for our manufacture and delivery of roxadustat.

In addition, as of December 31, 2018, Astellas had separate investments of $80.5 million in the equity of FibroGen, Inc.

AstraZeneca

In July 2013, we entered into the U.S./RoW Agreement a collaboration agreement with AstraZeneca for roxadustat for the treatment of anemia in the U.S. and all territories not previously licensed to Astellas, except China. In July 2013, through our China subsidiary and related affiliates, we entered into the China Agreement a collaboration agreement with AstraZeneca for roxadustat for the treatment of anemia in China. Under these agreements we provide AstraZeneca the right to develop and commercialize roxadustat for anemia in these territories. We share responsibility with AstraZeneca for clinical development activities required for U.S. regulatory approval of roxadustat.

In 2015, we reached the $116.5 million cap on our initial funding obligations (during which time we shared 50% of the joint initial development costs), therefore all development and commercialization costs for roxadustat for the treatment of anemia in CKD in the U.S., Europe, Japan and all other markets outside of China have been paid by Astellas and AstraZeneca since reaching the cap.

In China, FibroGen (China) Medical Technology Development Co., Ltd. (“FibroGen Beijing”) will conduct the development work for CKD anemia, will hold all of the regulatory licenses issued by China regulatory authorities, and will be primarily responsible for regulatory, clinical and manufacturing. China development costs are shared 50/50. AstraZeneca is also responsible for 100% of development expenses in all other licensed territories outside of China. We are responsible, through our contract manufacturers, for the manufacture and supply of all quantities of roxadustat to be used in development and commercialization under the AstraZeneca agreements.

Under the AstraZeneca agreements, we will receive upfront and subsequent non-contingent payments totaling $402.2 million. Potential milestone payments under the agreements total $1.2 billion, of which $571.0 million are development and regulatory milestones and $652.5 million are commercial-based milestones. Total consideration under the agreements, excluding development cost reimbursement, transfer price payments, royalties and profit share, could reach $1.6 billion. The aggregate amount of such consideration received through December 31, 2018 totals $432.2 million.

Under the U.S./RoW Agreement, AstraZeneca will pay for all commercialization costs in the U.S. and RoW and AstraZeneca will be responsible for the U.S. commercialization of roxadustat, with FibroGen undertaking specified promotional activities in the end stage renal disease segment in the U.S. In addition, we will receive a transfer price for delivery of commercial product based on a percentage of net sales in the low- to mid-single digit range and AstraZeneca will pay us a tiered royalty on net sales of roxadustat in the low 20% range.

Under the China Agreement, which is conducted through FibroGen China Anemia Holdings, Ltd. (“FibroGen China”), the commercial collaboration is structured as a 50/50 profit share. AstraZeneca will conduct commercialization activities in China as well as serve as the master distributor for roxadustat and will fund roxadustat launch costs in China until FibroGen Beijing has achieved profitability. At that time, AstraZeneca will recoup 50% of their historical launch costs out of initial roxadustat profits in China.

Payments under these agreements include over $500.0 million in upfront, non-contingent and other payments received or expected to be received prior to the first U.S. approval, excluding development expense reimbursement.

During the second quarter of 2016, we received an upfront payment of $62.0 million as a time based development milestone.

In October 2017, then the China Food and Drug Administration (“CFDA,” now known as the NMPA) accepted our NDA for registration of roxadustat for anemia in dialysis-dependent CKD and non-dialysis-dependent CKD (“NDD-CKD”) patients. This NDA submission triggered a $15.0 million milestone payment to us by AstraZeneca, which became probable of being achieved during the third quarter of 2017, and therefore partially recognized as revenue under the new revenue standards during 2017.

On December 17, 2018, FibroGen (China) Medical Technology Development Co., Ltd. (“FibroGen China”), received marketing authorization from the NMPA for roxadustat, a first-in-class hypoxia-inducible factor prolyl hydroxylase inhibitor, for the treatment of anemia caused by CKD in patients on dialysis. This approval triggered a $6.0 million milestone payable to us by AstraZeneca. On December 29, 2018, FibroGen China received First Manufacturing Approval for a Product in the Field in the Territory, which allows production for Phase IV clinical studies, patients’ early experience programs, donation programs, as well as to supply products for testing and assessments required prior to launch. This approval triggered a $6.0 million milestone payable to us by AstraZeneca. Approximately $9.9 million of the total $12.0 million milestone payables was recognized as revenue during the fourth quarter of 2018 from performance obligations satisfied or partially satisfied.

In September 2016, AstraZeneca approved the protocol related to the development of roxadustat for the treatment of anemia in patients with MDS, for which we have received approval from then the CFDA (now known as the NMPA) for our clinical trial application for a Phase 2/3 trial and acceptance of our Investigational New Drug Application from the U.S. Food and Drug Administration for a Phase 3 trial. As a result, for revenue recognition purposes, during the third quarter of 2016, we extended the estimated joint development service period for the AstraZeneca agreements from the end of 2018 to the end of 2020, to allow for development of MDS.

As mentioned above, in the fourth quarter of 2018, we were engaged in the final stages of review with our partners over the proposed development of roxadustat for the treatment of CIA. AstraZeneca and Astellas approved the program in December 2018 and January 2019, respectively. Costs associated with the development of this indication are expected to be shared 50-50 between our two partners. In addition to CIA, in December 2018, anemia of chronic inflammation ("ACI") and multiple myeloma ("MM") have been approved for development by AstraZeneca and is expected to be fully funded by them. For revenue recognition purposes, we concluded that the approval of additional research and development services for these new indications represent modifications to our collaboration agreements in the periods in which approval was received. The research and development services associated with the new indications are distinct from other promises in our collaboration agreements, and will be accounted for separately. The development service period for roxadustat for the treatment of CIA, ACI and MM under the AstraZeneca agreements is estimated to continue through the end of 2024, to allow for development of these additional indications.

AstraZeneca may terminate the U.S./RoW Agreement upon specified events, including our bankruptcy or insolvency, our uncured material breach, technical product failure, or upon 180 days prior written notice at will. If AstraZeneca terminates the U.S./RoW Agreement at will, in addition to any unpaid non-contingent payments, it will be responsible for paying for a substantial portion of the post-termination development costs under the agreed development plan until regulatory approval.

AstraZeneca may terminate the China Agreement upon specified events, including our bankruptcy or insolvency, our uncured material breach, technical product failure, or upon advance prior written notice at will. If AstraZeneca terminates our China Agreement at will, it will be responsible for paying for transition costs as well as make a specified payment to FibroGen China.

In the event of any termination of the agreements, but subject to modification upon termination for technical product failure, AstraZeneca will transfer and assign to us any regulatory filings and approvals for roxadustat in the affected territories that they may hold under our agreements, grant us licenses and conduct certain transition activities.

Additional Information Related to Collaboration Agreements

Of the $1.113.5 billion in development and regulatory milestones payable in the aggregate under our Astellas and AstraZeneca collaboration agreements, $425.0 million is payable upon achievement of milestones relating to the submission and approval of roxadustat in DD-CKD and NDD-CKD in the U.S. and Europe.

For more detailed discussions on the accounting for these agreements, refer to Note 3 to the consolidated financial statements. In addition, refer to "Business — Collaborations" for a more detailed description of our collaboration agreements.

Total cash consideration received through December 31, 2018 and potential cash consideration, other than development cost reimbursement, transfer price payments, royalties and profit share, pursuant to our existing collaboration agreements are as follows:

	Cash Received Through December 31, 2018	Additional Potential Cash Payments	Total Potential Cash Payments
	(in thousands)		
Astellas--related-party:			
Japan Agreement	$77,593	$ 95,000	$ 172,593
Europe Agreement	410,000	335,000	745,000
Total Astellas	487,593	430,000	917,593
AstraZeneca:			
U.S. / RoW Agreement	389,000	860,000	1,249,000
China Agreement	43,200	333,500	376,700
Total AstraZeneca	432,200	1,193,500	1,625,700
Total revenue	$919,793	$ 1,623,500	$ 2,543,293

These collaboration agreements also provide for reimbursement of certain fully burdened research and development costs as well as direct out of pocket expenses.

RESULTS OF OPERATIONS

Revenue

	Years Ended December 31,			Change 2018 vs. 2017		Change 2017 vs. 2016	
	2018	2017 *	2016 *	$	%	$	%
	(dollars in thousands)						
Revenue:							
License revenue	$22,269	$9,933	$50,607	$12,336	124 %	$(40,674)	(80)%
Development and other revenue	125,913	121,063	132,582	4,850	4 %	(11,519)	(9)%
Product revenue	64,776	—	—	64,776	100 %	—	— %
Total revenue	$212,958	$130,996	$183,189	$81,962	63 %	$(52,193)	(28)%

*Recast to reflect the adoption of the new revenue standards. See Note 2 to the consolidated financial statements.
Our revenue to date has been generated substantially from our collaboration agreements with Astellas and AstraZeneca.

Under our revenue recognition policy, license revenue includes amounts from upfront, non-refundable license payments and amounts allocated pursuant to the standalone selling price method from other consideration received during the periods. This revenue is generally recognized as deliverables are met and services are performed. License revenues represented 11%, 8% and 28% of total revenues for the years ended December 31, 2018, 2017 and 2016, respectively.

Development revenue include co-development and other development related services. Co-development services are recognized as revenue in the period in which they are billed to our partners, excluding China. For China co-development services, revenue is deferred until the end of the development period once all performance obligations have been satisfied. Other development related services are recognized as revenue over the non-contingent development period, ranging from 36 to 89 months, based on a proportional performance method. Other revenues consist of sales of research and development material and have been included with Development and other revenue in the condensed consolidated statements of operations, as they have not been material for any of the years presented. Development and other revenues represented 59%, 92% and 72% of total revenues for the years ended December 31, 2018, 2017 and 2016, respectively.

Product revenue consists primarily of commercial-grade API sales to Astellas for purposes of commercial validation activities by Astellas. Product revenue is recognized when we fulfill all the delivery obligations. Product revenue represented 30% of total revenue for the year ended December 31, 2018. There was no product revenue for the years ended December 31, 2017 and 2016.

We have not generated any revenues based on the sale of FDA or NMPA approved products. In the future, we may generate revenue from product sales and from collaboration agreements in the form of license fees, milestone payments, reimbursements for collaboration services and royalties on product sales. We expect that any revenues we generate will fluctuate from quarter to quarter as a result of the uncertain timing and amount of such payments and sales.

Total revenue increased $82.0 million, or 63% for the year ended December 31, 2018 compared to the year ended December 31, 2017, and decreased $52.2 million, or 28%, for the year ended December 31, 2017 compared to the year ended December 31, 2016, for the reasons discussed in the sections below.

License Revenue

	Years Ended December 31,			Change 2018 vs. 2017		Change 2017 vs. 2016	
	2018	2017 *	2016 *	$	%	$	%
	(dollars in thousands)						
License revenue:							
Astellas	$14,323	$—	$9,548	$14,323	100 %	$(9,548)	(100)%
AstraZeneca	7,946	9,933	41,059	(1,987)	(20)%	(31,126)	(76)%
Total license revenue	$22,269	$9,933	$50,607	$12,336	124 %	$(40,674)	(80)%

*Recast to reflect the adoption of the new revenue standards. See Note 2 to the consolidated financial statements.
Comparison of the years ended December 31, 2018 and 2017

License revenue increased $12.3 million, or 124% for the year ended December 31, 2018 compared to the year ended December 31, 2017 due to an increase in the license revenue recognized under our collaboration agreement with Astellas, partially offset by a decrease in the license revenue recognized under our collaboration agreement AstraZeneca.

License revenue recognized under our collaboration agreements with Astellas for the year ended December 31, 2018 represented the allocated revenue related to a $15.0 million regulatory milestone associated with Astellas' expected NDA submission in Japan that was included in the transaction price during the second quarter of 2018 when this milestone became probable of being achieved.

License revenue recognized under our collaboration agreements with AstraZeneca for the year ended December 31, 2018 represented the allocated revenue related to a $6.0 million milestone associated with FibroGen China's receipt of marketing authorization from the NMPA for roxadustat, and a $6.0 million milestone associated with FibroGen China's receipt of First Manufacturing Approval for a Product in the Field in the Territory. Comparatively, license revenue recognized under our collaboration agreements with AstraZeneca for the year ended December 31, 2017 was related to a $15.0 million regulatory milestone payment. In 2017, the NMPA accepted our NDA for registration of roxadustat for anemia in DD CKD and NDD-CKD patients. This NDA submission triggered a $15.0 million milestone payment..

Comparison of the years ended December 31, 2017 and 2016

License revenue decreased $40.7 million, or 80% for the year ended December 31, 2017 compared to the year ended December 31, 2016 due to decreases in the license revenue recognized under both of our collaboration agreements with AstraZeneca and with Astellas.

License revenue recognized under our collaboration agreements with AstraZeneca decreased due to the impact of $15.0 million milestone revenue during the third quarter of 2017, as compared to an upfront payment of $62.0 million during the second quarter of 2016. The revenue was also impacted by the extension of the estimated joint development service period for the AstraZeneca agreements, for revenue recognition purposes, from the end of 2018 to the end of 2020. We made this extension in the third quarter of 2016 due to the approval of the development budget for the treatment of anemia in patients with MDS.

License revenue recognized under our collaboration agreements with Astellas decreased primarily due to a $10.0 million of development milestone revenue recorded during the second quarter of 2016, with no corresponding milestones in the current year periods.

Development and Other Revenue

	Years Ended December 31,			Change 2018 vs. 2017		Change 2017 vs. 2016	
	2018	2017 *	2016 *	$	%	$	%
	(dollars in thousands)						
Development revenue:							
Astellas	$20,903	$20,111	$21,775	$792	4 %	$(1,664)	(8)%
AstraZeneca	104,970	100,928	110,677	4,042	4 %	(9,749)	(9)%
Total development revenue	125,873	121,039	132,452	4,834	4 %	(11,413)	(9)%
Other revenue	40	24	130	16	67 %	(106)	(82)%
Total development and other revenue	$125,913	$121,063	$132,582	$4,850	4 %	$(11,519)	(9)%

*Recast to reflect the adoption of the new revenue standards. See Note 2 to the consolidated financial statements.
Comparison of the years ended December 31, 2018 and 2017

Development revenue recognized under our collaboration agreements with AstraZeneca increased $4.0 million, or 4% for the year ended December 31, 2018 compared to the year ended December 31, 2017, primarily due to the allocated revenue related to the above mentioned total of $12.0 million milestone payments during the fourth quarter of 2018.

Development revenue recognized under our collaboration agreements with Astellas increased $0.8 million, or 4% for the year ended December 31, 2018 compared to the year ended December 31, 2017, primarily due to the allocated revenue related to the above mentioned $15.0 million associated with the regulatory milestone of NDA submission in Japan in the second quarter of 2018.

Comparison of the years ended December 31, 2017 and 2016

Collaboration services and other revenue decreased $11.5 million, or 9%, for the year ended December 31, 2017 compared to the year ended December 31, 2016, primarily due to a decrease in the development revenue recognized under our collaboration agreements with AstraZeneca from the impact of the extension of the estimated joint development service period for the AstraZeneca agreements, for revenue recognition purposes, from the end of 2018 to the end of 2020. We made this extension in the third quarter of 2016 due to the approval of the development budget for the treatment of anemia in patients with MDS. Development revenue for the year ended December 31, 2017 was also impacted by the allocation of the upfront payment of $62.0 million during the second quarter of 2016.

Product Revenue

As described above, the Japan Amendment obligates Astellas to purchase API from us to conduct commercial scale manufacturing validation for roxadustat drug product in anticipation of commercial launch in Japan. We fulfilled all the delivery obligations under the term of the Japan Amendment during the year ended December 31, 2018, and recognized the related product revenue of $64.8 million in the same period.

Operating Expenses

	Years Ended December 31,			Change 2018 vs. 2017		Change 2017 vs. 2016	
	2018	2017	2016	$	%	$	%
	(dollars in thousands)						
Operating expenses							
Research and development	$235,839	$196,517	$187,206	$39,322	20 %	$9,311	5 %
General and administrative	63,812	51,760	46,025	12,052	23 %	5,735	12 %
Total operating expenses	$299,651	$248,277	$233,231	$51,374	21 %	$15,046	6 %

Total operating expenses increased $51.4 million, or 21%, for the year ended December 31, 2018 compared to the year ended December 31, 2017, and increased $15.0 million, or 6%, for the year ended December 31, 2017 compared to the year ended December 31, 2016, for the reasons discussed in the sections below.

Research and Development Expenses

Research and development expenses consist of third party research and development costs and the fully-burdened amount of costs associated with work performed under collaboration agreements. Research and development costs include employee-related expenses for research and development functions, expenses incurred under agreements with clinical research organizations, other clinical and preclinical costs and allocated direct and indirect overhead costs, such as facilities costs, information technology costs and other overhead. Research and development costs are expensed as incurred. Costs for certain development activities are recognized based on an evaluation of the progress to completion of specific tasks using information and data provided to us by our vendors and our clinical sites.

The following table summarizes our research and development expenses incurred during the years ended December 31, 2018, 2017 and 2016:

		Years Ended December 31,		
		2018	2017	2016
Product Candidate	Phase of Development	(in thousands)		
Roxadustat	Phase 3	$139,876	$125,144	$132,562
Pamrevlumab	Phase 2	72,063	52,260	34,876
FG-5200	Preclinical	5,122	4,628	4,989
Other research and development expenses		18,778	14,485	14,779
Total research and development expenses		$235,839	$196,517	$187,206

The program-specific expenses summarized in the table above include costs we directly attribute to our product candidates. We allocate research and development salaries, benefits, stock-based compensation and other indirect costs to our product candidates on a program-specific basis, and we include these costs in the program-specific expenses. We expect our research and development expenses to continue to increase in the future as we advance our product candidates through clinical trials and expand our product candidate portfolio.

Comparison of the years ended December 31, 2018 and 2017

Research and development expenses increased $39.3 million, or 20%, for the year ended December 31, 2018 compared to the year ended December 31, 2017. The increase was primarily due to increases in drug development expenses of $22.4 million, employee-related costs of $9.9 million, stock-based compensation expense of $8.7 million, allocated facility related expense of $6.5 million, and outside services of $2.4 million, partially offset by a decrease in clinical trials costs of $11.3 million. Drug development expenses increased primarily due to higher drug substance manufacturing activities related to pamrevlumab. Employee-related costs increased due to higher headcount, higher average compensation level, and increased travel, seminar and conference costs. Stock-based compensation expense increased due to the cumulative impact of stock option grant activities. Facility related expenses, as part of the allocated overhead costs, was higher relative to the prior period in which our property taxes were reduced as a result of a final settlement we obtained related to historical property tax payments, as well as higher property management and maintenance costs during the current year. Outside services costs increased due to higher scientific contract work related to roxadustat and other HIF-PH inhibitors. Clinical trial costs decreased as a result of nearing completion of Phase 3 trials for roxadustat and Phase 2 trials for pamrevlumab. We expect development expenses to increase as we begin Phase 3 trials for pamrevlumab.

Comparison of the years ended December 31, 2017 and 2016

Research and development expenses increased $9.3 million, or 5%, for the year ended December 31, 2017 compared to the year ended December 31, 2016. The increase was primarily due to increases in employee-related costs of $8.6 million, drug development expenses of $8.2 million and stock-based compensation of $2.7 million, partially offset by decreases in outside services of $5.8 million and allocated facility related expense of $4.5 million. Drug development expenses increased due to higher drug substance manufacturing activities related to pamrevlumab. Employee-related costs increased due to higher headcount and higher average compensation level. Stock-based compensation increased due to cumulative impact of stock option grant activities. Outside services costs decreased due to lower scientific contract work related to other HIF-PH inhibitors. Facility related expenses, as part of the allocated overhead costs, decreased due to the final assessment we obtained during 2017 resulting in a reduction in assessed property tax, as compared to an additional assessed property tax in 2016.

General and Administrative Expenses

General and administrative expenses consist primarily of employee-related expenses for executive, operational, finance, legal, compliance and human resource functions. Other general and administrative expenses include facility-related costs and professional fees, accounting and legal services, other outside services, recruiting fees and expenses associated with obtaining and maintaining patents.

We anticipate that our general and administrative expenses will increase in the future as we increase our headcount to support our continued research and development and potential commercialization of our product candidates. We also anticipate increased expenses, including exchange listing and SEC requirements, director and officer insurance premiums, legal, audit and tax fees, regulatory compliance programs, and investor relations costs associated with being a public company and ceasing to be an emerging growth company. Additionally, if and when we believe the first regulatory approval of one of our product candidates appears likely, we anticipate an increase in payroll and related expenses as a result of our preparation for commercial operations, especially as it relates to the sales and marketing of our product candidates.

Comparison of the years ended December 31, 2018 and 2017

General and administrative expenses increased $12.1 million, or 23%, for the year ended December 31, 2018 compared to the year ended December 31, 2017. The increase was primarily due to increases in stock-based compensation expense of $5.9 million, employee-related costs of $3.0 million, facility related expense of $1.8 million, and outside services costs of $1.1 million. Stock-based compensation expense increased due to cumulative impact of stock option grant activities. Employee-related costs increased due to higher average compensation level and higher headcount. Facility related expenses, as part of the allocated overhead costs, was higher relative to the prior period in which our property taxes were reduced as a result of a final settlement we obtained related to historical property tax payments, as well as higher property management and maintenance costs during the current year. Outside services costs increased due to corporate activities surrounding the Japan Amendment and NDA approval during the fourth quarter of 2018.

Comparison of the years ended December 31, 2017 and 2016

General and administrative expenses increased $5.7 million, or 12%, for the year ended December 31, 2017 compared to the year ended December 31, 2016. The increase was primarily due to increases in employee-related costs of $4.5 million and stock-based compensation expense of $2.7 million, partially offset by a decrease in facility related expense of $1.9 million. Employee-related costs increased due to higher average compensation level, higher headcount, and increased recruiting activities. Stock-based compensation expense increased due to cumulative impact of stock option grant activities. Facility related expenses decreased due to the final assessment we obtained during 2017 resulting in a reduction in assessed property tax, as compared to an additional assessed property tax in 2016.

Interest and Other, Net

	Years Ended December 31,			Change 2018 vs. 2017		Change 2017 vs. 2016	
	2018	2017	2016	$	%	$	%
	(dollars in thousands)						
Interest and other, net:							
Interest expense	$(10,991)	$(9,706)	$(10,725)	$(1,285)	13 %	$1,019	(10)%
Interest income and other, net	11,568	6,433	2,628	5,135	80 %	3,805	145 %
Total interest and other, net	$577	$(3,273)	$(8,097)	$3,850	(118)%	$4,824	(60)%

Interest Expense

In connection with our long-term lease for our corporate headquarters in San Francisco, California, which was entered into in September 2006, and the lease for our pilot plant located in Beijing Yizhuang Biomedical Park (“BYBP”), which was entered into in February 2013, as the monthly lease payments are made, we record interest expense and an

increase or reduction in the corresponding lease financing obligation for any amounts allocated to or deficiencies being applied to the principal value of these obligations.

Interest expense includes payments made for imputed interest related to the facility lease financing obligations for our leased facilities in San Francisco and China (see Note 8 to the consolidated financial statements) as well as interest related to the Technology Development Center of the Republic of Finland product development obligations (see Note 6 to the consolidated financial statements).

Comparison of the years ended December 31, 2018 and 2017

Interest expense increased $1.3 million, or 13%, for the year ended December 31, 2018 compared to the year ended December 31, 2017 primarily due to a reduction in the imputed interest resulting from the government rent subsidy received by FibroGen China in 2017.

Comparison of the years ended December 31, 2017 and 2016

Interest expense decreased $1.0 million, or 10%, for the year ended December 31, 2017 compared to the year ended December 31, 2016 due to a reduction in the imputed interest resulting from the government rent subsidy received by FibroGen Beijing during the fourth quarter of 2017.

Interest Income and Other, Net

Interest income and other, net primarily include interest income earned on our cash, cash equivalents and investments, foreign currency transaction gains (losses), remeasurement of certain monetary assets and liabilities in non-functional currency of our subsidiaries into the functional currency, and realized gains (losses) on sales of investments.

Comparison of the years ended December 31, 2018 and 2017

Interest income and other, net increased $5.1 million, or 80%, for the year ended December 31, 2018 compared to the year ended December 31, 2017, primarily due to $7.0 million higher interest earned on our cash, cash equivalents and investments associated with the higher average balances and $1.6 million higher realized foreign currency gain during the current year period. The increases were partially offset by $1.1 million higher unrealized loss on our marketable equity investments during the current year. In addition, a total of approximately $2.0 million government industry subsidies was received by FibroGen Beijing during the prior year, which did not recur in the current year.

Comparison of the years ended December 31, 2017 and 2016

Interest income and other, net increased $3.8 million, or 145%, for the year ended December 31, 2017 compared to the year ended December 31, 2016 primarily due to a total of approximately $2.0 million government industry subsidies received by FibroGen Beijing during the fourth quarter of 2017, $1.7 million higher interest earned on our cash, cash equivalents and investments associated with the higher average balances, partially offset by the unrealized foreign currency translation loss on our monetary assets and liabilities denominated in foreign currency.

Provision for (Benefit from) Income Taxes

	Years Ended December 31,		
	2018	2017 *	2016 *
	(dollars in thousands)		
Loss before income taxes	$(86,116)	$(120,554)	$(58,139)
Provision for income taxes	304	321	(71)
Effective tax rate	(0.4)%	(0.3)%	0.1%

*Recast to reflect the adoption of the new revenue standards. See Note 2 to the consolidated financial statements.

The provisions for income taxes for the years end December 31, 2018 and 2017 were due to foreign taxes. The benefit from income taxes for the year ended December 31, 2016 was due to the tax effect arising from unrealized gains recognized during the current year in other comprehensive income related to available-for-sale securities, partially offset by foreign taxes.

On December 22, 2017, the Tax Cuts and Jobs Act (“Tax Act”) was signed into law making significant changes to the Internal Revenue Code. Changes include, but are not limited to, a corporate tax rate decrease from 35% to 21% effective for tax years beginning after December 31, 2017, the transition of U.S international taxation from a worldwide tax system to a territorial system, and a one-time transition tax on the mandatory deemed repatriation of cumulative foreign earnings as of December 31, 2017. In the fourth quarter of 2018, we completed our analysis to determine the effect of the Tax Act and no material adjustments were recognized as of December 31, 2018. Developing interpretations of the provisions of the Tax Act, changes to U.S. Treasury regulations, administrative interpretations or court decisions interpreting the Tax Act in the future periods may require further adjustments to our analysis.

Based upon the weight of available evidence, which includes our historical operating performance, reported cumulative net losses since inception and expected continuing net loss, we have established a full valuation allowance against our net deferred tax assets as we do not currently believe that realization of those assets is more likely than not. We will continue to maintain a full valuation allowance on our net deferred tax assets until there is sufficient evidence to support the reversal of all or some portion of this allowance.

SELECTED QUARTERLY FINANCIAL DATA

The following tables present unaudited quarterly results for 2018 and 2017. These tables include all adjustments, consisting only of normal recurring adjustments that we consider for the fair statement of our consolidated financial position and operating results for the quarters presented. Payments from our collaboration partners have caused, and are likely to continue to cause, fluctuations in our quarterly results. These unaudited quarterly results of operations should be read in conjunction with the consolidated financial statements and notes included in Item 8 of this Annual Report on Form 10-K. We have prepared the unaudited information on the same basis as our audited consolidated financial statements. Our operating results for any quarter are not necessarily indicative of results for any future quarters or for a full year.

	2018			
	Fourth Quarter	Third Quarter	Second Quarter	First Quarter
	(in thousands, except for per share data)			
Revenue (b)	$108,054	$ 29,027	$ 43,952	$ 31,925
Operating expenses	88,135	71,799	67,193	72,524
Net income (loss)	20,952	(42,556)	(23,420)	(41,396)
Net income (loss) per share (c):				
Basic	0.25	(0.50)	(0.28)	(0.50)
Diluted	$0.23	$ (0.50)	$ (0.28)	$ (0.50)

	2017			
	Fourth Quarter	Third Quarter	Second Quarter	First Quarter
	(in thousands, except for per share data)			
Revenue (a)	$30,736	$ 40,550	$ 30,268	$ 29,442
Operating expenses	66,320	63,289	60,406	58,262
Net loss	(33,894)	(24,459)	(31,912)	(30,610)
Net loss per share - basic and diluted (c):	$(0.41)	$ (0.32)	$ (0.46)	$ (0.48)

(a) Revenue for each quarter of the year ended December 31, 2017 was recast to reflect the adoption of the new revenue standards. See Note 2 to the consolidated financial statements.
(b) Revenue for the fourth quarter of 2018 was significantly higher compared to other quarters due to the product revenue recognized, and revenue recognized on two milestone payments.
(c) Basic and diluted net income (loss) per share is computed independently for each of the quarters presented. Therefore, the sum of quarterly basic and diluted net income (loss) per share may not equal annual basic and diluted net income (loss) per share.

LIQUIDITY AND CAPITAL RESOURCES

Financial Conditions

We have historically funded our operations principally from the sale of common stock (including our public offering proceeds) and from the execution of collaboration agreements involving license payments, milestones and reimbursement for development services.

On April 11, 2017, we closed an offering of our common stock. In this offering, we sold 5,228,750 shares of our common stock at a public offering price of $22.95 per share. Net proceeds from this offering were $115.1 million, after deducting underwriting discounts and commissions of $4.9 million. In addition, the total offering expenses were approximately $0.6 million. On August 24, 2017, we completed another follow-on offering of our common stock. In

this offering, we sold a total of 9,200,000 shares of our common stock at a public offering price of $40.75 per share. Net proceeds from this offering were $356.2 million, after deducting underwriting discounts and commissions of $18.7 million. In addition, the total offering expenses were approximately $0.4 million.

As of December 31, 2018, we had cash and cash equivalents of $89.3 million. Cash is invested in accordance with our investment policy, primarily with a view to liquidity and capital preservation. Investments, consisting of available-for-sale debt investments, marketable equity investments, term deposit and certificate of deposit, and stated at fair value, are also available as a source of liquidity. As of December 31, 2018 we had short-term and long-term investments of $532.1 million and $55.8 million, respectively. As of December 31, 2018, a total of $21.9 million of our cash and cash equivalents was held outside of the U.S. in our foreign subsidiaries to be used primarily for our China operations.

Operating Capital Requirements

To date, we have not generated any revenue from product sales. We do not know when, or if, we will generate any revenue from product sales. We do not expect to generate significant revenue from product sales unless and until we obtain regulatory approval of and commercialize one or more of our current or future product candidates. We anticipate that we will continue to generate losses for the foreseeable future, and we expect the losses to increase as we continue the development of, and seek regulatory approvals for, our product candidates, and begin to commercialize any approved products. To date, we have funded certain portions of our research and development and manufacturing efforts in China and Europe through outside parties. There is no guarantee that sufficient funds will be available to continue to fund these development efforts through commercialization or otherwise. Although our share of expenses for roxadustat will decrease as a result of AstraZeneca funding all non-China collaboration expenses not reimbursed by Astellas, we expect our research and development expenses to continue to increase as we invest in our other programs. We are subject to all the risks related to the development and commercialization of novel therapeutics, and we may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business. We anticipate that we will need substantial additional funding in connection with our continuing operations.

We believe that our existing cash and cash equivalents, short-term and long-term investments and accounts receivable will be sufficient to meet our anticipated cash requirements for at least the next 12 months from the date of this Annual Report on Form 10-K. However, our liquidity assumptions may change over time, and we could utilize our available financial resources sooner than we currently expect. In addition, we may elect to raise additional funds at any time through equity, equity-linked or debt financing arrangements. Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement and involves risks and uncertainties, and actual results could vary as a result of a number of factors. 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. Our future capital requirements and the adequacy of available funds will depend on many factors, including those set forth under Part I, Item 1A “Risk Factors” in this Annual Report on Form 10-K. We may not be able to secure additional financing to meet our operating requirements on acceptable terms, or at all. If we raise additional funds by issuing equity or equity-linked securities, the ownership of our existing stockholders will be diluted. If we raise additional financing by the incurrence of indebtedness, we will be subject to increased fixed payment obligations and could also be subject to restrictive covenants, such as limitations on our ability to incur additional debt, and other operating restrictions that could adversely impact our ability to conduct our business. If we are unable to obtain needed additional funds, we will have to reduce our operating expenses, which would impair our growth prospects and could otherwise negatively impact our business.

Cash Sources and Uses

The following table summarizes the primary sources and uses of cash for the years ended December 31, 2018, 2017 and 2016:

	Years Ended December 31,		
	2018	2017	2016
	(in thousands)		
Net cash provided by (used in):			
Operating activities	$(76,144)	$(66,513)	$7,108
Investing activities	(522,123)	69,866	6,622
Financing activities	13,875	496,472	6,738

Effect of exchange rate changes on cash and cash equivalents	(8)	51	(10)
Net increase (decrease) in cash and cash equivalents	$(584,400)	$499,876	$20,458

Operating Activities

Net cash used in operating activities was $76.1 million for the year ended December 31, 2018 and consisted primarily of net loss of $86.4 million adjusted for non-cash items of $58.7 million and a net decrease in operating assets and liabilities of $48.4 million. The significant non-cash items included stock-based compensation expense of $52.1 million, depreciation expense of $6.6 million, unrealized loss on our marketable equity investments of $1.1 million and realized foreign currency gain of $1.1 million. The significant items in the changes in operating assets and liabilities included decreases resulting from accounts receivable of $55.2 million and deferred revenue of $5.0 million, partially offset by increases resulting from accrued liabilities of $5.6 million, accounts payable of $3.6 million, other long-term liabilities of $1.6 million and other assets of $1.1 million. The change in accounts receivable was primarily related to the delivery of $43.9 million roxadustat API to Astellas in December 2018 under the Japan Amendment, as well as the timing of the receipt of payments and recognition of revenues under our collaboration agreements with Astellas and AstraZeneca. The change in deferred revenue was related to the recognition of revenues under our collaboration agreements with Astellas and AstraZeneca. The changes in accrued liabilities, accounts payable and other long-term liabilities were primarily driven by the timing of invoicing and payments. The change in other assets was primarily related to a cash refund for value added tax received by FibroGen China during the third quarter of 2018.

Net cash used in operating activities was $66.5 million for the year ended December 31, 2017, which consisted primarily of net loss of $120.9 million, adjusted for non-cash items of $45.3 million and a net increase in operating assets and liabilities of $9.0 million. The significant non-cash items included stock-based compensation expense of $37.5 million, depreciation expense of $6.1 million and amortization of bond premium/discount of $1.8 million. The significant items in the changes in operating assets and liabilities included increases resulted from accrued expenses of $9.2 million, accounts receivable of $2.0 million and other long-term liabilities of $1.6 million, partially offset by decreases resulted from other assets of $2.4 million and prepaid expenses and other current assets of $1.9 million. The changes in accrued liabilities and other long-term liabilities were primarily driven by clinical trial activities and the timing of payments. The change in accounts receivable were related to the timing of the receipt of upfront payments and recognition of revenues under our collaboration agreements with Astellas and AstraZeneca. The change in other assets was primarily driven by the input valuation added tax accumulated during the current year and payment for the land use right fee for the commercial active pharmaceutical ingredients manufacturing facility that we are establishing in China. The change in prepaid expenses and other current assets was primarily driven by the timing of invoicing and payments.

Net cash provided by operating activities was $7.1 million for the year ended December 31, 2016, which consisted primarily of net loss of $58.1 million, adjusted for non-cash items of $40.7 million and a net increase in operating assets and liabilities of $24.5 million. The significant non-cash items included stock-based compensation expense of $32.1 million, depreciation expense of $6.0 million and amortization of the premium on investments of $2.7 million. The significant items in the changes in operating assets and liabilities included increases resulted from deferred revenue of $13.2 million, accounts receivable of $5.0 million, accrued liabilities of $3.0 million, other long-term liabilities of $1.9 million, and prepaid expenses and other current assets of $1.1 million. The changes in deferred revenue and accounts receivable were related to the timing of the receipt of upfront payments and recognition of revenues under our collaboration agreements with Astellas and AstraZeneca. The change in accounts payable and accrued liabilities were primarily driven by clinical trial activities and the timing of payments. The changes in other long-term liabilities and prepaid expenses and other current assets were driven by the timing of invoicing and payments.

Investing Activities

Investing activities primarily consist of purchases of property and equipment, purchases of investments, and proceeds from the maturity and sale of investments.

Net cash used in investing activities was $522.1 million for the year ended December 31, 2018 and consisted of cash used in purchases of available-for-sale securities and term deposit of $576.9 million, and purchases of property and equipment of $8.0 million, partially offset by proceeds from maturities of investments of $54.4 million and sales of available-for-sale securities of $8.2 million.

Net cash provided by investing activities for the year ended December 31, 2017 was $69.9 million, which consisted of proceeds from maturities and sales of available-for-sale securities of $78.5 million, partially offset by cash used in purchases of property and equipment of $8.5 million.

Net cash provided by investing activities for the year ended December 31, 2016 was $6.6 million, which consisted of proceeds from maturities and sales of available-for-sale securities of $16.9 million, partially offset by cash used in purchases of available-for-sale securities of $9.0 million and purchases of property and equipment of $1.3 million.

Financing Activities

Financing activities primarily reflect proceeds from the issuance of our common stock, cash paid for payroll taxes on restricted stock unit releases, repayments of our lease liability.

Net cash provided by financing activities was $13.9 million for the year ended December 31, 2018 and consisted primarily of $29.8 million of proceeds from the issuance of common stock upon exercise of stock options and purchases under ESPP, partially offset by $15.6 million of cash paid for payroll taxes on restricted stock unit releases, and $0.4 million of repayments on our lease liability.

Net cash provided by financing activities for the year ended December 31, 2017 was $496.5 million, which consisted primarily of $471.2 million of total proceeds from follow-on offerings in April and August of 2017, net of underwriting discounts and commission costs, $34.9 million of proceeds from the issuance of common stock upon exercise of stock options and purchases under ESPP, partially offset by $8.3 million of cash paid for payroll taxes on restricted stock unit releases.

Net cash provided by financing activities for the year ended December 31, 2016 was $6.7 million, which consisted of $9.9 million of proceeds from the issuance of common stock upon exercise of stock options and purchases under ESPP, partially offset by $2.7 million of cash paid for payroll taxes on restricted stock unit releases and $0.4 million of repayments on our lease liability.

Off-Balance Sheet Arrangements

During the year ended December 31, 2018, we did not have any relationships with unconsolidated organizations or financial partnerships, such as structured finance or special purpose entities that would have been established for the purpose of facilitating off-balance sheet arrangements.

Indemnification Agreements

In the ordinary course of business, we provide indemnifications of varying scope and terms to vendors, lessors, business partners and other parties with respect to certain matters, including, but not limited to, losses arising out of breach of such agreements, solutions to be provided by us or from intellectual property infringement claims made by third parties. In addition, we have entered into indemnification agreements with directors and certain officers and employees that will require us, among other things, to indemnify them against certain liabilities that may arise by reason of their status or service as directors, officers or employees.

Contractual Obligations and Commitments

Contractual Obligations

At December 31, 2018, our contractual obligations were as follows:

	Payments Due In				
	Less Than 1 Year	1 - 3 Years	3 - 5 Years	More Than 5 Years	Total
	(in thousands)				
Operating lease obligations	$444	$257	$16	$—	$717
Lease financing obligations	14,379	28,843	27,207	—	70,429
Total contractual obligations	$14,823	$29,100	$27,223	$—	$71,146

The contractual obligations table excludes uncertain tax benefits of approximately $28.0 million that are disclosed in Note 12 to the consolidated financial statements because these uncertain tax positions, if recognized, would be an adjustment to the deferred tax assets.

Clinical Trials

As of December 31, 2018, we have several on-going clinical studies in various stages. Under agreements with various CROs, and clinical study sites, we incur expenses related to clinical studies of our product candidates and potential other clinical candidates. The timing and amounts of these disbursements are contingent upon the achievement of certain milestones, patient enrollment and services rendered or as expenses are incurred by the CROs or clinical trial sites. Therefore we cannot estimate the potential timing and amount of these payments and they have been excluded from the table above. Although our material contracts with CROs are cancellable, we have historically not cancelled such contracts.

Product Development Obligations

As of December 31, 2018, our FibroGen Europe Oy ("FibroGen Europe") subsidiary had $10.8 million of principal outstanding and $6.0 million of interest accrued related to the TEKES loans, respectively, which have been included as product development obligations on our consolidated balance sheet.

There is no stated maturity date related to these loans and each loan may be forgiven if the research work funded by TEKES does not result in an economically profitable business or does not meet its technological objectives. In addition, we are not a guarantor of the TEKES loans, and these loans are not repayable by FibroGen Europe until it has distributable funds. We do not expect FibroGen Europe to have such funds for at least the next five years. For the foregoing reasons, we cannot estimate the potential timing and the amounts of repayments (if required) or forgiveness. As a result, the TEKES loans have been excluded from the table above.

CRITICAL ACCOUNTING POLICIES AND ESTIMATES

Our management's discussion and analysis of our financial condition and results of operations are based on our financial statements, which have been prepared in accordance with accounting principles generally accepted in the U.S. The preparation of these financial statements requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, and expenses and the disclosure of contingent assets and liabilities in our financial statements. We evaluate our estimates and judgments on an ongoing basis. We base our estimates on historical experience, known trends and events, and various other factors that we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are described in more detail in the notes to our financial statements appearing elsewhere in this Annual Report, we believe the following accounting policies to be most critical to the judgments and estimates used in the preparation of our financial statements.

Revenue Recognition

Substantially all of our revenues to date have been generated from our collaboration agreements.

Our collaboration agreements include multiple performance obligations comprised of promised services, or bundles of services, that are distinct. Services that are not distinct are combined with other services in the agreement until they form a distinct bundle of services. Our process for identifying performance obligations and an enumeration of each obligation for each agreement is outlined in Note 3 "Collaboration Agreements" to our consolidated financial statements. Determining the performance obligations within a collaboration agreement often involves significant judgment and is specific to the facts and circumstances contained in each agreement.

We have identified the following material promises under our collaboration agreements: (1) license of FibroGen technology, (2) the performance of co-development services, including manufacturing of clinical supplies and other services during the development period, and (3) manufacture of commercial supply. The evaluation as to whether these promises are distinct, and therefore represent separate performance obligations, is described in more details in Note 3 "Collaboration Agreements" to our consolidated financial statements.

For revenue recognition purposes, we determine that the term of our collaboration agreements begin on the effective date and ends upon the completion of all performance obligations contained in the agreements. In each agreement, the contract term is defined as the period in which parties to the contract have present and enforceable rights and obligations. We believe that the existence of what it considers to be substantive termination penalties on the part of the counterparty create sufficient incentive for the counterparty to avoid exercising its right to terminate the agreement unless in exceptionally rare situations.

The transaction price for each collaboration agreement is determined based on the amount of consideration we expect to be entitled for satisfying all performance obligations within the agreement. Our collaboration agreements include payments to us of one or more of the following: non-refundable upfront license fees; co-development billings; development, regulatory, and commercial milestone payments; and royalties on net sales of licensed products.

Upfront license fees are non-contingent and non-refundable in nature and are included in the transaction price at the point when the license fees become due to us. We do not assess whether a contract has a significant financing component if the expectation at contract inception is such that the period between payment by the customer and the transfer of the promised goods or services to the customer will be one year or less.

Co-development billings resulting from our research and development efforts, which are reimbursable under our collaboration agreements, are considered variable consideration. Determining the reimbursable amount of research and development efforts requires detailed analysis of the terms of the collaboration agreements and the nature of the research and development efforts incurred. Determining the amount of variable consideration from co-development billings requires us to make estimates of future research and development efforts, which involves significant judgment. Co-development billings are allocated entirely to the co-development services performance obligation when amounts are related specifically to research and development efforts necessary to satisfy the performance obligation, and such an allocation is consistent with the allocation objective.

Milestone payments are also considered variable consideration, which requires us to make estimates of when achievement of a particular milestone becomes probable. Similar to other forms of variable consideration, milestone payments are included in the transaction price when it becomes probable that such inclusion would not result in a significant revenue reversal. Milestone payments are therefore included in the transaction price when achievement of the milestone becomes probable.

Product revenue consists primarily of sales of commercial-grade API used in support of pre-commercial validation work. In 2018, we recorded revenue from commercial-grade API sales to Astellas based on a transaction price that is subject to potential future adjustments. This represents a form of variable consideration. With respect to these sales in 2018, the transaction price will be adjusted at the time the roxadustat listed price is issued by the Japanese Ministry of Health, Labour and Welfare to reflect differences between estimated and actual listed price, yield from the manufacture of bulk product tablets, and bulk product manufacturing costs. We evaluate the latest available facts and circumstances, including listed prices of comparable drug products in Japan and historical bulk drug product manufacturing yields and costs, to determine whether any adjustments to the estimated transaction price is necessary. As of December 31, 2018, no new facts or circumstances were available to warrant an adjustment to the transaction price.

For arrangements that include sales-based royalties and for which the license is deemed to be the predominant item to which the royalties relate, we recognize revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied). To date, we have not recognized any royalty revenue resulting from our collaboration arrangements.

The transaction price is allocated to performance obligations based on their relative standalone selling price (“SSP”), with the exception of co-development billings allocated entirely to co-development services performance obligations. The SSP is determined based on observable prices at which we separately sell the products and services. If an SSP is not directly observable, then we will estimate the SSP considering marketing conditions, entity-specific factors, and information about the customer or class of customer that is reasonably available. The process for determining SSP involves significant judgment and includes consideration of multiple factors, including assumptions related to the market opportunity and the time needed to commercialize a product candidate pursuant to the relevant license, estimated direct expenses and other costs, which include the rates normally charged by contract research and contract manufacturing organizations for development and manufacturing obligations, and rates that would be charged by qualified outsiders for committee services.

Significant judgment may be required in determining whether a performance obligation is distinct, determining the amount of variable consideration to be included in the transaction price, and estimating the SSP of each performance obligation. An enumeration of our significant judgments is outlined in Note 3 “Collaboration Agreements” to our consolidated financial statements.

For each performance obligation identified within an arrangement, we determine the period over which the promised services are transferred and the performance obligation is satisfied. Service revenue is recognized over time based on progress toward complete satisfaction of the performance obligation. We use an input method to measure progress toward the satisfaction of co-development services and certain other related performance obligations, which is based on costs of labor hours or full time equivalents and out-of-pocket expenses incurred relative to total expected costs to be incurred. We believe this measure of progress provides a faithful depiction of the transfer of services because other measures do not measure as accurately how we transfer our performance obligations to our collaboration partners.

Clinical Trial Accruals

Clinical trial costs are a component of research and development expenses. We accrue and expense clinical trial activities performed by third parties based upon actual work completed in accordance with agreements established with clinical research organizations and clinical sites. We determine the actual costs through external service providers as well as confirmation with internal personnel as to the progress or stage of completion of trials or services and the agreed-upon fee to be paid for such services.

Income Taxes

We account for income taxes using an asset and liability approach. Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Operating loss and tax credit carryforwards are measured by applying currently enacted tax laws. We record a valuation allowance to reduce our deferred tax assets to reflect the net amount that we believe is more likely than not to be realized. Realization of our deferred tax assets is dependent upon the generation of future taxable income, the amount and timing of which are uncertain. The valuation allowance requires an assessment of both positive and negative evidence when determining whether it is more likely than not that deferred tax assets are recoverable; such assessment is required on a jurisdiction by jurisdiction basis. Based upon the weight of available evidence at December 31, 2018, we continue to maintain a full valuation allowance against all of our deferred tax assets after management considered all available evidence, both positive and negative, including but not limited to our historical operating results, income or loss in recent periods, cumulative income in recent years, forecasted earnings, future taxable income, and significant risk and uncertainty related to forecasts.

We recognize the tax effects of an uncertain tax position only if it is more likely than not to be sustained based solely on its technical merits as of the reporting date and only in an amount more likely than not to be sustained upon review by the tax authorities. We evaluate uncertain tax positions on a quarterly basis and adjust the liability for changes in facts and circumstances, such as new regulations or interpretations by the taxing authorities, new information obtained during a tax examination, significant amendment to an existing tax law, or resolution of an examination. To the extent that the final tax outcome of these matters is different than the amounts recorded, such differences will impact the income tax provision in the period in which such determination is made. The resolution of our uncertain income tax positions is dependent on uncontrollable factors such as law changes, new case law, and the willingness of the income tax authorities to settle, including the timing thereof and other factors. Although we do not anticipate significant changes to our uncertain income tax positions in the next twelve months, items outside of our control could cause our uncertain income tax positions to change in the future, which would be recorded in our consolidated statements of operations. Interest and/or penalties related to income tax matters are recognized as a component of income tax expense.

Stock-Based Compensation

We measure and recognize compensation expense for all stock options granted to our employees, directors and non-employees based on the estimated fair value of the award on the grant date. We use the Black-Scholes valuation model to estimate the fair value of stock option awards. The fair value is recognized as expense, net of estimated forfeitures, over the requisite service period, which is generally the vesting period of the respective award, on a straight-line basis. We believe that the fair value of stock options granted to non-employees is more reliably measured than the fair value of the services received. As such, the fair value of the unvested portion of the options granted to non-employees is re-measured as of each reporting date. The resulting increase in value, if any, is recognized as expense during the requisite service period on a straight-line basis. The determination of the grant date fair value of options using an option pricing model is affected by our estimated common stock fair value and requires management to make a number of assumptions, including the expected life of the option, the volatility of the underlying stock, the risk-free interest rate and expected dividends.

Recently Issued and Adopted Accounting Guidance

In May 2014, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2014-09, Revenue from Contracts with Customers (Topic 606) ("ASU 2014-09"), which supersedes the revenue recognition requirements in Accounting Standards Codification ("ASC") 605, Revenue Recognition. ASU 2014-09 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. ASU 2014-09 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. Subsequently, the FASB has issued the following standards related to ASU 2014-09: ASU No. 2016-08, Revenue from Contracts with Customers (Topic 606): Principal versus Agent Considerations; ASU No. 2016-10, Revenue from Contracts with Customers (Topic 606): Identifying Performance Obligations and Licensing; ASU No. 2016-12, Revenue from Contracts with Customers (Topic 606): Narrow-Scope Improvements and Practical Expedients; and ASU No. 2016-20, Technical Corrections and Improvements to Topic 606, Revenue from Contracts with Customers (collectively, the "new revenue standards"). Under ASC 606, we recognize revenue when our customer obtains control of promised goods or services, in an amount that reflects the consideration which we expect to receive in exchange for those goods or services. To determine revenue recognition for arrangements that we determine are within the scope of ASC 606, we perform the following five steps: (i) identify the contract(s) with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) we satisfy a performance obligation. We only apply the five-step model to contracts when it is probable that we will collect the consideration we are entitled to in exchange for the goods or services we transfer to the customer. At contract inception, once the contract is determined to be within the scope of ASC 606, we assess the goods or services promised within each contract and determines those that are performance obligations and assesses whether each promised good or service is distinct. We then recognize as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) the performance obligation is satisfied. We adopted the new revenue standards as of January 1, 2018 using the full retrospective method, which required us to recast the prior reporting period presented in the consolidated financial statements. The primary impact upon adoption of the new revenue standards relates to the manner in which revenue is recognized for co-development billings and milestone payments under our collaboration arrangements. Under the new revenue standards, both of these elements of consideration are considered variable consideration which requires us to make estimates of when co-development billings become due or when achievement of a particular milestone becomes probable. Payments are included in the transaction price when it becomes probable that inclusion would not lead to a significant revenue reversal. We have recast our consolidated statement of operations and balance sheet from amounts previously reported due to the adoption of the new revenue standards, which resulted in increases in revenue of $5.3 million and $3.6 million for the years ended December 31, 2017 and 2016, respectively. The adoption of the new revenue standards resulted in increases in deferred revenue, current, and deferred revenue, net of current, as of December 31, 2017 of $8.7 million and $26.0 million, respectively. The adoption of the new revenue standards also resulted in increases in the accumulated deficit of $34.7 million, $40.0 million and $43.7 million as of December 31, 2017, 2016 and 2015, respectively. The adoption of the new revenue standards had no impact to our previously reported consolidated statement of cash flows. Refer to Note 2 to the consolidated financial statements for details.

In January 2016, the FASB issued ASU 2016-01, Financial Instruments-Overall (Subtopic 825-10). This guidance requires equity investments that are not accounted for under the equity method of accounting to be measured at fair value with changes recognized in net income, simplifies the impairment assessment of certain equity investments, and updates certain presentation and disclosure requirements. This guidance was effective for the annual reporting period beginning after December 15, 2017 and interim periods within those annual periods. We adopted this guidance as of January 1, 2018 using the modified retrospective approach, which resulted in a cumulative-effect adjustment of $1.3 million as a decrease in accumulated deficit on January 1, 2018, and an increase in accumulated other comprehensive

loss. The adoption of this guidance had no impact to our consolidated statement of cash flows for the year ended December 31, 2018. Refer to Note 2 to the consolidated financial statements for details.

In May 2017, the FASB issued ASU 2017-09, Compensation - Stock Compensation (Topic 718): Scope of Modification Accounting. This guidance provides guidance about which changes to the terms or conditions of a stock-based payment award require an entity to apply modification accounting in Topic 718. This guidance was effective for annual reporting period beginning after December 15, 2017, including interim periods. We adopted this guidance as of January 1, 2018, and the adoption of this guidance had no impact to our consolidated financial statements.

In October 2016, the FASB issued ASU 2016-16, Intra-Entity Transfers of Assets Other Than Inventory. This guidance requires companies to recognize the income tax effects of intercompany sales or transfer of assets, other than inventory, in the income statement as income tax expense (or benefit) in the period the sale or transfer occurs. The exception to recognizing the income tax effects of intercompany sales or transfer sales or transfer of assets remains in place for intercompany inventory sales and transfers. This guidance was effective for annual reporting period beginning after December 15, 2017, including interim periods. We adopted this guidance as of January 1, 2018 using the modified retrospective method. The adoption of this guidance did not result in any recognition of previously unrecognized deferred charges using a modified retrospective method, thus had no impact to our consolidated financial statements.

Recently Issued Accounting Guidance Not Yet Adopted

In August 2018, the FASB issued ASU 2018-15, Intangibles—Goodwill and Other—Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract. This guidance requires capitalizing implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). This guidance should be applied either retrospectively or prospectively, and is effective for annual reporting period beginning after December 15, 2019 including interim periods, with early adoption permitted. We are currently evaluating the impact on our consolidated financial statements upon the adoption of this guidance.

In August 2018, the FASB issued ASU 2018-13, Fair Value Measurement (Topic 820): Disclosure Framework—Changes to the Disclosure Requirements for Fair Value Measurement. This guidance amends existing fair value measurement disclosure requirements by adding, changing, or removing certain disclosures. This guidance is effective for annual reporting period beginning after December 15, 2019 including interim periods, with early adoption permitted. The amendments on changes in unrealized gains and losses, the range and weighted average of significant unobservable inputs used to develop Level 3 fair value measurements, and the narrative description of measurement uncertainty should be applied prospectively for only the most recent interim or annual period presented in the initial fiscal year of adoption. All other amendments should be applied retrospectively to all periods presented upon their effective date. We do not anticipate a material impact to our consolidated financial statements upon adoption of this guidance.

In June 2018, the FASB issued ASU 2018-07, Compensation - Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting. This guidance expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. The guidance also specifies that Topic 718 applies to all share-based payment transactions in which a grantor acquires goods or services to be used or consumed in a grantor's own operations by issuing share-based payment awards. This guidance is effective for annual reporting period beginning after December 15, 2018, including interim periods. We will adopt this guidance on January 1, 2019 and do not anticipate a material impact to our consolidated financial statements upon adoption.

In February 2018, the FASB issued ASU 2018-02, Income Statement - Reporting Comprehensive Income: Reclassification of Certain Tax effects from Accumulated Other Comprehensive Income. This guidance allows for the reclassification from accumulated other comprehensive income to retained earnings for the stranded tax effects arising from the change in the reduction of the U.S. federal statutory income tax rate from 35% to 21%. This guidance is effective for annual reporting period beginning after December 15, 2018, including interim periods, with early adoption permitted. We will adopt this guidance on January 1, 2019 and anticipate a reclassification of $0.6 million from the accumulated other comprehensive loss to the accumulated deficit upon adoption.

In June 2016, the FASB issued ASU 2016-13, Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments ("ASU 2016-13"). This guidance requires that financial assets measured at

amortized cost be presented at the net amount expected to be collected. The measurement of expected credit losses is based on historical experience, current conditions, and reasonable and supportable forecasts that affect the collectability. In November 2018, the FASB issued ASU 2018-19, Codification Improvements to Topic 326, Financial Instruments-Credit Losses ("ASU 2018-19"), which clarifies certain topics included within ASU 2016-13. ASU 2016-13 and ASU 2018-19 are effective for the annual reporting period beginning after December 15, 2019, including interim periods within that reporting period. We are currently evaluating the impact on our consolidated financial statements upon the adoption of this guidance.

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842) (“ASU 2016-02”). Under this guidance, an entity is required to recognize right-of-use assets and lease liabilities on its balance sheet and disclose key information about leasing arrangements. This guidance offers specific accounting guidance for a lessee, a lessor and sale and leaseback transactions. Lessees and lessors are required to disclose qualitative and quantitative information about leasing arrangements to enable a user of the financial statements to assess the amount, timing and uncertainty of cash flows arising from leases. In July 2018, the FASB issued ASU 2018-11, Leases (Topic 842): Targeted Improvements (“ASU 2018-11”), which provides entities the option to initially apply ASU 2016-02 at the adoption date and recognize a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption. ASU 2016-02 and ASU 2018-11 are effective for the annual reporting period beginning after December 15, 2018, including interim periods within that reporting period. We will adopt this guidance as of January 1, 2019 and utilize the modified retrospective transition method through a cumulative-effect adjustment at the beginning of the first quarter of 2019. Based on the current evaluation, we anticipate a recognition of approximately $47 million to $62 million in right-of-use assets and approximately $57 million to $67 million in lease liabilities, respectively, upon adoption of this guidance, for our operating leases and facility leases disclosed in Note 8 to our consolidated balance sheets. Accordingly, the related balances as of December 31, 2018 in property and equipment, net, and long-term portion of lease financing obligations would be removed. We do not anticipate a material impact to our consolidated statement of operations or consolidated statement of cash flows upon adoption of this guidance.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISKS

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 foreign currency exchange rates. The functional currency of our FibroGen Europe Oy subsidiary is the local currency. Most of our revenue from collaboration agreements are denominated in U.S. dollars, and therefore our revenue is not currently subject to significant foreign currency risk. Our operating expenses are denominated in the currencies of the countries in which our operations are located, which are primarily in the United States, China, and Europe. Our consolidated results of operations and cash flows are, therefore, subject to fluctuations due to changes in foreign currency exchange rates and may be adversely affected in the future due to changes in foreign exchange rates.

As of December 31, 2018, our financial assets and liabilities denominated in foreign currencies primarily included CNY22.5 million in cash and cash equivalent, and CNY14.4 million, EUR5.9 million and GBP0.6 million in accounts payable and accrued liabilities. These balances are subject to fluctuation in the exchange rate with the U.S. dollar. The effect of a hypothetical 10% change in foreign currency exchange rates would have resulted in a net gain or loss on foreign currency of approximately $0.6 million for the year ended December 31, 2018.

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 non-operating cash and cash equivalents primarily in U.S. government treasury bills and notes. A portion of our investments is also invested in certificates of deposit and demand deposits with high quality and established banking institutions. Given the nature of our investments as of December 31, 2018, we believe that our exposure to interest rate risk is not significant. We actively monitor changes in interest rates.

To date, we have not entered into any hedging arrangements with respect to foreign currency risk or other derivative financial instruments.

ITEM 8. CONSOLIDATED FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

The supplementary financial information required by this Item 8 is included in Item 7 under the caption “Quarterly Results of Operations”.

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of FibroGen, Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of FibroGen, Inc. and its subsidiaries (the “Company”) as of December 31, 2018 and 2017, and the related consolidated statements of operations, of comprehensive loss, of changes in stockholders’ equity and of cash flows for each of the three years in the period ended December 31, 2018, including the related notes and financial statement schedule listed in the accompanying index (collectively referred to as the “consolidated financial statements”). We also have audited the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the COSO.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company changed the manner in which it accounts for revenues from contracts with customers in 2018.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Annual Report on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company’s consolidated financial statements and on the Company's internal control over financial reporting 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 audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements 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. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating

the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ PricewaterhouseCoopers LLP

San Jose, California

February 27, 2019

We have served as the Company's auditor since 2000.

FIBROGEN, INC.

CONSOLIDATED BALANCE SHEETS

(In thousands, except per share amounts)

	December 31, 2018	December 31, 2017 (Note 2)
Assets		
Current assets:		
Cash and cash equivalents	$ 89,258	$ 673,658
Short-term investments	532,144	62,060
Accounts receivable ($47,210 and $4,004 from a related party)	63,684	8,452
Prepaid expenses and other current assets	4,929	4,800
Total current assets	690,015	748,970
Restricted time deposits	4,145	5,181
Long-term investments	55,820	10,506
Property and equipment, net	127,198	129,476
Other assets	3,420	4,517
Total assets	$ 880,598	$ 898,650
Liabilities, stockholders' equity and non-controlling interests		
Current liabilities:		
Accounts payable	$ 9,139	$ 5,509
Accrued liabilities ($444 and $272 to a related party)	66,123	63,781
Deferred revenue	13,771	16,670
Total current liabilities	89,033	85,960
Long-term portion of lease financing obligations	97,157	97,763
Product development obligations	16,798	17,244
Deferred rent	3,038	3,657
Deferred revenue, net of current	136,109	138,241
Other long-term liabilities	9,993	8,047
Total liabilities	352,128	350,912
Commitments and Contingencies		
Stockholders' equity:		
Preferred stock, $0.01 par value; 125,000 shares authorized; no shares issued and outstanding at December 31, 2018 and December 31, 2017	—	—
Common stock, $0.01 par value; 225,000 shares authorized at December 31, 2018 and December 31, 2017; 85,432 and 82,498 shares issued and outstanding at	854	825

December 31, 2018 and December 31, 2017		
Additional paid-in capital	1,226,453	1,160,094
Accumulated other comprehensive loss	(2,281)	(1,795)
Accumulated deficit	(715,827)	(630,657)
Total stockholders' equity	509,199	528,467
Non-controlling interests	19,271	19,271
Total equity	528,470	547,738
Total liabilities, stockholders' equity and non-controlling interests	$ 880,598	$ 898,650

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIBROGEN, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS

(In thousands, except per share amounts)

	Years Ended December 31,		
	2018	2017 (Note 2)	2016 (Note 2)
Revenue:			
License revenue (includes $14,323, $0 and $9,548 from a related party)	$22,269	$9,933	$50,607
Development and other revenue (includes $20,903, $20,111 and $21,775 from a related party)	125,913	121,063	132,582
Product revenue (includes $64,776, $0, and $0 from a related party)	64,776	—	—
Total revenue	212,958	130,996	183,189
Operating expenses:			
Research and development	235,839	196,517	187,206
General and administrative	63,812	51,760	46,025
Total operating expenses	299,651	248,277	233,231
Loss from operations	(86,693)	(117,281)	(50,042)
Interest and other, net			
Interest expense	(10,991)	(9,706)	(10,725)
Interest income and other, net	11,568	6,433	2,628
Total interest and other, net	577	(3,273)	(8,097)
Loss before income taxes	(86,116)	(120,554)	(58,139)
Provision for (benefit from) income taxes	304	321	(71)
Net loss	$(86,420)	$(120,875)	$(58,068)
Net loss per share - basic and diluted	$(1.03)	$(1.66)	$(0.93)
Weighted average number of common shares used to calculate net loss per share - basic and diluted	84,062	72,987	62,744

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIBROGEN, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS

(In thousands)

	Years Ended December 31,		
	2018	2017 (Note 2)	2016 (Note 2)
Net loss	$(86,420)	$(120,875)	$(58,068)
Other comprehensive income (loss):			
Foreign currency translation adjustments	771	(2,022)	532
Available-for-sale investments:			
Unrealized gain (loss) on investments, net of tax effect	(7)	1,259	140
Reclassification from accumulated other comprehensive loss	—	(72)	19
Net change in unrealized gain on available-for-sale investments	(7)	1,187	159
Other comprehensive income (loss), net of taxes	764	(835)	691
Comprehensive loss	$(85,656)	$(121,710)	$(57,377)

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIBROGEN, INC.

CONSOLIDATED STATEMENTS OF CHANGES IN STOCKHOLDERS' EQUITY

(In thousands, except share data)

	Common Stock Shares	Amount	Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit (Note 2)	Non Controlling Interests	Total
Balance at December 31, 2015	61,985,079	$ 620	$586,647	$ (1,651)	$ (451,714)	$ 19,271	$153,173
Net loss (Note 2)	—	—	—	—	(58,068)	—	(58,068)
Change in unrealized gain or loss on investments	—	—	—	159	—	—	159
Foreign currency translation adjustments	—	—	—	532	—	—	532
Shares issued from stock plans, net of payroll taxes paid	1,660,759	17	7,124	—	—	—	7,141
Stock appreciation rights settled	17,855	—	—	—	—	—	—
Stock-based compensation	—	—	32,132	—	—	—	32,132
Warrants exercised	1,591	—	—	—	—	—	—
Balance at December 31, 2016	63,665,284	637	625,903	(960)	(509,782)	19,271	135,069
Net loss (Note 2)	—	—	—	—	(120,875)	—	(120,875)
Change in unrealized gain or loss on investments	—	—	—	1,187	—	—	1,187
Foreign currency translation	—	—	—	(2,022)	—	—	(2,022)

adjustments							
Follow-on Offerings, net of underwriting discounts, commission and issuance costs	14,428,750	144	470,082	—	—	—	470,226
Shares issued from stock plans, net of payroll taxes paid	4,404,094	44	26,570	—	—	—	26,614
Stock-based compensation	—	—	37,539	—	—	—	37,539
Balance at December 31, 2017	82,498,128	825	1,160,094	(1,795)	(630,657)	19,271	547,738
Impact of change in accounting principle upon adoption of ASU 2016-01 (Note 2)	—	—	—	(1,250)	1,250	—	—
Net loss	—	—	—	—	(86,420)	—	(86,420)
Change in unrealized gain or loss on investments	—	—	—	(7)	—	—	(7)
Foreign currency translation adjustments	—	—	—	771	—	—	771
Adjustment to issuance costs for Follow-on Offerings			11	—	—	—	11
Shares issued from stock plans, net of payroll taxes paid	2,933,974	29	14,206	—	—	—	14,235
Stock-based compensation	—	—	52,142	—	—	—	52,142

Balance at December 31,							
2018	85,432,102	$ 854	$1,226,453	$ (2,281)	$ (715,827)	$ 19,271	$528,470

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIBROGEN, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS

(In thousands)

	Years Ended December 31,		
	2018	2017 (Note 2)	2016 (Note 2)
Operating activities			
Net loss	$(86,420)	$(120,875)	$(58,068)
Adjustments to reconcile net loss to net cash provided by (used in) operating activities:			
Depreciation	6,562	6,099	6,040
Net amortization of premium and discount on investments	(42)	1,844	2,729
Unrealized loss on cash equivalents and short-term equity investments	1,120	2	—
Loss on disposal of property and equipment	53	3	—
Stock-based compensation	52,142	37,539	32,132
Realized foreign currency gain	(1,074)	—	—
Tax benefit on unrealized gain on available-for-sale securities	—	—	(211)
Realized gain on sales of available-for-sale securities	(87)	(143)	(37)
Changes in operating assets and liabilities:			
Accounts receivable ($(43,206), $98 and $353 from related party)	(55,232)	1,996	4,957
Prepaid expenses and other current assets	(129)	(1,911)	1,099
Other assets	1,090	(2,365)	(136)
Accounts payable	3,630	(714)	(298)
Accrued liabilities ($172, $(1,343) and $(430) from related party)	5,606	9,196	2,965
Deferred revenue	(5,031)	174	13,225
Lease financing liability	32	1,023	814
Other long-term liabilities	1,636	1,619	1,897
Net cash provided by (used in) operating activities	(76,144)	(66,513)	7,108
Investing activities			
Purchases of property and equipment	(8,020)	(8,500)	(1,252)
Proceeds from sale of property and equipment	184	5	-
Purchases of available-for-sale securities and term deposit	(576,880)	(169)	(9,041)
Proceeds from sales of available-for-sale securities	8,167	21,109	4,298
Proceeds from maturities of investments	54,426	57,421	12,617
Net cash provided by (used in) investing activities	(522,123)	69,866	6,622
Financing activities			
Borrowings under capital lease obligations	49	—	—
Repayments of capital lease obligations	(6)	—	—
Repayments of lease liability	(403)	(403)	(403)
Proceeds from follow-on offerings, net of underwriting discounts and	—	471,205	—

commission costs			
Cash paid for payroll taxes on restricted stock unit releases	(15,612)	(8,296)	(2,740)
Proceeds from issuance of common stock	29,847	34,910	9,881
Payments of deferred offering costs	—	(944)	—
Net cash provided by financing activities	13,875	496,472	6,738
Effect of exchange rate change on cash and cash equivalents	(8)	51	(10)
Net increase (decrease) in cash and cash equivalents	(584,400)	499,876	20,458
Total cash and cash equivalents at beginning of period	673,658	173,782	153,324
Total cash and cash equivalents at end of period	$89,258	$673,658	$173,782
Supplemental cash flow information:			
Interest payments	$218	$255	$295
Balance in accounts payable and accrued liabilities related to purchases of property and equipment	276	3,781	356
Deferred offering costs recorded in accounts payable and accrued liabilities	$24	$35	$—

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIBROGEN, INC.

NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS

1. The Company

FibroGen, Inc. (“FibroGen” or the “Company”) was incorporated in 1993 in Delaware and is a leading biopharmaceutical company discovering and developing a pipeline of first-in-class therapeutics. The Company has applied its pioneering expertise in hypoxia-inducible factor (“HIF”) and connective tissue growth factor (“CTGF”) biology to develop innovative medicines for the treatment of anemia, fibrotic disease, and cancer. Roxadustat (FG-4592), the Company’s most advanced product candidate, is an oral small molecule inhibitor of HIF prolyl hydroxylase (“HIF-PH”) activity. Roxadustat has received approval of its New Drug Application (“NDA”) in anemia associated with chronic kidney disease (“CKD”) in dialysis-dependent patients from the National Medical Products Administration (“NMPA”) of the People’s Republic of China (“China”). In conjunction with our collaboration partners, we have completed the Phase 3 trials of roxadustat intended to support an NDA in the United States (“U.S.”) and a Marketing Authorization Application (“MAA”) in the European Union for the treatment of anemia in CKD. In collaboration with its partners AstraZeneca AB (“AstraZeneca”) and Astellas Pharma Inc. (“Astellas”), the Company is in the process of preparing the NDA for submission to the U.S. Food and Drug Administration (“FDA”) and MAAs for submission to the European Medicines Agency this year. Both the U.S. NDA and European MAA for roxadustat are expected to cover anemia associated with dialysis-dependent CKD and non-dialysis-dependent CKD. The Company is also in Phase 3 clinical development for the treatment of anemia associated with myelodysplastic syndromes (“MDS”). Pamrevlumab, a human monoclonal antibody that inhibits the activity of CTGF, is advancing towards Phase 3 clinical development for the treatment of idiopathic pulmonary fibrosis (“IPF”) and pancreatic cancer, and is currently in a Phase 2 trial for Duchenne muscular dystrophy (“DMD”).

On April 11, 2017, the Company closed a follow-on offering of its common stock. In this offering, the Company sold 5,228,750 shares of its common stock at a public offering price of $22.95 per share. Net proceeds from this offering were $115.1 million, after deducting underwriting discounts and commissions of $4.9 million. In addition, the offering expenses were approximately $0.6 million in total. On August 24, 2017, the Company completed another follow-on offering of its common stock. In this offering, the Company sold a total of 9,200,000 shares of its common stock at a public offering price of $40.75 per share. Net proceeds from this offering were $356.2 million, after deducting underwriting discounts and commissions of $18.7 million. In addition, the offering expenses were approximately $0.4 million in total.

2. Summary of Significant Accounting Policies

Basis of Presentation

The consolidated financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America (“U.S. GAAP”). The consolidated financial statements include the accounts of the Company, its wholly owned subsidiaries and its majority-owned subsidiaries, FibroGen Europe and FibroGen China Anemia Holdings, Ltd. (“FibroGen China”). All inter-company transactions and balances have been eliminated in consolidation.

The Company operates in one segment — the discovery, development and commercialization of novel therapeutics to treat serious unmet medical needs.

Foreign Currency Translation

The reporting currency of the Company and its subsidiaries is the United States ("U.S.") dollar. The functional currency of FibroGen Europe is the Euro. The assets and liabilities of FibroGen Europe are translated to U.S. dollars at exchange rates in effect at the balance sheet date. All income statement accounts are translated at monthly average exchange rates. Resulting foreign currency translation adjustments are recorded directly in accumulated other comprehensive income (loss) as a separate component of stockholders' equity.

The functional currency of FibroGen, Inc. and all other subsidiaries is the U.S. dollar. Accordingly, monetary assets and liabilities in the non-functional currency of these subsidiaries are remeasured using exchange rates in effect at the end of the period. Revenues and costs in local currency are remeasured using average exchange rates for the period, except for costs related to those balance sheet items that are remeasured using historical exchange rates. The resulting remeasurement gains and losses are included within interest income and other, net in the consolidated statements of operations as incurred and have not been material for all periods presented.

Use of Estimates

The preparation of the consolidated financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and reported amounts of revenues and expenses during the reporting period. The more significant areas requiring the use of management estimates and assumptions include valuation and recognition of revenue, estimates of accruals related to clinical trial costs, valuation allowances for deferred tax assets, and valuation and recognition of stock-based compensation. On an ongoing basis, management reviews these estimates and assumptions. Changes in facts and circumstances may alter such estimates and actual results could differ from those estimates.

Concentration of Credit Risk and Other Risks and Uncertainties

The Company is subject to risks associated with concentration of credit for cash and cash equivalents. A portion of cash on hand is invested in a diversified portfolio of investment grade corporate bonds issued by U.S. corporations as rated investment grade corporate bonds. Any remaining cash is deposited with major financial institutions in the U.S., Finland, China and the Cayman Islands. At times, such deposits may be in excess of insured limits. The Company has not experienced any loss on its deposits of cash and cash equivalents. Included in current assets are significant balances of accounts receivable as follows:

	December 31,	
	2018	2017
Astellas Pharma Inc. (“Astellas”)—Related party	74 %	47 %
AstraZeneca AB (“AstraZeneca”)	26 %	53 %

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, rapid technological change, the results of clinical trials and the achievement of milestones, market acceptance of the Company’s product candidates, competition from other products and larger companies, protection of proprietary technology, strategic relationships and dependence on key individuals.

Cash, Cash Equivalents and Restricted Time Deposits

The Company considers all highly liquid investments with maturities of three months or less and that are used in the Company’s cash management activities at the date of purchase to be cash equivalents. Cash and cash equivalents include money market accounts, various deposit accounts, and money market funds. Restricted time deposits include an irrevocable standby letter of credit as security deposit for a long-term property lease with the Company’s landlord. Restricted time deposits as of December 31, 2018 and 2017 totaled $4.1 million and $5.2 million, respectively. As of December 31, 2018, a total of $21.9 million of the Company’s cash and cash equivalents is held outside of the U.S. in the Company’s foreign subsidiaries to be used primarily for the Company’s China operations.

Investments

The Company’s investments consist of available-for-sale debt investments, marketable equity investments, a term deposit and a certificate of deposit. Those investments with original maturities of greater than three months and remaining maturities of less than 12 months are considered short-term investments. Those investments with maturities

greater than 12 months are considered long-term investments. The Company's investments classified as available-for-sale are recorded at fair value based upon quoted market prices at period end. Unrealized gains and losses for available-for-sale debt investments that are deemed temporary in nature are recorded in accumulated other comprehensive income (loss) as a separate component of stockholder' equity. Marketable equity securities are equity securities with readily determinable fair value, and are measured and recorded at fair value. Realized and unrealized gains or losses resulting from changes in value and sale of the Company's marketable equity investments are recorded in other income (expenses) in the consolidated statement of operations.

A decline in the fair value of any security below cost that is deemed other than temporary results in a charge to earnings and the corresponding establishment of a new cost basis for the security. Premiums and discounts are amortized (accreted) over the life of the related security as an adjustment to its yield. Dividend and interest income are recognized when earned. Realized gains and losses are included in earnings and are derived using the specific identification method for determining the cost of investments sold.

Fair Value of Financial Instruments

Carrying amounts of certain of the Company's financial instruments including cash equivalents, investments, receivables, accounts payable and accrued liabilities approximate fair value (refer to Note 4).

Property and Equipment

Property and equipment (except for costs of construction of certain long-lived assets — refer to Note 8) are recorded at cost and depreciated over their estimated useful lives using the straight-line method. Computer equipment, laboratory equipment, and furniture and fixtures are depreciated over three to five years. Leasehold improvements are recorded at cost and amortized over the term of the lease or their useful life, whichever is shorter.

Impairment of Long-Lived Assets

The Company continually evaluates whether events or circumstances have occurred that indicate that the estimated remaining useful life of its long-lived assets may warrant revision or that the carrying value of these assets may be impaired. If the Company determines that an impairment trigger has been met, the Company evaluates the realizability of its long-lived assets based on a comparison of projected undiscounted cash flows from use and eventual disposition with the carrying value of the related asset. Any write-downs (which are measured based on the difference between the fair value and the carrying value of the asset) are treated as permanent reductions in the carrying amount of the assets (asset group). Based on this evaluation, the Company believes that, as of each of the balance sheet dates presented, none of the Company's long-lived assets were impaired.

Revenue Recognition

Substantially all of the Company's revenues to date have been generated from its collaboration agreements.

The Company's collaboration agreements include multiple performance obligations comprised of promised services, or bundles of services, that are distinct. Services that are not distinct are combined with other services in the agreement until they form a distinct bundle of services. The Company's process for identifying performance obligations and an enumeration of each obligation for each agreement is outlined in Note 3 "Collaboration Agreements." Determining the performance obligations within a collaboration agreement often involves significant judgment and is specific to the facts and circumstances contained in each agreement.

The Company has identified the following material promises under its collaboration agreements: (1) license of FibroGen technology, (2) the performance of co-development services, including manufacturing of clinical supplies and other services during the development period, and (3) manufacture of commercial supply. The evaluation as to whether these promises are distinct, and therefore represent separate performance obligations, is described in more details in Note 3 "Collaboration Agreements."

For revenue recognition purposes, the Company determines that the term of its collaboration agreements begin on the effective date and ends upon the completion of all performance obligations contained in the agreements. In each agreement, the contract term is defined as the period in which parties to the contract have present and enforceable rights and obligations. The Company believes that the existence of what it considers to be substantive termination penalties on the part of the counterparty create sufficient incentive for the counterparty to avoid exercising its right to terminate the agreement unless in exceptionally rare situations.

The transaction price for each collaboration agreement is determined based on the amount of consideration the Company expects to be entitled for satisfying all performance obligations within the agreement. The Company's collaboration agreements include payments to the Company of one or more of the following: non-refundable upfront license fees; co-development billings; development, regulatory, and commercial milestone payments; payments from sales of active pharmaceutical ingredient ("API"); and royalties on net sales of licensed products.

Upfront license fees are non-contingent and non-refundable in nature and are included in the transaction price at the point when the license fees become due to the Company. The Company does not assess whether a contract has a significant financing component if the expectation at contract inception is such that the period between payment by the customer and the transfer of the promised goods or services to the customer will be one year or less.

Co-development billings resulting from the Company's research and development efforts, which are reimbursable under its collaboration agreements, are considered variable consideration. Determining the reimbursable amount of research and development efforts requires detailed analysis of the terms of the collaboration agreements and the nature of the research and development efforts incurred. Determining the amount of variable consideration from co-development billings requires the Company to make estimates of future research and development efforts, which involves significant judgment. Co-development billings are allocated entirely to the co-development services performance obligation when amounts are related specifically to research and development efforts necessary to satisfy the performance obligation, and such an allocation is consistent with the allocation objective.

Milestone payments are also considered variable consideration, which requires the Company to make estimates of when achievement of a particular milestone becomes probable. Similar to other forms of variable consideration, milestone payments are included in the transaction price when it becomes probable that such inclusion would not result in a significant revenue reversal. Milestone payments are therefore included in the transaction price when achievement of the milestone becomes probable.

Product revenue consists of sales of commercial-grade API used in support of pre-commercial validation work. In 2018, the Company recorded revenue from commercial-grade API sales to Astellas based on a transaction price that is subject to potential future adjustments. This represents a form of variable consideration. With respect to these sales in 2018, the transaction price will be adjusted at the time the roxadustat listed price is issued by the Japanese Ministry of Health, Labour and Welfare to reflect differences between estimated and actual listed price, yield from the manufacture of bulk product tablets, and bulk product manufacturing costs. The Company evaluates the latest available facts and circumstances, including listed prices of comparable drug products in Japan and historical bulk drug product manufacturing yields and costs, to determine whether any adjustments to the estimated transaction price is necessary. As of December 31, 2018, no new facts or circumstances were available to warrant an adjustment to the transaction price.

For arrangements that include sales-based royalties and for which the license is deemed to be the predominant item to which the royalties relate, the Company recognizes revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied). To date, the Company has not recognized any royalty revenue resulting from its collaboration arrangements.

The transaction price is allocated to performance obligations based on their relative standalone selling price (“SSP”), with the exception of co-development billings allocated entirely to co-development services performance obligations. The SSP is determined based on observable prices at which the Company separately sells the products and services. If an SSP is not directly observable, then the Company will estimate the SSP considering marketing conditions, entity-specific factors, and information about the customer or class of customer that is reasonably available. The process for determining SSP involves significant judgment and includes consideration of multiple factors, including assumptions related to the market opportunity and the time needed to commercialize a product candidate pursuant to the relevant license, estimated direct expenses and other costs, which include the rates normally charged by contract research and contract manufacturing organizations for development and manufacturing obligations, and rates that would be charged by qualified outsiders for committee services.

Significant judgment may be required in determining whether a performance obligation is distinct, determining the amount of variable consideration to be included in the transaction price, and estimating the SSP of each performance obligation. An enumeration of the Company’s significant judgments is outlined in Note 3 “Collaboration Agreements.”

For each performance obligation identified within an arrangement, the Company determines the period over which the promised services are transferred and the performance obligation is satisfied. Service revenue is recognized over time based on progress toward complete satisfaction of the performance obligation. The Company uses an input method to measure progress toward the satisfaction of co-development services and certain other related performance obligations, which is based on costs of labor hours or full time equivalents and out-of-pocket expenses incurred relative to total expected costs to be incurred. The Company believes this measure of progress provides a faithful depiction of the transfer of services because other measures do not measure as accurately how the Company transfers its performance obligations to its collaboration partners.

Research and Development Expenses

Research and development expenses consist of independent research and development costs and the gross amount of costs associated with work performed under collaboration agreements. Research and development costs include employee-related expenses, expenses incurred under agreements with clinical research organizations (“CROs”), other clinical and preclinical costs and allocated direct and indirect overhead costs, such as facilities costs, information technology costs and other overhead. All research and development costs are expensed as incurred.

Clinical Trial Accruals

Clinical trial costs are a component of research and development expenses. The Company accrues and expenses clinical trial activities performed by third parties based upon actual work completed in accordance with agreements established with clinical research organizations and clinical sites. The Company determines the costs to be recorded based upon validation with the external service providers as to the progress or stage of completion of trials or services and the agreed-upon fee to be paid for such services.

General and Administrative Expenses

General and administrative expenses consist primarily of employee-related expenses for executive, operational, finance, legal, compliance and human resource functions. Other general and administrative expenses include facility-related costs and professional fees, accounting and legal services, other outside services, recruiting fees and expenses associated with obtaining and maintaining patents.

Income Taxes

The Company utilizes the asset and liability method of accounting for income taxes which requires the recognition of deferred tax assets and liabilities for expected future consequences of temporary differences between the financial reporting and income tax bases of assets and liabilities using enacted tax rates. Management makes estimates, assumptions and judgments to determine the Company's provision for income taxes and also for deferred tax assets and liabilities, and any valuation allowances recorded against the Company's deferred tax assets. The Company assesses the likelihood that its deferred tax assets will be recovered from future taxable income and, to the extent the Company believes that recovery is not likely, the Company must establish a valuation allowance.

The calculation of the Company's current provision for income taxes involves the use of estimates, assumptions and judgments while taking into account current tax laws, interpretation of current tax laws and possible outcomes of future tax audits. The Company has established reserves to address potential exposures related to tax positions that could be challenged by tax authorities. Although the Company believes its estimates, assumptions and judgments to be reasonable, any changes in tax law or its interpretation of tax laws and the resolutions of potential tax audits could significantly impact the amounts provided for income taxes in the Company's consolidated financial statements.

The calculation of the Company's deferred tax asset balance involves the use of estimates, assumptions and judgments while taking into account estimates of the amounts and type of future taxable income. Actual future operating results and the underlying amount and type of income could differ materially from the Company's estimates, assumptions and judgments thereby impacting the Company's financial position and results of operations.

The Company has adopted ASC 740-10, Accounting for Uncertainty in Income Taxes, that prescribes a recognition threshold and measurement attribute for the financial statement recognition and measurement of uncertain tax positions taken or expected to be taken in the Company's income tax return, and also provides guidance on derecognition, classification, interest and penalties, accounting in interim periods, disclosure and transition.

The Company includes interest and penalties related to unrecognized tax benefits within income tax expense in the Consolidated Statements of Operations.

Stock-Based Compensation

The Company maintains equity incentive plans under which incentive and nonqualified stock options are granted to employees and non-employee consultants. Compensation expense relating to non-employee stock options has not been material for all the periods presented.

The Company measures and recognizes compensation expense for all stock options and restricted stock units ("RSUs") granted to its employees and directors based on the estimated fair value of the award on the grant date. The Company uses the Black-Scholes valuation model to estimate the fair value of stock option awards. The fair value is recognized as expense, net of estimated forfeitures, over the requisite service period, which is generally the vesting period of the respective award, on a straight-line basis. The Company believes that the fair value of stock options granted to non-employees is more reliably measured than the fair value of the services received. As such, the fair value of the

unvested portion of the options granted to non-employees is re-measured each period. The resulting increase in value, if any, is recognized as expense during the period the related services are rendered on a straight-line basis. The determination of the grant date fair value of options using an option pricing model is affected by the Company's estimated Common Stock fair value and requires management to make a number of assumptions including the expected life of the option, the volatility of the underlying stock, the risk-free interest rate and expected dividends.

Comprehensive Income (Loss)

The Company is required to report all components of comprehensive income (loss), including net loss, in the consolidated financial statements in the period in which they are recognized. Comprehensive income (loss) is defined as the change in equity during a period from transactions and other events and circumstances from non-owner sources, including unrealized gains and losses on investments and foreign currency translation adjustments. Comprehensive gains (losses) have been reflected in the consolidated statements of comprehensive income (loss) for all periods presented.

Recently Issued and Adopted Accounting Guidance

New Revenue Standards

In May 2014, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2014-09, Revenue from Contracts with Customers (Topic 606) ("ASU 2014-09"), which supersedes the revenue recognition requirements in Accounting Standards Codification ("ASC") 605, Revenue Recognition. ASU 2014-09 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. ASU 2014-09 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. Subsequently, the FASB has issued the following standards related to ASU 2014-09: ASU No. 2016-08, Revenue from Contracts with Customers (Topic 606): Principal versus Agent Considerations; ASU No. 2016-10, Revenue from Contracts with Customers (Topic 606): Identifying Performance Obligations and Licensing; ASU No. 2016-12, Revenue from Contracts with Customers (Topic 606): Narrow-Scope Improvements and Practical Expedients; and ASU No. 2016-20, Technical Corrections and Improvements to Topic 606, Revenue from Contracts with Customers (collectively, the "new revenue standards").

Under ASC 606, the Company recognizes revenue when its customer obtains control of promised goods or services, in an amount that reflects the consideration which the Company expects to receive in exchange for those goods or services. To determine revenue recognition for arrangements that the Company determines are within the scope of ASC 606, the Company performs the following five steps: (i) identify the contract(s) with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) the Company satisfies a performance obligation. The Company only applies the five-step model to contracts when it is probable that the Company will collect the consideration it is entitled to in exchange for the goods or services it transfers to the customer. At contract inception, once the contract is determined to be within the scope of ASC 606, the Company assesses the goods or services promised within each contract and determines those that are performance obligations and assesses whether each promised good or service is distinct. The Company then recognizes as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) the performance obligation is satisfied.

The Company adopted the new revenue standards as of January 1, 2018 using the full retrospective method, which required the Company to recast the prior reporting periods presented in the consolidated financial statements. The primary impact upon adoption of the new revenue standards relates to the manner in which revenue is recognized for co-development billings and milestone payments under the Company's collaboration arrangements. Under the new revenue standards, both of these elements of consideration are considered variable consideration which requires the Company to make estimates of when co-development billings become due or when achievement of a particular milestone becomes probable. Payments are included in the transaction price when it becomes probable that inclusion would not lead to a significant revenue reversal.

The Company has recast its consolidated statement of operations and balance sheet from amounts previously reported due to the adoption of the new revenue standards. The adoption of the new revenue standards had no impact to the Company's previously reported consolidated statement of cash flows.

Select line items from the Company's consolidated statement of operations and balance sheet, which reflect the adoption of the new revenue standards are as follows (in thousands):

	Year Ended December 31, 2017			Year Ended December 31, 2016		
	As Previously Reported	New Revenue Standards Adjustment	As Recast	As Previously Reported	New Revenue Standards Adjustment	As Recast
Statement of Operations						
License revenue	$96,056	$ (86,123)	$9,933	$137,352	$ (86,745)	$50,607
Development and other revenue	29,612	91,451	121,063	42,225	90,357	132,582
Total revenue	125,668	5,328	130,996	179,577	3,612	183,189
Net loss	(126,203)	5,328	(120,875)	(61,680)	3,612	(58,068)
Net loss per share - basic and diluted	$(1.73)	$ 0.07	$(1.66)	$(0.98)	$ 0.05	$(0.93)

	December 31, 2017		
	As Previously Reported	New Revenue Standards Adjustment	As Recast
Balance Sheet			
Deferred revenue, current	$7,968	$ 8,702	$16,670
Deferred revenue, net of current	112,231	26,010	138,241
Accumulated deficit	(595,945)	(34,712)	(630,657)

The adoption of the new revenue standards also resulted in the following changes in the accumulated deficit as of December 31, 2016 and 2015:

	As Previously Reported	New Revenue Standards Adjustment	As Recast
Accumulated Deficit			
As of December 31, 2016	$(469,742)	$ (40,040)	$(509,782)
As of December 31, 2015	$(408,062)	$ (43,652)	$(451,714)

ASU 2016-01

In January 2016, the FASB issued ASU 2016-01, Financial Instruments-Overall (Subtopic 825-10). This guidance requires equity investments that are not accounted for under the equity method of accounting to be measured at fair value with changes recognized in net income, simplifies the impairment assessment of certain equity investments, and updates certain presentation and disclosure requirements. This guidance was effective for the annual reporting period beginning after December 15, 2017 and interim periods within those annual periods. The Company adopted this guidance as of January 1, 2018 using the modified retrospective approach. The impacts to the Company's accumulated

other comprehensive loss and accumulated deficit upon adoption of this guidance are as follows (in thousands):

	Accumulated Other Comprehensive Loss	Accumulated Deficit
Balance at December 31, 2017	$ (1,795)	$ (630,657)*
Impact of change in accounting principle upon adoption of ASU 2016-01	(1,250)	1,250
Opening balance as of January 1, 2018	$ (3,045)	$ (629,407)

*Recast to reflect the adoption of the new revenue standards. See above.

The adoption of this guidance had no impact to the Company's consolidated statement of cash flows for the year ended December 31, 2018.

ASU 2017-09

In May 2017, the FASB issued ASU 2017-09, Compensation - Stock Compensation (Topic 718): Scope of Modification Accounting. This guidance provides guidance about which changes to the terms or conditions of a stock-based payment award require an entity to apply modification accounting in Topic 718. This guidance was effective for annual reporting period beginning after December 15, 2017, including interim periods. The Company adopted this guidance as of January 1, 2018, and the adoption of this guidance had no impact to the Company's consolidated financial statements.

ASU 2016-16

In October 2016, the FASB issued ASU 2016-16, Intra-Entity Transfers of Assets Other Than Inventory. This guidance requires companies to recognize the income tax effects of intercompany sales or transfer of assets, other than inventory, in the income statement as income tax expense (or benefit) in the period the sale or transfer occurs. The exception to recognizing the income tax effects of intercompany sales or transfer sales or transfer of assets remains in place for intercompany inventory sales and transfers. This guidance was effective for annual reporting period beginning after December 15, 2017, including interim periods. The Company adopted this guidance as of January 1, 2018 using the modified retrospective method. The adoption of this guidance did not result in any recognition of previously unrecognized deferred charges using a modified retrospective method, thus had no impact to the Company's consolidated financial statements.

Recently Issued Accounting Guidance Not Yet Adopted

In August 2018, the FASB issued ASU 2018-15, Intangibles—Goodwill and Other—Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract. This guidance requires capitalizing implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). This guidance should be applied either retrospectively or prospectively, and is effective for annual reporting period beginning after December 15, 2019 including interim periods, with early adoption permitted. The Company is currently evaluating the impact on its consolidated financial statements upon the adoption of this guidance.

In August 2018, the FASB issued ASU 2018-13, Fair Value Measurement (Topic 820): Disclosure Framework—Changes to the Disclosure Requirements for Fair Value Measurement. This guidance amends existing fair value measurement disclosure requirements by adding, changing, or removing certain disclosures. This guidance is effective for annual reporting period beginning after December 15, 2019 including interim periods, with early adoption permitted. The amendments on changes in unrealized gains and losses, the range and weighted average of significant unobservable inputs used to develop Level 3 fair value measurements, and the narrative description of measurement uncertainty should be applied prospectively for only the most recent interim or annual period presented in the initial fiscal year of adoption. All other amendments should be applied retrospectively to all periods presented upon their effective date. The Company does not anticipate a material impact to its consolidated financial statements upon adoption of this guidance.

In June 2018, the FASB issued ASU 2018-07, Compensation - Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting. This guidance expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. The guidance also specifies that Topic 718 applies to all share-based payment transactions in which a grantor acquires goods or services to be used or consumed in a grantor's own operations by issuing share-based payment awards. This guidance is effective for annual reporting period beginning after December 15, 2018, including interim periods. The Company will adopt this guidance on January 1, 2019 and does not anticipate a material impact to its consolidated financial statements upon

adoption.

In February 2018, the FASB issued ASU 2018-02, Income Statement - Reporting Comprehensive Income: Reclassification of Certain Tax effects from Accumulated Other Comprehensive Income. This guidance allows for the reclassification from accumulated other comprehensive income to retained earnings for the stranded tax effects arising from the change in the reduction of the United States ("U.S.") federal statutory income tax rate from 35% to 21%. This guidance is effective for annual reporting period beginning after December 15, 2018, including interim periods, with early adoption permitted. The Company will adopt this guidance on January 1, 2019 and anticipate a reclassification of $0.6 million from its accumulated other comprehensive loss to its accumulated deficit upon adoption.

In June 2016, the FASB issued ASU 2016-13, Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments ("ASU 2016-13"). This guidance requires that financial assets measured at amortized cost be presented at the net amount expected to be collected. The measurement of expected credit losses is based on historical experience, current conditions, and reasonable and supportable forecasts that affect the collectability. In November 2018, the FASB issued ASU 2018-19, Codification Improvements to Topic 326, Financial Instruments-Credit Losses ("ASU 2018-19"), which clarifies certain topics included within ASU 2016-13. ASU 2016-13 and ASU 2018-19 are effective for the annual reporting period beginning after December 15, 2019, including interim periods within that reporting period. The Company is currently evaluating the impact on its consolidated financial statements upon the adoption of this guidance.

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842) ("ASU 2016-02"). Under this guidance, an entity is required to recognize right-of-use assets and lease liabilities on its balance sheet and disclose key information about leasing arrangements. This guidance offers specific accounting guidance for a lessee, a lessor and sale and leaseback transactions. Lessees and lessors are required to disclose qualitative and quantitative information about leasing arrangements to enable a user of the financial statements to assess the amount, timing and uncertainty of cash flows arising from leases. In July 2018, the FASB issued ASU 2018-11, Leases (Topic 842): Targeted Improvements ("ASU 2018-11"), which provides entities the option to initially apply ASU 2016-02 at the adoption date and recognize a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption. ASU 2016-02 and ASU 2018-11 are effective for the annual reporting period beginning after December 15, 2018, including interim periods within that reporting period. The Company will adopt this guidance as of January 1, 2019 and utilize the modified retrospective transition method through a cumulative-effect adjustment at the beginning of the first quarter of 2019. Based on the current evaluation, the Company anticipates a recognition of approximately $47 million to $62 million in right-of-use assets and approximately $57 million to $67 million in lease liabilities, respectively, upon adoption of this guidance, for its operating leases and facility leases disclosed in Note 8 to its consolidated balance sheets. Accordingly, the related balances as of December 31, 2018 in property and equipment, net, and long-term portion of lease financing obligations would be removed. The Company does not anticipate a material impact to its consolidated statement of operations or consolidated statement of cash flows upon adoption of this guidance.

3. Collaboration Agreements

Astellas Agreements

Japan Agreement

In June 2005, the Company entered into a collaboration agreement with Astellas Pharma Inc. ("Astellas") for the development and commercialization (but not manufacture) of roxadustat for the treatment of anemia in Japan ("Japan Agreement"). Under this agreement, Astellas paid license fees and other consideration totaling $40.1 million (such amounts were fully received as of February 2009). The Japan Agreement also provides for additional development and regulatory approval milestone payments up to $117.5 million, a commercial sales related milestone of $15.0 million and additional consideration based on net sales (as defined) in the low 20% range after commercial launch.

During the second quarter of 2018, Astellas reported positive results from the final phase 3 CKD-dialysis trial of roxadustat in Japan, indicating that Astellas was ready to make an NDA submission for the treatment of anemia with roxadustat in CKD-dialysis patients in 2018. The Company evaluated the regulatory milestone payment associated with NDA submission in Japan based on variable consideration requirements under the current revenue standards and concluded that this milestone became probable of being achieved in the second quarter of 2018. Accordingly, the consideration of $15.0 million associated with this milestone was included in the transaction price and allocated to performance obligations under the Japan Agreement in the second quarter of 2018, substantially all of which was recognized as revenue during the year ended December 31, 2018 from performance obligations satisfied or partially

satisfied.

On November 30, 2018, FibroGen and Astellas entered into an amendment to the Japan Agreement that will allow Astellas to manufacture roxadustat drug product for commercialization in Japan (the “Japan Amendment”). Under this amendment, FibroGen would continue to manufacture and deliver to Astellas roxadustat API. The commercial terms of the Japan Agreement relating to the transfer price for roxadustat for commercial use remain substantially the same, reflecting an adjustment for the manufacture of drug product by Astellas rather than FibroGen. This amendment obligates Astellas to purchase API from the Company, of which $20.9 million was delivered to Astellas in the second quarter of 2018 under a material transfer agreement to conduct commercial scale manufacturing validation for roxadustat drug product in anticipation of commercial launch in Japan. The remaining $43.9 million of API was delivered to Astellas in December 2018.

Europe Agreement

In April 2006, the Company entered into a separate collaboration agreement with Astellas for the development and commercialization of roxadustat for the treatment of anemia in Europe, the Middle East, the Commonwealth of Independent States and South Africa ("Europe Agreement"). Under the terms of the Europe Agreement, Astellas paid license fees and other upfront consideration totaling $320.0 million (such amounts were fully received as of February 2009). The Europe Agreement also provides for additional development and regulatory approval milestone payments up to $425.0 million. Under the Europe Agreement, Astellas committed to fund 50% of joint development costs for Europe and North America, and all territory-specific costs. The Europe Agreement also provides for tiered payments based on net sales of product (as defined) in the low 20% range.

In the fourth quarter of 2018, the Company's was engaged in the final stages of review with its partners over the proposed development of roxadustat for the treatment of chemotherapy induced anemia ("CIA"). AstraZeneca and Astellas approved the program in December 2018 and January 2019, respectively. Costs associated with the development of this indication are expected to be shared 50-50 between the Company's two partners. For revenue recognition purposes, the Company concluded that this new indication represents a modification to the Europe agreements and will be accounted for separately, meaning the development costs associated with the new indications are distinct from the original development costs. The development service period for roxadustat for the treatment of CIA under the Europe Agreement is estimated to continue through the end of 2023 to allow for development of this indication.

AstraZeneca Agreements

U.S./Rest of World Agreement

Effective July 30, 2013, the Company entered into a collaboration agreement with AstraZeneca for the development and commercialization of roxadustat for the treatment of anemia in the U.S. and all other countries in the world, other than China, not previously licensed under the Astellas Europe and Astellas Japan Agreements ("U.S./RoW Agreement"). It also excludes China, which is covered by a separate agreement with AstraZeneca described below. Under the terms of the U.S./RoW Agreement, AstraZeneca has agreed to pay upfront, non-contingent and time-based payments totaling $374.0 million, which were fully received in various amounts through June 2016. In addition, the U.S./RoW Agreement also provides for development and regulatory approval based milestone payments of up to $550.0 million, which include potential future indications which the companies choose to pursue, and commercial related milestone payments of up to $325.0 million.

Under the U.S./RoW Agreement, the Company and AstraZeneca will share equally in the development costs of roxadustat not already paid for by Astellas, up to a total of $233.0 million (i.e. the Company's share of development costs is $116.5 million, which was reached in 2015). Development costs incurred by FibroGen during the development period in excess of the $233.0 million (aggregated spend) are fully reimbursed by AstraZeneca. AstraZeneca will pay the Company tiered royalty payments on AstraZeneca's future net sales (as defined in the agreement) of roxadustat in the low 20% range. In addition, the Company will receive a transfer price for delivery of commercial product based on a percentage of AstraZeneca's net sales (as defined in the agreement) in the low- to mid-single digit range.

China Agreement

Effective July 30, 2013, the Company (through its subsidiaries affiliated with China) entered into a collaboration agreement with AstraZeneca for the development and commercialization (but not manufacture) of roxadustat for the treatment of anemia in China ("China Agreement"). Under the terms of the China Agreement, AstraZeneca agreed to

pay upfront consideration totaling $28.2 million, which were fully received in 2014. In addition, the China Agreement provides for AstraZeneca to pay regulatory approval and other approval related milestones of up to $161.0 million. The China Agreement also provides for sales related milestone payments of up to $167.5 million and contingent payments of $20.0 million related to possible future compounds. The China Agreement is structured as a 50/50 profit or loss share (as defined) and provides for joint development costs (including capital and equipment costs for construction of the manufacturing plant in China), to be shared equally during the development.

In September 2016, AstraZeneca approved the protocol related to the development of roxadustat for the treatment of anemia in patients with myelodysplastic syndrome (“MDS”), for which the Company has received approval from then the China Food and Drug Administration (“CFDA,” now known as the National Medicine Products Administration (“NMPA”)) for its clinical trial application for a Phase 2/3 trial and acceptance of its Investigational New Drug Application from the U.S. Food and Drug Administration for a Phase 3 trial. As a result, for revenue recognition purposes, during the third quarter of 2016, the Company extended the estimated joint development service period for the AstraZeneca agreements from the end of 2018 to the end of 2020, to allow for development of MDS.

As mentioned above, in the fourth quarter of 2018, the Company was engaged in the final stages of review with its partners over the proposed development of roxadustat for the treatment of CIA. AstraZeneca and Astellas approved the program in December 2018 and January 2019, respectively. Costs associated with the development of this indication are expected to be shared 50-50 between the Company's two partners. In addition to CIA, in December 2018, anemia of chronic inflammation ("ACI") and multiple myeloma ("MM") have been approved for development by AstraZeneca and is expected to be fully funded by them. For revenue recognition purposes, the Company concluded that the addition of these new indications represents a modification to the collaboration agreements and will be accounted for separately, meaning the development costs associated with the new indications are distinct from the original development costs. The development service period for roxadustat for the treatment of CIA, ACI and MM under the AstraZeneca agreements is estimated to continue through the end of 2024, to allow for development of these additional indications.

In October 2017, then the CFDA (now known as the NMPA) accepted the Company's recently submitted New Drug Application ("NDA") for registration of roxadustat for anemia in dialysis-dependent CKD and non-dialysis-dependent CKD (NDD-CKD) patients. This NDA submission triggered a $15.0 million milestone payment to the Company by AstraZeneca, which became probable of being achieved during the third quarter of 2017, and therefore partially recognized as revenue under the new revenue standards during 2017.

On December 17, 2018, FibroGen (China) Medical Technology Development Co., Ltd. ("FibroGen China"), received marketing authorization from the NMPA for roxadustat, a first-in-class hypoxia-inducible factor prolyl hydroxylase inhibitor, for the treatment of anemia caused by CKD in patients on dialysis. This approval triggered a $6.0 million milestone payable to the Company by AstraZeneca. On December 29, 2018, FibroGen China received First Manufacturing Approval for a Product in the Field in the Territory , which allows production for Phase IV clinical studies, patients' early experience programs, donation programs, as well as to supply products for testing and assessments required prior to launch. This approval triggered a $6.0 million milestone payable to the Company by AstraZeneca. Approximately $9.9 million of the total $12.0 million milestone payables was recognized as revenue during the fourth quarter of 2018 from performance obligations satisfied or partially satisfied.

Accounting for the Astellas Agreements

For each of the Astellas agreements, the Company has evaluated the promised services within the respective arrangements and has identified performance obligations representing those services and bundles of services that are distinct.

Promised services that were not distinct have been combined with other promised services to form a distinct bundle of promised services, with revenue being recognized on the bundle of services rather than the individual services. There are no right-of-return provisions for the delivered items in the Astellas agreements.

As of December 31, 2018, the transaction price for the Japan Agreement included $40.1 million of non-contingent upfront payments, $37.5 million of variable consideration related to payments for milestones considered probable of being achieved, and $12.1 million of variable consideration related to co-development billings. The transaction price for the Europe Agreement included $320.0 million of non-contingent upfront payments, $90.0 million of variable consideration related to payments for milestones considered probable of being achieved, and $180.9 million of variable consideration related to co-development billings.

For revenue recognition purposes, the Company determined that the term of each collaboration agreement with Astellas begins on the effective date and ends upon the completion of all performance obligations contained in the agreement. The contract term is defined as the period in which parties to the contract have present and enforceable rights and obligations. The Company believes that the requirement to continue funding development for a substantive

period of time and loss of product rights, along with non-refundable upfront payments already remitted by Astellas, create significant disincentive for Astellas to exercise its right to terminate the agreements.

For the Astellas agreements, the Company allocated the transaction price to the various performance obligations based on the relative SSP of each performance obligation, with the exception of co-development billings allocated entirely to co-development services performance obligations.

For the technology license under the Japan Agreement and Europe Agreement, SSP was determined primarily by using the discounted cash flow ("DCF") method, which aggregates the present value of future cash flows to determine the valuation as of the effective date of each of the agreements. The DCF method involves the following key steps: 1) the determination of cash flow forecasts and 2) the selection of a range of comparative risk-adjusted discount rates to apply against the cash flow forecasts. The discount rates selected were based on expectations of the total rate of return, the rate at which capital would be attracted to the Company and the level of risk inherent within the Company. The discounts applied in the DCF analysis ranged from 17.5% to 20.0%. The Company's cash flow forecasts were derived from probability-adjusted revenue and expense projections by territory. Such projections included consideration of taxes and cash flow adjustments. The probability adjustments were made after considering the likelihood of technical success at various stages of clinical trials and regulatory approval phases. SSP also considered certain future royalty payments associated with commercial performance of the Company's compounds, transfer prices and expected gross margins.

The promised services that were analyzed, along with their general timing of satisfaction and recognition as revenue, are as follows:

(1) License to the Company's technology existing at the effective date of the agreements. For both of the Astellas agreements, the license was delivered at the beginning of the agreement term. In both cases, the Company concluded at the time of the agreement that its collaboration partner, Astellas, would have the knowledge and capabilities to fully exploit the licenses without the Company's further involvement. However, the Japan Agreement has contractual limitations that might affect Astellas' ability to fully exploit the license and therefore, potentially, the conclusion as to whether the license is capable of being distinct. In the Japan Agreement, Astellas does not have the right to manufacture commercial supplies of the drug. In order to determine whether this characteristic of the agreement should lead to a conclusion that the license was not distinct in the context of the agreement, the Company considered the ability of Astellas to benefit from the license together with other resources readily available to Astellas. Finally, the Company considered the fact that at the time of delivery of the license, the development services were beyond the preclinical development phase and any remaining development work in either agreement would not be expected to result in any significant modification or customization to the licensed technology. As such, the development services are separately identifiable from the licensed technology, indicating that the license is a distinct performance obligation.

Manufacturing rights. In the case of the Japan Agreement, the Company retained manufacturing rights largely because of the way the parties chose for FibroGen to be compensated under the agreement. At the time the agreement was signed, the Company believed that it was more advantageous upon commercialization to have a transfer price revenue model in place as opposed to a traditional sales-based model. The manufacturing process does not require specialized knowledge or expertise uniquely held by FibroGen, and notwithstanding contractual restrictions, Astellas could employ manufacturing services from readily available third parties in order to benefit from the license. Therefore, along with the foregoing paragraph, the Company determined that the license in Japan is a distinct performance obligation despite the retention of manufacturing rights by the Company.

In summary, the Company concludes that item (1) represents a performance obligation. The portion of the transaction price allocated to this performance obligation based on a relative SSP basis is recognized as revenue in its entirety at the point in time the license transfers to Astellas.

(2) Co-development services (Europe Agreement). This promise relates to co-development services that were reasonably expected to be performed by the Company at the time the collaboration agreement was signed and is considered distinct. Co-development billings are allocated entirely to the co-development services performance obligation as amounts are related specifically to research and development efforts necessary to satisfy the performance obligation, and such an allocation is consistent with the allocation objective. Revenue is recognized over time based on progress toward complete satisfaction of the performance obligation. The Company uses an

input method to measure progress toward the satisfaction of the performance obligation, which is based on costs of labor hours and out-of-pocket expenses incurred relative to total expected costs to be incurred. The measure of progress is updated each reporting period. Co-development services are expected to continue over the development period that is currently estimated to continue through the end of 2019. In addition, the Company concluded that the new indication related to CIA approved in January 2019 represents a modification to the Europe agreements at that time and will be accounted for separately, for which the development service period is estimated to continue through the end of 2023. There was no provision for co-development services in the Japan Agreement.

(3) License to the Company's technology developed during the term of the agreement and development (referred to as "when and if available") and information sharing services. These promises are generally satisfied throughout the term of the agreements.

(4) Manufacturing of clinical supplies of products. This promise is satisfied as supplies for clinical product are delivered for use in the Company's clinical trial programs during the development period, or pre-commercialization period.

(5) Committee service. This promise is satisfied throughout the course of the agreements as meetings are attended.

Items (3)-(5) are bundled into a single performance obligation which is distinct given the fact that all are highly interrelated during the development period (pre-commercial phase of development) such that satisfying them independently is not practicable. Revenue is recognized over time based on progress toward complete satisfaction of the performance obligation. The Company uses an input method to measure progress toward the satisfaction of the performance obligation, which is based on costs of labor hours or full time equivalents and out-of-pocket expenses incurred relative to total expected costs to be incurred. The measure of progress is updated each reporting period.

(6) Manufacturing commercial supplies of products. This promised service is distinct as services are not interrelated with any of the other performance obligations. Payments received for commercial supplies of products represent sales-based payments related predominately to the license of intellectual property under both Astellas agreements. Revenue is recognized as supplies are shipped for commercial use during the commercialization period. To date, no such revenue has been recognized.

In 2018, the Company recorded revenue from commercial-grade API sales to Astellas to conduct commercial scale manufacturing validation based on a transaction price that is subject to potential future adjustments. This represents a form of variable consideration. The Company evaluates the latest available facts and circumstances to determine whether any adjustments to the estimated transaction price is necessary. As of December 31, 2018, no new facts or circumstances were available to warrant an adjustment to the transaction price.

Accounting for the AstraZeneca Agreements

The Company evaluated whether the U.S./RoW Agreement and China Agreement should be accounted for as a single or separate arrangements and concluded that the agreements should be accounted for as a single arrangement with the presumption that two or more agreements executed with a single customer at or around the same time should be presumed to be a single arrangement. The key points the Company considered in reaching this conclusion are as follows:

1. While the two agreements were largely negotiated separately, those negotiations proceeded concurrently, and were intended to be completed contemporaneously, presuming AstraZeneca decided to proceed with licenses in all regions available.
2. Throughout negotiations for both agreements, the Company and the counterparties understood and considered the possibility that one arrangement may be executed without the execution of the other arrangement. However, the preference for the Company and the counterparties during the negotiations was to execute both arrangements concurrently.
3. The two agreements were executed as separate agreements because different development, regulatory and commercial approaches required certain terms of the agreements to be structured differently, rather than because the Company or the counterparties considered the agreements to be fundamentally separate negotiations.

Accordingly, as the agreements are being accounted for as a single arrangement, upfront and other non-contingent consideration received and to be received has been and will be pooled together and allocated to each of the performance obligations in both the U.S./RoW Agreement and China Agreement based on their relative SSPs.

For each of the AstraZeneca agreements, the Company has evaluated the promised services within the respective arrangements and has identified performance obligations representing those services and bundled services that are distinct.

Promised services that were not distinct have been combined with other promised services to form a distinct bundle of promised services, with revenue being recognized on the bundle of services rather than the individual promised services. There are no right-of-return provisions for the delivered items in the AstraZeneca agreements.

As of December 31, 2018, the transaction price for the U.S./RoW Agreement and China Agreement included $402.2 million of non-contingent upfront payments, $42.0 million of variable consideration related to payments for milestones considered probable of being achieved, and $621.6 million of variable consideration related to co-development billings.

For the AstraZeneca agreements, the Company allocated the transaction price to the various performance obligations based on the relative SSP of each performance obligation, with the exception of co-development billings. Co-development billings under the U.S./RoW Agreement were allocated entirely to the U.S./RoW co-development services performance obligation, and co-development billings under the China Agreement were allocated entirely to the combined performance obligation under the China Agreement.

For revenue recognition purposes, the Company determined that the term of its collaboration agreements with AstraZeneca begin on the effective date and ends upon the completion of all performance obligations contained in the agreements. The contract term is defined as the period in which parties to the contract have present and enforceable rights and obligations. The Company believes that the requirement to continue funding development for a substantive period of time and the loss of product rights, along with non-refundable upfront payments already remitted by AstraZeneca, represent substantive termination penalties that create significant disincentive for AstraZeneca to exercise its right to terminate the agreement.

For the technology license under the AstraZeneca U.S./RoW Agreement, SSP was determined based on a two-step process. The first step involved determining an implied royalty rate that would result in the net present value of future cash flows to equal to zero (i.e. where the implied royalty rate on the transaction would equal the target return for the investment). This results in an upper bound estimation of the magnitude of royalties that a hypothetical acquirer would reasonably pay for the forecasted cash flow stream. The Company's cash flow forecasts were derived from probability-adjusted revenue and expense projections. Such projections included consideration of taxes and cash flow adjustments. The probability adjustments were made after considering the likelihood of technical success at various stages of clinical trials and regulatory approval phases. The second step involved applying the implied royalty rate, which was determined to be 40%, against the probability-adjusted projected net revenues by territory and determining the value of the license as the net present value of future cash flows after adjusting for taxes. The discount rate utilized was 17.5%.

U.S./RoW Agreement:

The promised services that were analyzed, along with their general timing of satisfaction and recognition as revenue, are as follows:

(1) License to the Company's technology existing at the effective date of the agreements. For the U.S./RoW Agreement, the license was delivered at the beginning of the agreement term. The Company concluded that AstraZeneca has the knowledge and capabilities to fully exploit the license under the U.S./RoW Agreement without the Company's further involvement. Finally, the Company considered the fact that at the time of delivery of the license, the development services were beyond the preclinical development phase and any remaining development work would not be expected to result in any significant modification or customization to the licensed technology. As such, the development services are separately identifiable from the licensed technology, indicating that the license is a distinct performance obligation. Therefore, the Company has concluded that the license is distinct and represents a performance obligation. The portion of the transaction price allocated to this performance obligation based on a relative SSP basis is recognized as revenue in its entirety at the point in time the license transfers to AstraZeneca.

(2) Co-development services. This promise relates to co-development services that were reasonably expected to be performed by the Company at the time the collaboration agreement was signed and is distinct. Co-development billings are allocated entirely to the co-development services performance obligation as amounts are related specifically to research and development efforts necessary to satisfy the performance obligation, and such an allocation is consistent with the allocation objective. Revenue is recognized over time based on progress toward complete satisfaction of the performance obligation. The Company uses an input method to measure progress toward the satisfaction of the performance obligation, which is based on costs of labor hours or full time equivalents and out-of-pocket expenses incurred relative to total expected costs to be incurred. Co-development services are expected to continue over the development period that is currently estimated to continue through the end of 2020. In addition, the Company concluded that the addition of the new indications related to CIA, ACI and MM approved during the fourth quarter of 2018 represents a modification to the collaboration agreements and will be accounted for separately, for which the joint development service period is estimated to continue through the end of 2024.

(3) Manufacturing of clinical supplies of products. This promise is satisfied as supplies for clinical product are delivered for use in the Company's clinical trial programs during the development period, or pre-commercialization period.

(4) Information sharing and committee service. These promises are satisfied throughout the course of the agreement as services are provided.

Items (3)-(4) are bundled into a single performance obligation which is distinct given the fact that all are highly interrelated during the development period (pre-commercial phase of development) such that delivering them independently is not practicable. Revenue is recognized over time based on progress toward complete satisfaction of the performance obligation. The Company uses an input method to measure progress toward the satisfaction of the performance obligation, which is based on costs of labor hours or full time equivalents and out-of-pocket expenses incurred relative to total expected costs to be incurred. The measure of progress is updated each reporting period.

(5) Manufacturing commercial supplies of products. This promise is distinct as services are not interrelated with any of the other performance obligations. Payments received for commercial supplies of products represent sales-based royalties related predominately to the license of intellectual property under the agreement. Revenue is recognized as supplies are shipped for commercial use during the commercialization period. To date, no such revenue has been recognized.

China Agreement:

The performance obligation that were analyzed, along with their general timing of satisfaction and recognition as revenue, are as follows:

- License to the Company's technology existing at the effective date of the agreement. The license was delivered at the beginning of the agreement term. However, the China Agreement with AstraZeneca has contractual limitations that might affect AstraZeneca's ability to fully exploit the license and therefore, potentially, the conclusion as to whether the license is distinct in the context of the agreement. In the China Agreement, AstraZeneca does not have the right to manufacture commercial supplies of the drug. In order to determine whether this characteristic of the arrangement should lead to a conclusion that the license was not distinct in the context of the agreement, the Company considered the ability of AstraZeneca to benefit from the license on its own or together with other resources readily available to AstraZeneca.

For the China Agreement, the Company retained manufacturing rights as an essential part of a strategy to pursue domestic regulatory pathway for product approval which requires the regulatory licensure of the manufacturing facility in order to commence commercial shipment. The prospects for the collaboration as a whole would have been substantially different had manufacturing rights been provided to AstraZeneca. Due to certain regulatory restrictions in China, manufacturing services of commercial drug product in China are not readily available to AstraZeneca or any other parties. Therefore, AstraZeneca cannot benefit from the license on its own or together with other readily available resources. Accordingly, all the promises identified, including co-development services, under the China Agreement have been bundled into a single performance obligation and amounts of the transaction price allocable to this performance obligation are deferred until control of the manufactured commercial drug product has begun to transfer to AstraZeneca. Upon commencement of the transfer of control to commercial drug product, revenue would be recognized in a pattern consistent with estimated deliveries of the commercial drug product.

Summary of revenue recognized under the collaboration agreements

The table below summarizes the accounting treatment for the various performance obligations pursuant to each of the Astellas and AstraZeneca agreements. License amounts identified below are included in the "License revenue" line item in the consolidated statements of operations. All other elements identified below are included in the "Development and other revenue" line item in the consolidated statements of operations.

Amounts recognized as revenue under the Japan Agreement were as follows (in thousands):

		Years Ended December 31,		
Agreement	Performance Obligation	2018	2017 *	2016 *
Japan	License revenue	$14,323	$—	$9,548
	Development revenue	$2,400	$1,588	$4,288

*Recast to reflect the adoption of the new revenue standards. See Note 2.

The transaction price related to consideration received and accounts receivable has been allocated to each of the following performance obligations under the Japan Agreement, along with any associated deferred revenue as follows (in thousands):

Japan Agreement	Cumulative Revenue Through December 31, 2018	Deferred Revenue at December 31, 2018	Total Consideration Through December 31, 2018
License	$ 74,089	$ —	$ 74,089
Development revenue	13,908	286	14,194
Total license and development revenue	$ 87,997	$ 286	$ 88,283

The revenue recognized under the Japan Agreement for the year ended December 31, 2018 included an increase of $14.9 million resulting from changes to estimated variable consideration in the current year relating to performance obligations satisfied or partially satisfied in previous periods. The remainder of the transaction price related to the Japan Agreement includes $1.4 million of variable consideration from estimated future co-development billing and is expected to be recognized over the remaining development service period.

Amounts recognized as revenue under the Europe Agreement were as follows (in thousands):

		Years Ended December 31,		
Agreement	Performance Obligation	2018	2017 *	2016 *
Europe	License revenue	$—	$—	$—
	Development revenue	$18,503	$18,523	$17,487

*Recast to reflect the adoption of the new revenue standards. See Note 2.

The transaction price related to consideration received and accounts receivable has been allocated to each of the following performance obligations under the Europe Agreement, along with any associated deferred revenue as follows (in thousands):

Europe Agreement	Cumulative Revenue Through December 31, 2018	Deferred Revenue at December 31, 2018	Total Consideration Through December 31, 2018
License	$ 370,481	$ —	$ 370,481
Development revenue	202,836	3,225	206,061
Total license and development revenue	$ 573,317	$ 3,225	$ 576,542

The revenue recognized under the Europe Agreement for the year ended December 31, 2018 included an increase in revenue of $0.6 million, resulting from changes to estimated variable consideration in the current year relating to performance obligations satisfied or partially satisfied in previous periods. The remainder of the transaction price related to the Europe Agreement includes $14.3 million of variable consideration from estimated future co-development billing and is expected to be recognized over the remaining development service period.

Amounts recognized as revenue under the U.S./RoW and China Agreements were as follows (in thousands):

		Years Ended December 31,		
Agreement	Performance Obligation	2018	2017 *	2016 *
U.S. / RoW and China	License revenue	$7,946	$9,933	$41,059
	Development revenue	$104,970	$100,928	$110,677
	China performance obligation	$—	$—	$—

*Recast to reflect the adoption of the new revenue standards. See Note 2.

The transaction price related to consideration received and accounts receivable has been allocated to each of the following performance obligations under the U.S./RoW Agreement and China Agreement, along with any associated deferred revenue as follows (in thousands):

U.S. / RoW and China Agreements	Cumulative Revenue Through December 31, 2018	Deferred Revenue at December 31, 2018	Total Consideration Through December 31, 2018
License	$ 294,163	$ —	$ 294,163
Co-development, information sharing & committee services	408,637	20,521	429,158
China performance obligation	—	125,848	125,848
Total license and development revenue	$ 702,800	$ 146,369	$ 849,169

The revenue recognized under the U.S./RoW Agreement and China Agreement for the year ended December 31, 2018 included an increase in revenue of $20.2 million resulting from changes to estimated variable consideration in the current year relating to performance obligations satisfied or partially satisfied in previous periods. The remainder of the transaction price related to the U.S./RoW Agreement and China Agreement includes $197.4 million of variable consideration from estimated future co-development billing and is expected to be recognized over the remaining development service period, except for amounts allocated to the China performance obligation, which are expected to be recognized in a pattern consistent with estimated deliveries of the commercial drug product.

Product Revenue

As described above, the Japan Amendment obligates Astellas to purchase API from the Company to conduct commercial scale manufacturing validation for roxadustat drug product in anticipation of commercial launch in Japan. The Company fulfilled all the delivery obligations under the term of the Japan Amendment during the year ended December 31, 2018, and recognized the related product revenue of $64.8 million in the same period.

Other Revenues

Other revenues consist primarily of collagen material sold for research purposes. Other revenues were immaterial for each of the three years ended December 31, 2018.

Deferred Revenue

Deferred revenue represents amounts billed to the Company’s collaboration partners for which the related revenues have not been recognized because one or more of the revenue recognition criteria have not been met. The current portion of deferred revenue represents the amount to be recognized within one year from the balance sheet date based on the estimated performance period of the underlying performance obligations. The long term portion of deferred revenue represents amounts to be recognized after one year through the end of the non-contingent performance period of the underlying performance obligations. The long term portion of deferred revenue also includes amounts allocated to the China unit of accounting under the AstraZeneca arrangement as revenue recognition associated with this unit of accounting is tied to the commercial launch of the products within China, which is not expected to occur within the next year.

4. Fair Value Measurements

In accordance with the authoritative guidance on fair value measurements and disclosures under U.S. GAAP, the Company presents all financial assets and liabilities and any other assets and liabilities that are recognized or disclosed at fair value on a nonrecurring basis. The guidance defines fair value, establishes a framework for measuring fair value in generally accepted accounting principles and expands disclosures about fair-value measurements. The guidance also requires fair value measurements be classified and disclosed in one of the following three categories:

Level 1: Quoted prices in active markets for identical assets or liabilities.

Level 2: Observable inputs other than quoted prices in active markets for identical assets or liabilities.

Level 3: Unobservable inputs.

The Company values certain assets and liabilities, focusing on the inputs used to measure fair value, particularly in instances where the measurement uses significant unobservable (Level 3) inputs. The Company’s financial instruments

are valued using quoted prices in active markets (Level 1) or based upon other observable inputs (Level 2). The Company's assessment of the significance of a particular input to the fair value measurement in its entirety requires management to make judgments and considers factors specific to the asset or liability. In addition, the categories presented do not suggest how prices may be affected by the size of the purchases or sales, particularly with the largest highly liquid financial issuers who are in markets continuously with non-equity instruments, or how any such financial assets may be impacted by other factors such as U.S. government guarantees. Assets and liabilities measured at fair value are classified in their entirety based on the lowest level of input that is significant to the fair value measurement.

The fair values of the Company's financial assets that are measured on a recurring basis are as follows (in thousands):

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
US treasury notes and bills	$292,317	$224,953	$ —	$517,270
Bond and mutual funds	10,484	—	—	10,484
Equity investments	234	—	—	234
Money market funds	541	—	—	541
Term deposit	—	80,000	—	80,000
Certificate of deposit	—	29,910	—	29,910
Total	$303,576	$334,863	$ —	$638,439

	December 31, 2017			
	Level 1	Level 2	Level 3	Total
Corporate bonds	$—	$53,943	$ —	$53,943
Bond and mutual funds	18,402	—	—	18,402
Equity investments	221	—	—	221
Money market funds	569,942	—	—	569,942
Total	$588,565	$53,943	$ —	$642,508

The Company's Level 2 investments are valued using third-party pricing sources. The pricing services utilize industry standard valuation models, including both income and market-based approaches, for which all significant inputs are observable, either directly or indirectly, to estimate fair value. These inputs include reported trades of and broker/dealer quotes on the same or similar investments, issuer credit spreads, benchmark investments, prepayment/default projections based on historical data and other observable inputs.

The fair values of the Company's financial liabilities that are carried at historical cost are as follows (in thousands):

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Lease financing obligations	$—	$ —	$98,105	$98,105

	December 31, 2017			
	Level 1	Level 2	Level 3	Total
Lease financing obligations	$—	$ —	$98,476	$98,476

The fair value of the Company's financial liabilities were derived by using an income approach, which required Level 3 inputs such as discounted estimated future cash flows.

There were no transfers of assets or liabilities between levels for the years ended December 31, 2018, 2017 and 2016.

5. Balance Sheet Components

Cash and Cash Equivalents

Cash and cash equivalents consisted of the following (in thousands):

	December 31,	
	2018	2017
Cash	$38,783	$103,716
US treasury notes and bills	49,934	—
Money market funds	541	569,942
Total cash and cash equivalents	$89,258	$673,658

Property and Equipment

Property and equipment consisted of the following (in thousands):

	December 31,	
	2018	2017
Leasehold improvements	$101,200	$93,758
Building shell (Refer to Note 8)	53,880	53,879
Laboratory equipment	16,405	19,497
Machinery	8,382	—
Computer equipment	6,473	6,006
Furniture and fixtures	5,690	5,575
Construction in progress	367	10,402
Total property and equipment	$192,397	$189,117
Less: accumulated depreciation	(65,199)	(59,641)
Property and equipment, net	$127,198	$129,476

Depreciation expense for the years ended December 31, 2018, 2017 and 2016 was $6.6 million, $6.1 million, and $6.0 million, respectively.

Investments

The Company’s investments consist of available-for-sale debt investments, marketable equity investments, term deposit and certificate of deposit. The amortized cost, gross unrealized holding gains or losses, and fair value of the Company’s investments by major investments type are summarized in the tables below (in thousands):

	December 31, 2018			
	Amortized Cost	Gross Unrealized Holding Gains	Gross Unrealized Holding Losses	Fair Value
US treasury notes and bills	$467,296	$ 109	$ (69)	$467,336
Term deposit	80,000	—	—	80,000
Certificates of deposit	30,000	—	(90)	29,910
Bond and mutual funds	10,464	20	—	10,484
Equity investments	125	109	—	234
Total investments	$587,885	$ 238	$ (159)	$587,964

	December 31, 2017			
	Amortized Cost	Gross Unrealized Holding Gains	Gross Unrealized Holding Losses	Fair Value
Corporate bonds	$53,985	$ 4	$ (46)	$53,943
Bond and mutual funds	17,249	1,153	—	18,402
Equity investments	126	95	—	221
Total investments	$71,360	$ 1,252	$ (46)	$72,566

The contractual maturities of the available-for-sale investments and term deposit were as follows (in thousands):

	December 31, 2018
Within one year	$ 532,144
After one year through four years	45,102
Total debt investments	577,246
Bond and mutual funds	10,484
Equity investments	234
Total investments	$ 587,964

The Company periodically reviews its available-for-sale investments and term deposit for other-than-temporary impairment. The Company considers factors such as the duration, severity and the reason for the decline in value, the potential recovery period and its intent to sell. For debt securities, the Company also considers whether (i) it is more likely than not that the Company will be required to sell the debt securities before recovery of their amortized cost basis, and (ii) the amortized cost basis cannot be recovered as a result of credit losses. During the three years ended December 31, 2018, the Company did not recognize any other-than-temporary impairment loss.

Accrued Liabilities

Accrued liabilities consisted of the following (in thousands):

	December 31,	
	2018	2017
Preclinical and clinical trial accruals	$35,413	$32,321
Payroll and related accruals	21,430	18,810
Property taxes and other	1,095	4,201
Professional services	2,648	1,991
Other	5,537	6,458
Total accrued liabilities	$66,123	$63,781

6. Product Development Obligations

The Technology Development Center of the Republic of Finland (“TEKES”) product development obligations consist of 11 separate advances (each in the form of a note agreement) received by FibroGen Europe between 1996 and 2008 from TEKES. These advances are granted on a project by project basis to fund various product development efforts undertaken by FibroGen Europe only. Each separate note bears interest (not compounded) calculated as one percentage point less than the Bank of Finland rate in effect at the time of the note, but no less than 3.0%.

If the research work funded by TEKES does not result in an economically profitable business or does not meet its technological objectives, TEKES may, on application from FibroGen Europe, forgive each of these loans, including accrued interest, either in full or in part. As of December 31, 2018 and 2017, the Company had $10.8 million and $11.3 million of principal outstanding, respectively, and $6.0 million and $5.9 million of interest accrued, respectively, which were presented in the product development obligations line on the consolidated balance sheets.

The Company is not a guarantor of these loans, and these loans are not repayable by FibroGen Europe until it has distributable funds.

7. Convertible Note Payable

In January 2013, FibroGen China entered into a $0.6 million convertible promissory note. The note bears simple interest at a rate of two percent (2.00%) per annum, accrued on an annual basis in arrears. The outstanding principal balance and unpaid accrued interest on the note is due and payable upon the earlier of (a) the effectiveness of the initial public offering of FibroGen China or (b) the eight year anniversary of the date of the note. The total outstanding principal balance and unpaid accrued interest on the note will be converted into Series A Preferred Stock of FibroGen China at the option of the lender or by the Company at its discretion. As of December 31, 2018 and 2017, the total outstanding principal balance and accrued interest were $0.7 million and $0.6 million, respectively, and recorded in the other long-term liabilities in the consolidated balance sheets.

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8. Commitments and Contingencies

Operating Leases

Future minimum lease payments under all non-cancelable operating lease obligations as of December 31, 2018 are as follows (in thousands):

Year Ending	Operating Leases
2019	$ 444
2020	232
2021	25
2022	16
2023	—
Total minimum payments	$ 717

Facility Lease Financing Obligations

FibroGen, Inc.

In September 2006, the Company entered into a long-term property lease with Shorenstein Properties LLC (“Alexandria” or “landlord”) providing the Company with 234,249 square feet of space for an initial term of 15 years. Upon signing, a stand-by letter of credit was established in the amount of $7.3 million which has been included in restricted time deposits. Starting the fourth quarter of 2016, on an annual basis, 1/8th of this letter of credit was released. As a result, the restriction of a $1.0 million was removed, and the amount was reclassified from restricted time deposits to short-term investment during the fourth quarter of each year since 2016. The agreement included an expansion option to occupy part of an adjacent building within 31 months of the lease commencement date of November 20, 2008. In June 2012, the Company gave notice to its landlord that it would not exercise this expansion option, which resulted in a $5.0 million payment liability to the landlord which is being financed over the remaining lease term of its lease.

In connection with this lease, the Company was responsible for approximately 60% of the construction costs for the tenant improvements. The Company is deemed, for accounting purposes only, to be the accounting owner of the entire project including the building shell, even though it is not the legal owner. The balance of the tenant improvements were paid by Alexandria in the form of a tenant improvement allowance of $140.50 per square foot of rentable space, or $32.5 million.

In connection with the Company’s accounting for this transaction, the Company capitalized Alexandria’s costs of constructing the building shell which totaled $50.8 million, and recognized a corresponding lease financing obligation. The Company also recognized, as an additional lease financing obligation, the reimbursements totaling $32.5 million from landlord for tenant improvements since these reimbursements are also deemed to be a financing obligation.

A portion of the monthly lease payment is allocated to land rent and recorded as an operating lease expense and the non-interest portion of the amortized lease payments to the landlord related to rent of the building is applied to the lease financing liability.

FibroGen China

In February 2013, the Company entered into a long-term property lease with Beijing Economic-Technological Development Area ("BDA") Management Committee for a pilot plant located in Beijing Yizhuang Biomedical Park ("BYBP") of BDA. The leased space is 4,820 square meters over an eight (8) year term starting February 1, 2013.

In connection with this lease, the Company was responsible for approximately 100% of the construction costs for the tenant improvements. The Company is deemed, for accounting purposes only, to be the accounting owner of the entire project, including the building shell, even though it is not the legal owner.

In connection with the Company's accounting for this transaction, the Company capitalized BDA Management Committee's costs of constructing the building shell which totaled $3.1 million, and recognized a corresponding lease financing obligation. The Company also recognized, as an additional lease financing obligation, the reimbursements totaling $0.5 million from BYBP for a rent subsidy since this reimbursement is also deemed to be a financing obligation.

A portion of the monthly lease payment is allocated to land rent and recorded as an operating lease expense and the non-interest portion of the amortized lease payments to the landlord related to rent of the building is applied to the lease financing liability.

Future minimum lease payments, on a consolidated basis, under the Company's facility lease financing obligations as of December 31, 2018 are as follows (in thousands):

Year Ending	Lease financing obligations
2019	$ 14,379
2020	14,664
2021	14,179
2022	14,335
2023	12,872
Total minimum payments	$ 70,429

Apart from the property leases with Alexandria and BDA Management Committee, rent expense for leased facilities under operating lease commitments was $3.1 million, $3.0 million, and $2.8 million for the years ended December 31, 2018, 2017 and 2016, respectively. The Company received sublease income of $3.5 million, $3.9 million, and $3.8 million for the years ended December 31, 2018, 2017 and 2016, respectively, which were recorded as a reduction of research and development expenses and general and administrative expenses for the respective periods.

Indemnification Agreements

The Company enters into standard indemnification arrangements in the ordinary course of business, including for example, service, manufacturing and collaboration agreements. Pursuant to these arrangements, the Company indemnifies, holds harmless, and agrees to reimburse the indemnified parties for losses suffered or incurred by the indemnified party, including in connection with intellectual property infringement claims by any third party with respect to its technology. The term of these indemnification agreements is generally perpetual any time after the execution of the agreement. The maximum potential amount of future payments the Company could be required to make under these arrangements is not determinable. The Company has never incurred costs to defend lawsuits or settle claims related to these indemnification agreements. As a result, the Company believes the estimated fair value of these arrangements is minimal.

The Company has entered into indemnification agreements with its directors and officers that may require the Company to indemnify its directors and officers against liabilities that may arise by reason of their status or service as directors or officers to the extent permissible under applicable law.

9. Equity and Stock-based Compensation
Subsidiary Stock and Non-Controlling Interests

FibroGen Europe

As of December 31, 2018 and 2017, respectively, FibroGen Europe had a total of 42,619,022 shares of Preferred Stock outstanding, of which there were 1,700,845 shares of Series A Preferred Stock, 1,875,000 shares of Series B Preferred Stock, 1,599,503 shares of Series C Preferred Stock, 1,520,141 shares of Series D Preferred Stock, 459,565 shares of Series E Preferred Stock, 5,714,332 shares of Series F Preferred Stock, 9,927,500 shares of Series G Preferred Stock and 19,822,136 shares of Series H Preferred Stock, all of which shares no longer have any right to be

exchanged for FibroGen, Inc. Common Stock.

The holders of FibroGen Europe's shares of Preferred Stock ("Preferred Shares") have the following rights, preferences and privileges:

Dividend Rights — When the assets of FibroGen Europe are distributed (except for distribution in a liquidation), Preferred Shares shall have the same rights to dividend or other forms of distribution as shares of Common Stock of FibroGen Europe. In the event of a merger, holders of Preferred Shares do not have the right to demand FibroGen Europe to redeem all or part of their Preferred Shares. FibroGen Europe may repurchase shares of Common Stock or Preferred Shares for consideration.

Pre-emptive Right — Preferred Shares shall have pre-emptive subscription right in accordance with the Finnish Limited Liability Companies Act if additional shares are issued, option rights are given, or convertible loan is taken, provided, however, that the foregoing pre-emptive right does not apply to a directed share issue, for which two thirds (2/3) of the voting shares represented at a general meeting of shareholders approve for an important legitimate cause.

Redemption Right — If a Preferred Share can be redeemed by a majority shareholder owning more than ninety percent (90%) of the shares of FibroGen Europe in accordance with the provisions of the Finnish Limited Liability Companies Act, the minority holders of Preferred Shares have the right to request redemption of their shares.

Voting Right — Each share has one vote. Preferred Shares have voting rights only in situations that are specifically provided in the Articles of Association, which include a merger transaction and directed share issue. In addition, Preferred Shares have right to vote in a general shareholder meeting for amending the Articles of Association if the amendment will affect the rights of Preferred Shares.

Conversion Right (1-for-1 basis into Common Stock of FibroGen Europe):

- Voluntary conversion right: Preferred Shares can be converted into common shares upon the written request of a shareholder provided that the conversion is feasible within the maximum and minimum amounts of shares of classes of FibroGen Europe as set forth in its Articles of Association. Such request can be withdrawn before the notification of conversion is filed with the Finnish Trade Register.
- Compulsory conversion right: Preferred Shares will be converted into common shares if (i) FibroGen Europe's shares are listed in a stock exchange or other trading system in the European Economic Area, or (ii) FibroGen Europe's recombinant collagen and gelatin production technology is being put into commercial use in the area of EU and certain other European states. Commercial use means there is income generated from the first commercial sale of the products incorporating the above mentioned technology and does not include license fees, development financing, milestone payments or income from test products or equipment used in research. The board of directors of FibroGen Europe shall notify the shareholders of the compulsory conversion in writing, and the shareholders shall request to convert their shares within the timeframe provided in the notification. Should the shareholders fail to make the conversion request within the time limit, FibroGen Europe may redeem the shares of such shareholders.

Liquidation Right — In the event of a dissolution of FibroGen Europe, holders of Preferred Shares are entitled to be paid in an amount equal to the subscription price of the shares before any distribution is made to holders of common shares. Among holders of Preferred Shares, holders of shares of Series F Preferred Stock are entitled to be paid in an amount equal to the subscription price of Series F Preferred Stock before any distribution is made to holders of other Preferred Shares.

FibroGen China

FibroGen China had 6,758,000 Series A Preference Shares outstanding as of December 31, 2018 and 2017, respectively. The holders of the FibroGen China Series A Preference Shares have the following rights, preferences and privileges:

Liquidation — In the event of liquidation, dissolution, or winding up of the Company, either voluntary or involuntary, including by means of a merger, the holders of FibroGen China Series A Preference Shares are entitled to be paid an amount equal to the product of the number of shares held by a holder of shares of FibroGen China Series A Preference Shares and the original issue price of $1.00 (subject to equitable adjustment for any stock dividend, combination, split, reclassification, recapitalization) plus all declared and unpaid dividends thereon.

Conversion — Each share of FibroGen China Series A Preference Shares is convertible into the number of fully paid and non-assessable shares of Common Stock of FibroGen China that results from dividing the original issue price by the conversion price in effect at the time of the conversion, subject to adjustments for stock splits, stock dividends, reclassifications and like events. The FibroGen China Series A Preference Shares have a conversion price that is equal to the original issuance price such that the conversion ratio to FibroGen China Common Stock is 1:1 as of all periods presented.

Voting — The holders of FibroGen China Series A Preference Shares are entitled to vote together with the FibroGen China Common Stock holders on all matters submitted for a vote of the stockholders. The holder of each share of FibroGen China Series A Preference Shares has the number of votes equal to the number of shares of FibroGen China Common Stock into which it is convertible.

Dividends — The holders of FibroGen China Series A Preference Shares are entitled to receive cash dividends when and if declared, at a rate of 6%.

Non-Controlling Interests

Non-controlling interest positions related to the issuance of subsidiary stock as described above are reported as a separate component of consolidated equity from the equity attributable to the Company's stockholders at December 31, 2018 and 2017. In addition, the Company does not allocate losses to the non-controlling interests as the outstanding shares representing the non-controlling interest do not represent a residual equity interest in the subsidiary. Upon the initial public offering and as described above, all eligible FibroGen Europe preferred shares were exchanged for 958,996 shares of FibroGen Common Stock. No other FibroGen Europe shares have the right to be exchanged for FibroGen, Inc. Common Stock.

Common Stock

Each share of Common Stock is entitled to one vote. The holders of Common Stock are also entitled to receive dividends whenever funds are legally available and when declared by the board of directors, subject to the prior rights of holders of all classes of stock outstanding.

Shares of Common Stock outstanding, shares of stock plans outstanding and shares reserved for future issuance related to stock options and RSUs grant and the Company's Employee Stock Purchase Plan ("ESPP") purchases are as follows (in thousands):

	December 31,	
	2018	2017
Common stock outstanding	85,432	82,498
Stock options outstanding	10,430	11,550
RSUs outstanding	1,428	1,562
Common stock warrants outstanding	4	4
Shares reserved for future stock options and RSUs grant	6,041	4,190
Shares reserved for future ESPP offering	2,618	2,024
Total shares of common stock reserved	105,953	101,828

Stock Plans

Stock Option and RSU Plans

Under the Company's Amended and Restated 2005 Stock Plan ("2005 Stock Plan"), the Company may issue shares of Common Stock and options to purchase Common Stock and other forms of equity incentives to employees, directors and consultants. Options granted under the 2005 Stock Plan may be incentive stock options or nonqualified stock options. Incentive stock options ("ISO") may be granted only to employees and officers of the Company. Nonqualified stock options ("NSO") and stock purchase rights may be granted to employees, directors and consultants. The board of directors has the authority to determine to whom options will be granted, the number of options, the term and the exercise price. Options are to be granted at an exercise price not less than fair market value for an ISO or an NSO. Options generally vest over four years. Options expire no more than 10 years after date of grant. Upon the effective date of the registration statement related to the Company's initial public offering, the 2005 Plan was amended to cease the grant of any additional awards thereunder, although the Company will continue to issue common stock upon the exercise of previously granted stock options under the 2005 Plan.

In September 2014, the Company adopted a 2014 Equity Incentive Plan (the "2014 Plan") which became effective on November 13, 2014. The 2014 Plan is the successor equity compensation plan to the 2005 Plan. The 2014 Plan will terminate on November 12, 2024. The 2014 Plan provides for the grant of incentive stock options, nonqualified stock options, restricted stock awards, stock appreciation rights, performance stock awards, performance cash awards, restricted stock units and other stock awards to employees, directors and consultants. Stock options granted must be at prices not less than 100% of the fair market value at date of grant. Option vesting schedules are determined by the Company at the time of issuance and generally have a four year vesting schedule (25% vesting on the first anniversary of the vesting base date and quarterly thereafter over the next 3 years). Options generally expire ten years from the date of grant unless the optionee is a 10% stockholder, in which case the term will be five years from the date of grant. Unvested options exercised are subject to the Company's repurchase right. Shares reserved for issuance increases on

January 1 of each year commencing on January 1, 2016 and ending on January 1, 2024 by the lesser of (i) the amount equal to 4% of the number of shares issued and outstanding on December 31 immediately prior to the date of increase or (ii) such lower number of shares as may be determined by the board of directors. As of December 31, 2018, the Company has reserved 6,040,725 shares of its common stock that remains unissued for issuance under the 2014 Plan.

Issuance of shares upon share option exercise or share unit conversion is made through issuance of new shares authorized under the plan.

Certain Common Stock option holders have the right to exercise unvested options, subject to a right held by the Company to repurchase the stock, at the original exercise price, in the event of voluntary or involuntary termination of employment of the stockholder. The shares are generally released from repurchase provisions ratably over four years. The Company accounts for the cash received in consideration for the early exercised options as a liability. At December 31, 2018 and 2017, no shares of Common Stock were subject to repurchase by the Company.

Stock option transactions, including forfeited options granted under the 2014 Plan as well as prior plans, are summarized below:

	Shares (In thousands)	Weighted Average Exercise per Share	Weighted Average Remaining Contractual Life (In Years)	Aggregate Intrinsic Value (In thousands)
Outstanding at December 31, 2017	11,550	$ 14.82		
Granted	1,307	53.64		
Exercised	(2,271)	11.20		
Expired	(7)	5.82		
Forfeited	(149)	30.55		
Outstanding at December 31, 2018	10,430	20.25	5.47	$ 281,436
Vested and expected to vest, December 31, 2018	10,430	20.25	5.47	281,436
Exercisable at December 31, 2018	7,644	$ 13.83	4.47	$ 248,206

The total intrinsic value of options exercised during the years ended December 31, 2018, 2017 and 2016 was $97.5 million, $111.9 million, and $17.9 million, respectively.

The following table summarizes RSU activity:

	Shares (In thousands)	Fair Value at Grant
Unvested at December 31, 2017	1,562	$ 24.75
Granted	706	53.69
Vested	(727)	24.70
Forfeited	(113)	35.12
Unvested at December 31, 2018	1,428	$ 38.26

Among the vested RSUs during the year ended December 31, 2017, 432,472 shares were released and issued, while the remaining was withheld for the related payroll taxes. The estimated weighted-average fair value of the awards granted during the years ended December 31, 2018, 2017 and 2016 was $53.69, $26.59 and $19.37, respectively.

ESPP

In September 2014, the Company adopted a 2014 ESPP that became effective on November 13, 2014. The 2014 ESPP is designed to enable eligible employees to periodically purchase shares of the Company’s common stock at a discount through payroll deductions of up to 15% of their eligible compensation, subject to any plan or IRS limitations. At the end of each offering period, employees are able to purchase shares at 85% of the lower of the fair market value of the

Company’s common stock on the first trading day of the offering period or on the last day of the offering period. Purchases are accomplished through participation in discrete offering periods. The 2014 ESPP is intended to qualify as an ESPP under Section 423 of the Internal Revenue Code. The Company has reserved 1,600,000 shares of its common stock for issuance under the 2014 ESPP and shares reserved for issuance increases January 1 of each year commencing January 1, 2016 by the lesser of (i) a number of shares equal to 1% of the total number of outstanding shares of common stock on December 31 immediately prior to the date of increase; (ii) 1,200,000 shares or (iii) such number of shares as may be determined by the board of directors. There were 230,317 shares, 250,834 shares and 266,720 shares purchased by employees under the 2014 Purchased Plan for the years ended December 31, 2018, 2017 and 2016, respectively.

The expected term of 2014 ESPP shares is the average of the remaining purchase periods under each offering period.

Stock-Based Compensation

Stock-based compensation expense allocated to research and development and general and administrative expense for the years ended December 31, 2018, 2017 and 2016 was as follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Research and development	$30,491	$21,807	$19,070
General and administrative	21,651	15,732	13,062
Total stock-based compensation expense	$52,142	$37,539	$32,132

The Company estimates the fair value of stock options using the Black-Scholes option valuation model. The fair value of employee stock options is being amortized on a straight-line basis over the requisite service period of the awards.

Prior to the Company's initial public offering, the Company, in making its determinations of the fair value of its Common Stock, considered a variety of quantitative and qualitative factors, including (i) net present value of the Company's projected earnings, (ii) fair market value of the stock of comparable publicly-traded companies, (iii) any third party transactions involving the Company's convertible preferred stock, (iv) liquidation preferences of the Company's preferred stock and the likelihood of conversion of the preferred stock, (v) changes in the Company's business operations, financial condition and results of operations over time, including cash balances and burn-rate, (vi) the status of new product development, and (vii) general financial market conditions. Subsequent to the IPO, the fair market value of common stock is based on the closing price of the Company's common stock as reported on the NASDAQ Global Select Market on the date of the grant.

The fair value of employee stock options was estimated using the following assumptions:

Expected Term. Expressed as a weighted-average, the expected life of the options is based on the average period the stock options are expected to be outstanding and was based on the Company's historical information of the option exercise patterns and post-vesting termination behavior as well as contractual terms of the instruments.

Expected Volatility. While the Company considers its historical data regarding the volatility of its Common Stock, the expected volatility is currently based upon the historical volatility of comparable public entities. In evaluating comparable companies, the Company considered factors such as industry, stage of life cycle, size and duration as a public company.

Risk-Free Interest Rate. Expressed as a weighted-average, the risk-free interest rate assumption is based on the U.S. Treasury instruments whose term was consistent with the expected term of the Company's stock options.

Expected Dividend Yield. The Company has never declared or paid any cash dividends and does not plan to pay cash dividends in the foreseeable future.

The assumptions used to estimate the fair value of stock options granted and ESPPs using the Black-Scholes option valuation model were as follows:

	Years Ended December 31,		
	2018	2017	2016
Stock Options			
Expected term (in years)	5.4	5.7	5.3
Expected volatility	67.9 %	71.5 %	69.9 %
Risk-free interest rate	2.7 %	2.2 %	1.4 %
Expected dividend yield	—	—	—
Weighted average estimated fair value	$32.12	$16.96	$11.49
ESPPs			
Expected term (in years)	0.5 - 2.0	0.5 - 2.0	0.5 - 2.0

Expected volatility	47.3 - 75.3 %	52.8 - 77.2 %	61.9 - 80.7 %
Risk-free interest rate	0.8 - 2.9 %	0.5 - 1.6 %	0.2 - 1.0 %
Expected dividend yield	—	—	—
Weighted average estimated fair value	$16.27	$9.41	$9.94

As of December 31, 2018, there was $46.6 million of total unrecognized compensation costs, net of estimated forfeitures, related to non-vested stock option awards granted that will be recognized on a straight-line basis over the weighted-average period of 2.24 years. As of December 31, 2018, there was $40.9 million of total unrecognized compensation costs, net of estimated forfeitures, related to non-vested RSUs granted that will be recognized on a straight-line basis over the weighted-average period of 2.40 years.

Warrants

The following warrants to purchase shares of Common Stock were issued in connection with certain facility and equipment lease financing arrangements and are outstanding at December 31, 2018:

Year of Issuance	Number of Shares	Exercise Price per Share	Reason for Issuance	Expiration Date
2000	4,430	$ 15.00	Issued in connection with lease agreement	Five years after initial public offering or upon merger or sale of the Company's assets, whichever occurs first
	4,430			

10. Net Loss Per Share

The following securities were excluded from the calculation of diluted net loss per share because their effect would have been anti-dilutive for the three years presented (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Employee stock options	10,430	11,550	13,660
RSUs outstanding	1,428	1,562	1,211
Warrants	4	4	4
	11,862	13,116	14,875

11. FibroGen, Inc. 401(k) Plan

Substantially all of the Company's full-time United States of America-based employees are eligible to make contributions to the Company's 401(k) Plan. Under this plan, participating employees may defer up to 60% of their pretax salary during the year, but not more than statutory limits. The Company may elect to match employee contributions. Matching contributions of $2.9 million, $2.5 million and $2.3 million were made during years ended December 31, 2018, 2017 and 2016, respectively.

12. Income Taxes

The components of loss before income taxes are as follows (in thousands):

	Years Ended December 31,		
	2018	2017 *	2016 *
Domestic	$(38,472)	$(80,735)	$(25,342)
Foreign	(47,644)	(39,819)	(32,797)
Loss before provision for income taxes	$(86,116)	$(120,554)	$(58,139)

*Recast to reflect the adoption of the new revenue standards. See Note 2.

The provision for (benefit from) income taxes consists of the following (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Current:			
Federal	$—	$—	$—
State	2	2	2
Foreign	302	319	139
Total current	304	321	141
Deferred:			
Federal	—	—	(212)
State	—	—	—
Foreign	—	—	—
Total deferred	—	—	(212)
Total provision for (benefit from) income taxes	$304	$321	$(71)

The following is the reconciliation between the statutory federal income tax rate and the Company's effective tax rate:

	Years Ended December 31,		
	2018	2017	2016
Tax at statutory federal rate	21.0 %	34.0 %	34.0 %
State tax	— %	— %	— %
Stock-based compensation expense	14.5 %	18.5 %	(7.9)%
Change in deferred tax assets due to rate change	— %	43.9 %	— %
Change in valuation allowance due to rate change	— %	(43.9)%	— %
Net operating losses not benefitted	(23.2)%	(43.8)%	(12.9)%
Foreign net operating losses not benefitted	(11.6)%	(6.7)%	(13.0)%
Orphan drug credit	0.0 %	(2.0)%	— %
Other	(1.1)%	(0.3)%	(0.1)%
Total	(0.4)%	(0.3)%	0.1 %

Significant components of the Company's deferred tax assets are as follows (in thousands):

	December 31,	
	2018	2017
Federal and state net operating loss carryforwards	$91,683	$71,256
Tax credit carryforwards	45,885	39,488
Foreign net operating loss carryforwards	21,295	15,052
Stock-based compensation	9,281	7,835
Lease obligations	2,511	2,737
Reserves and accruals	6,072	4,851
Deferred revenue	16,454	18,103
Fixed assets	356	—
Other	450	420
Subtotal	193,987	159,742
Less: Valuation allowance	(193,987)	(159,540)
Net deferred tax assets	—	202
Fixed assets	—	(181)
Other	—	(21)
Net deferred tax liabilities	—	(202)
Total net deferred tax assets	$—	$—

A valuation allowance has been provided to reduce the deferred tax assets to an amount management believes is more likely than not to be realized. Expected realization of the deferred tax assets for which a valuation allowance has not been recognized is based on upon the reversal of existing temporary differences and future taxable income.

The valuation allowance increased by $34.4 million, $30.5 million and $12.3 million for the years ended December 31, 2018, 2017 and 2016, respectively. Due to uncertainty surrounding the realization of the favorable tax attributes in the future tax returns, the Company has established a valuation allowance against its otherwise recognizable net deferred tax assets.

At December 31, 2018, the Company had net operating loss carryforwards available to offset future taxable income of approximately $400.3 million and $148.1 million for federal and state tax purposes, respectively. These carryforwards will begin to expire in 2026 for federal and 2019 for state purposes, if not utilized before these dates. The Company also had foreign net operating loss carryforwards of approximately $86.3 million which expire between 2019 and 2028 if not utilized.

At December 31, 2018, the Company had approximately $46.4 million of federal and $26.3 million of California research and development tax credit and other tax credit carryforwards available to offset future taxable income. The federal credits begin to expire in 2019 and the California research credits have no expiration dates.

On December 22, 2017, the Tax Cuts and Jobs Act ("Tax Act") was signed into law making significant changes to the Internal Revenue Code. Changes include, but are not limited to, a corporate tax rate decrease from 35% to 21% effective for tax years beginning after December 31, 2017, the transition of U.S international taxation from a worldwide tax system to a territorial system, and a one-time transition tax on the mandatory deemed repatriation of cumulative foreign earnings as. In the fourth quarter of 2018, the Company completed its analysis to determine the effect of the Tax Act and no material adjustments were recognized as of December 31, 2018. Developing interpretations of the provisions of the Tax Act, changes to U.S. Treasury regulations, administrative interpretations or court decisions interpreting the Tax Act in the future periods may require further adjustments to the Company's analysis.

Due to the adoption of ASU 2016-09 in 2017, the Company recorded a retrospective increase of $19.5 million in the deferred tax assets for previously unrecognized excess tax benefits that existed as of December 31, 2016, and a corresponding increase of $19.5 million in the valuation allowance against these deferred tax assets. In addition, all excess tax benefits and deficiencies are recognized as income tax expense and will result in increased volatility in the Company's income tax.

Federal and state tax laws impose substantial restrictions on the utilization of net operating loss and credit carryforwards in the event of an "ownership change" for tax purposes, as defined in IRC Section 382. The Company reviewed its stock ownership for year ended December 31, 2018 and concluded no ownership changes occurred which would result in a reduction of its net operating loss or in its research and development credits expiring unused. If additional ownership change occurs, the utilization of net operating loss and credit carryforwards could be significantly reduced.

Uncertain Tax Positions

The Company had unrecognized tax benefits of approximately $28.0 million as of December 31, 2018. Approximately $0.5 million of unrecognized tax benefits, if recognized, would affect the effective tax rate. The interest accrued as of December 31, 2018 and 2017 was immaterial.

A reconciliation of the beginning and ending amounts of unrecognized income tax benefits during the three years ended December 31, 2018 is as follows (in thousands):

	Federal and State
Balance as of December 31, 2015	$ 24,213
Decrease due to prior positions	(7,109)
Increase due to current year position	2,550
Balance as of December 31, 2016	19,654
Increase due to prior positions	303
Increase due to current year position	5,448
Decrease due to U.S. tax rate change	(2,044)
Balance as of December 31, 2017	23,361
Increase due to prior positions	379
Increase due to current year position	4,216
Balance as of December 31, 2018	$ 27,956

Unrecognized tax benefits may change during the next twelve months for items that arise in the ordinary course of business. The Company does not anticipate a material change to its unrecognized tax benefits over the next twelve months that would affect the Company's effective tax rate.

The Company classifies interest and penalties as a component of tax expense, if any.

The Company files income tax returns in the U.S. federal jurisdiction, U.S. state and other foreign jurisdictions. The U.S. federal and U.S. state taxing authorities may choose to audit tax returns for tax years beyond the statute of limitation period due to significant tax attribute carryforwards from prior years, making adjustments only to carryforward attributes. The foreign statute of limitation generally remains open from 2009 to 2018. The Company is not currently under audit in any tax jurisdiction.

13. Related Party Transactions

Astellas is an equity investor in the Company and considered a related party. During the years ended December 31, 2018, 2017 and 2016, the Company recorded revenue related to collaboration agreements with Astellas of $100.0 million, $20.1 million, and $31.3 million, respectively. The related party revenue for the year ended December 31, 2018 included $64.8 million product revenue for API to conduct commercial scale manufacturing validation for roxadustat drug product in anticipation of commercial launch in Japan. See Note 3 and below for details. The related party revenue was recast for each of the years ended December 31, 2017 and 2016 as a result of adoption of the new revenue standards. See Note 2 for details.

During the years ended December 31, 2018, 2017 and 2016, the Company recorded expense related to collaboration agreements with Astellas of $1.5 million, $1.0 million and $6.4 million, respectively.

As of December 31, 2018 and 2017, accounts receivable from Astellas were $47.2 million and $4.0 million, respectively, and amounts due to Astellas were $0.4 million and $0.3 million, respectively. The amounts due are included in accrued liabilities on the consolidated balance sheets. The accounts receivable from Astellas as of December 31, 2018 included $43.8 million related to the delivery of roxadustat API to Astellas during the fourth quarter of 2018. The sale of API was pursuant to the Japan Amendment allowing Astellas to manufacture roxadustat drug product for commercialization in Japan.

14. Segment and Geographic Information

The Company has determined that the chief executive officer is the chief operating decision maker (“CODM”). The CODM reviews financial information presented for the Company’s various clinical trial programs as well as results on a consolidated basis. License revenues and development revenues received are not allocated to various programs for purposes of determining a profit measure and resource allocation decisions are made by the CODM based primarily on consolidated results. As such, the Company has concluded that it operates as one segment. Supplemental enterprise-wide information has been presented below.

Geographic Revenues

Geographic revenues, which are based on the bill-to region, are as follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Europe	$112,916	$110,861	$151,736
Japan (related party)	100,002	20,111	31,323
All other	40	24	130
Total revenue	$212,958	$130,996	$183,189

Geographic Long-Lived Assets

Property and equipment, net by geographic location are as follows (in thousands):

	December 31,	
	2018	2017
United States	$103,539	$107,228
China	23,659	22,248

Total property and equipment	$127,198	$129,476

Customer Concentration

Substantially all of the Company's revenues to date have been generated from the following collaboration partners that respectively accounted for more than 10% of the Company's total revenue and accounts receivable:

	Percentage of Revenue Years Ended December 31,			Percentage of Accounts Receivable December 31,	
	2018	2017	2016	2018	2017
Astellas—Related party	47 %	15 %	17 %	74 %	47 %
AstraZeneca	53 %	85 %	83 %	26 %	53 %

Schedule II: Valuation and Qualifying Accounts

(in thousands)

	Balance at Beginning of Year	Charged (Credited) to Statement of Operation	Charged to Other Accounts - Equity	Deductions, Net	Balance at End of Year
Valuation allowances for deferred tax assets					
Year ended December 31, 2018	$ 159,540	$ 34,447	$ —	$ —	$ 193,987
Year ended December 31, 2017	$ 128,995	$ 11,039	$ 19,506	$ —	$ 159,540
Year ended December 31, 2016	$ 116,718	$ 12,277	$ —	$ —	$ 128,995

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURES

None.

ITEM 9A. CONTROLS AND PROCEDURES

Attached as exhibits 31.1 and 31.2 to this Annual Report on Form 10-K are certifications of our Chief Executive Officer and our Chief Financial Officer required by Rule 13a-14(a) and 15d-15(e) promulgated under the Securities Exchange Act of 1934, as amended (the "Rule 13a-14(a) and 15d-15(e) Certifications"). This Controls and Procedures section of the Annual Report on Form 10-K includes the information concerning the controls evaluation referred to in the Rule 13a-14(a) and 15d-15(e) Certifications.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and our Chief Financial Officer, has evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2018, the end of the period covered by this Annual Report on Form 10-K. Disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the "Exchange Act")) are designed to provide reasonable assurance 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 U.S. Securities and Exchange Commission's rules and forms and that such information is accumulated and communicated to the company's management, including its Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

Based on management's evaluation, our principal executive officer and principal financial officer have concluded that our disclosure controls and procedures were effective as of December 31, 2018 at the reasonable assurance level.

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 such term is defined in Rule 13a-15(f) of the Exchange Act. Our internal control over financial reporting is a process established under the supervision of and with the participation of our management, including our Chief Executive Officer and our Chief Financial Officer. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Management, with the participation and under the supervision of our Chief Executive Officer and our Chief Financial Officer, evaluated our internal control over financial reporting as of December 31, 2018, the end of our fiscal year, using the criteria established in Internal Control - Integrated Framework (2013) set forth by the Committee of Sponsoring Organizations of the Treadway Commission.

Based on management's evaluation of our internal control over financial reporting, management concluded that, our internal control over financial reporting was effective as of December 31, 2018.

The effectiveness of the Company's internal control over financial reporting as of December 31, 2018 has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report which appears herein.

Changes in Internal Control over Financial Reporting

There was no change 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 most recent fiscal quarter ended December 31, 2018 that materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information required by this item is incorporated by reference to our Proxy Statement for our 2019 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year ended December 31, 2018.

Code of Conduct

We have adopted a Code of Business Conduct which applies to all of our directors, officers and employees. A copy of our Code of Business Conduct can be found on our website (www.FibroGen.com) under “Corporate Governance.” The contents of our website are not a part of this report.

In addition, we intend to promptly disclose the nature of any amendment to, or waiver from, our Code of Business Conduct that applies to our principal executive officer, principal financial officer, principal accounting officer or persons performing similar functions on our website in the future.

ITEM 11. EXECUTIVE COMPENSATION

The information required by this item is incorporated by reference to our Proxy Statement for our 2019 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year ended December 31, 2018.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The information required by this item is incorporated by reference to our Proxy Statement for our 2019 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year ended December 31, 2018.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The information required by this item is incorporated by reference to our Proxy Statement for our 2019 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year ended December 31, 2018.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

The information required by this item is incorporated by reference to our Proxy Statement for our 2019 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year ended December 31, 2018.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) We have filed the following documents as part of this Annual Report on Form 10-K:

1. Consolidated Financial Statements

Information in response to this Item is included in Part II, Item 8 of this Annual Report on Form 10-K.

2. Financial Statement Schedules

Schedule II is included on page 166. All other schedules are omitted because they are not required or the required information is included in the consolidated financial statements or notes thereto.

3. Exhibits

See Item 15(b) below.

(b) Exhibits—We have filed, or incorporated into this Annual Report on Form 10-K by reference, the exhibits listed below. Where an exhibit is incorporated by reference, the number in parentheses indicates the document to which cross-reference is made. Refer to the end of this table for a listing of cross-reference documents.

Exhibit Number	Exhibit Description	Incorporation By Reference Form	SEC File No.	Exhibit	Filing Date
3.1	Amended and Restated Certificate of Incorporation of FibroGen, Inc.	8-K	001-36740	3.1	11/21/2014
3.2	Amended and Restated Bylaws of FibroGen, Inc.	S-1/A	333-199069	3.4	10/23/2014
4.1	Form of Common Stock Certificate.	8-K	001-36740	4.1	11/21/2014
4.2	Investor Rights Agreement by and among FibroGen, Inc. and certain of its stockholders, dated as of December 1995.	S-1	333-199069	4.2	10/1/2014
4.3	Investor Rights Agreement by and among FibroGen, Inc. and certain of its warrant holders, dated as of February 8, 2000.	S-1	333-199069	4.7	10/1/2014
4.4	Warrant to Purchase 11,076 Shares of Common Stock issued to Bristow Investments, L.P, dated as of February 8, 2000.	S-1	333-199069	4.12	10/1/2014
4.5	Shareholders' Agreement by and among FibroGen International (Cayman) Limited and certain of its shareholders, dated as of September 8, 2017.	10-Q	001-36740	4.6	11/8/2017

4.6	Common Stock Purchase Agreement by and between FibroGen, Inc. and AstraZeneca AB, dated as of October 20, 2014.	S-1/A	333-199069	4.17	10/24/2014
10.1(i)+	FibroGen, Inc. Amended and Restated 2005 Stock Plan.	S-1	333-199069	10.3(i)	10/1/2014
10.1(ii)+	Forms of stock option agreement, restricted stock purchase agreement and stock appreciation right agreement under the FibroGen, Inc. Amended and Restated 2005 Stock Plan.	S-1	333-199069	10.3(ii)	10/1/2014
10.1(iii)+	Form of stock option agreement under the FibroGen, Inc. Amended and Restated 2005 Stock Plan applicable to options exchanged pursuant to FibroGen, Inc.'s 2010 amendment and exchange offer.	S-1	333-199069	10.3(iii)	10/1/2014

10.1(iv)+	Form of 2010 amendment to the form of stock option agreement under the FibroGen, Inc. Amended and Restated 2005 Stock Plan applicable to options amended pursuant to FibroGen, Inc.'s 2010 amendment and exchange offer.	S-1	333-199069	10.3(iv)	10/1/2014
10.1(v)+	Form of 2013 amendment to the form of stock option agreement under the FibroGen, Inc. Amended and Restated 2005 Stock Plan applicable to options amended or exchanged pursuant to FibroGen, Inc.'s 2010 amendment and exchange offer.	S-1	333-199069	10.3(v)	10/1/2014
10.2+	FibroGen, Inc. 2014 Equity Incentive Plan and forms of agreement thereunder.	S-1/A	333-199069	10.4	11/12/2014
10.3+	FibroGen, Inc. 2014 Employee Stock Purchase Plan.	S-1/A	333-199069	10.5	11/12/2014
10.4+	FibroGen, Inc. Non-Employee Director Compensation Policy, as amended.	10-Q		10.6	8/7/2018
10.5+	FibroGen, Inc. 2018 Bonus Plan.	8-K	001-36740	10.5	2/16/2018
10.6	Lease Agreement by and between FibroGen, Inc. and X-4 Dolphin LLC, dated as of September 22, 2006; as amended by First Amendment to Lease by and between FibroGen, Inc. and X-4 Dolphin LLC, dated as of October 10, 2007; as amended by Second Amendment to Lease by and between FibroGen, Inc. and X-4 Dolphin LLC, dated as of June 29, 2009; as amended by Third Amendment to Lease by and between FibroGen, Inc. and Are-San Francisco No. 43, LLC (as successor in interest to X-4 Dolphin LLC), dated as of May 19, 2011; as amended by Fourth Amendment to Lease by and between FibroGen, Inc. and Are-San Francisco No. 43, LLC, dated as of September 8, 2011.	S-1	333-199069	10.8	10/1/2014
10.7	Lease for Premises in Beijing BDA Biomedical Park by and among Beijing FibroGen Medical Technology Development Co., Ltd., Beijing Economic and Technology Investment Development Parent Company and Beijing BDA International Biological Pharmaceutical Investment Management Co., Ltd., effective as of February 1, 2013, as supplemented by the Supplementary Agreement to Lease of Premises in Beijing BDA Biomedical Park by and among Beijing FibroGen Medical Technology Development Co., Ltd., Beijing Economic Technology Investment Development Parent Company and Beijing BDA International Biological Pharmaceutical Investment Management Co., Ltd., dated as of January 30, 2013.	S-1	333-199069	10.9	10/1/2014
10.8+	Form of Employment Offer Letter.	S-1	333-199069	10.10	10/1/2014
10.9†		10-Q	001-36740	10.9	11/8/2017

	Collaboration Agreement, by and between FibroGen, Inc. and Astellas Pharma Inc., effective as of June 1, 2005.					
10.9(i)*†	Amendment No. 1 to Collaboration Agreement, by and between FibroGen, Inc. and Astellas Pharma Inc., effective as of January 1, 2013.	—	—	—	—	

10.10†	Anemia License and Collaboration Agreement, by and between FibroGen, Inc. and Astellas Pharma Inc., effective as of April 28, 2006.	S-1	333-199069	10.12	10/1/2014
10.11†	Amendment to Anemia License and Collaboration Agreement, by and between FibroGen, Inc. and Astellas Pharma Inc., effective as of August 31, 2006.	S-1	333-199069	10.13	10/1/2014
10.12	Amendment No. 2 to Anemia License and Collaboration Agreement, by and between FibroGen, Inc. and Astellas Pharma Inc., effective as of December 1, 2006.	S-1	333-199069	10.14	10/1/2014
10.13†	Supplement to Anemia License and Collaboration Agreement, by and between FibroGen, Inc. and Astellas Pharma Inc., effective as of April 28, 2006.	S-1	333-199069	10.15	10/1/2014
10.14†	Amendment No. 3 to Anemia License and Collaboration Agreement, by and between FibroGen, Inc. and Astellas Pharma Inc., dated as of May 10, 2012.	S-1	333-199069	10.16	10/1/2014
10.15†	Amended and Restated License, Development and Commercialization Agreement (China) by and among FibroGen China Anemia Holdings, Ltd., Beijing FibroGen Medical Technology Development Co., Ltd., FibroGen International (Hong Kong) Limited and AstraZeneca AB, effective as of July 30, 2013.	S-1/A	333-199069	10.17	10/23/2014
10.16†	Amended and Restated License, Development and Commercialization Agreement by and between Registrant and AstraZeneca AB, effective as of July 30, 2013.	10-Q/A	001-36740	10.16	12/14/2017
10.17†	License Agreement by and between FibroGen, Inc. and the University of Miami and its School of Medicine, dated as of May 23, 1997.	S-1	333-199069	10.19	10/1/2014
10.18†	First Amendment to May 23, 1997 License Agreement by and between FibroGen, Inc. and University of Miami, effective as of July 29, 1999.	S-1	333-199069	10.20	10/1/2014
10.19	Research and Commercialization Agreement by and among FibroGen, Inc., GenPharm International Inc., Medarex, Inc. and FibroPharma, Inc., effective as of July 9, 1998.	S-1	333-199069	10.21	10/1/2014
10.20	Amendment No. 1 to Research and Commercialization Agreement by and among FibroGen, Inc., GenPharm International Inc., Medarex, Inc. and FibroPharma, Inc., effective as of June 30, 2001.	S-1	333-199069	10.22	10/1/2014
10.21†	Amendment No. 2 to Research and Commercialization Agreement by and among FibroGen, Inc., GenPharm International Inc., Medarex, Inc. and FibroPharma, Inc., effective as of January 28, 2002.	S-1	333-199069	10.23	10/1/2014

10.22†	License Agreement by and between FibroGen, Inc. and the Dana-Farber Cancer Institute, Inc., effective as of March 29, 2006.	S-1	333-199069	10.24	10/1/2014	

10.23	Amendment No. 1 to License agreement by and between FibroGen, Inc. and Dana-Farber Cancer Institute, Inc., effective as of February 28, 2006.	S-1	333-199069	10.25	10/1/2014
10.24	Amendment No. 2 to License Agreement by and between FibroGen, Inc. and Dana-Farber Cancer Institute, Inc., effective as of March 14, 2006.	S-1	333-199069	10.26	10/1/2014
10.25+	Form of Indemnity Agreement by and between FibroGen, Inc. and its directors and officers.	S-1/A	333-199069	10.27	10/23/2014
10.26(i)†	Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of November 29, 2007.	S-1	333-199069	10.28(i)	10/1/2014
10.26(ii)†	Letter Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of June 26, 2008.	S-1	333-199069	10.28(ii)	10/1/2014
10.26(iii)†	Letter Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of August 18, 2008.	S-1	333-199069	10.28(iii)	10/1/2014
10.26(iv)†	Amendment No. 1 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of May 28, 2009.	S-1	333-199069	10.28(iv)	10/1/2014
10.26(v)†	Amendment No. 3 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of November 5, 2010.	S-1	333-199069	10.28(v)	10/1/2014
10.26(vi)†	Amendment No. 4 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of January 24, 2011.	S-1	333-199069	10.28(vi)	10/1/2014
10.26(vii)†	Amendment No. 5 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of April 15, 2011.	S-1	333-199069	10.28(vii)	10/1/2014
10.26(viii)†	Amendment No. 6 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of May 26, 2011.	S-1	333-199069	10.28(viii)	10/1/2014
10.26(ix)†		S-1	333-199069	10.28(ix)	10/1/2014

	Amendment No. 7 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of January 1, 2012.				
10.26(x)†	Amendment No. 8 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of July 10, 2012.	S-1	333-199069	10.28(x)	10/1/2014
10.26(xi)†	Amendment No. 9 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of November 26, 2012.	S-1	333-199069	10.28(xi)	10/1/2014

10.26(xii)†	Amendment No. 10 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of June 21, 2013.	S-1	333-199069	10.28(xii)	10/1/2014
10.26(xiii)†	Amendment No. 11 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of July 9, 2013.	S-1	333-199069	10.28(xiii)	10/1/2014
10.26(xiv)†	Amendment No. 12 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of August 1, 2013.	S-1	333-199069	10.28(xiv)	10/1/2014
10.26(xv)†	Amendment No. 13 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of March 6, 2014.	S-1	333-199069	10.28(xv)	10/1/2014
10.26(xvi)†	Amendment No. 14 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of February 5, 2014.	S-1	333-199069	10.28(xvi)	10/1/2014
10.26(xvii)†	Amendment No. 15 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of October 20, 2014.	10-Q	001-36740	10.28(xvii)	11/12/2015
10.26(xviii)†	Amendment No. 16 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of December 8, 2014.	10-Q	001-36740	10.28(xviii)	11/12/2015
10.26(xix)†	Amendment No. 17 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of December 8, 2014.	10-Q	001-36740	10.28(xix)	11/12/2015
10.26(xx)†	Amendment No. 18 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of February 15, 2015.	10-Q	001-36740	10.28(xx)	11/12/2015
10.26(xxi)†	Amendment No. 19 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG,	10-Q	001-36740	10.28(xxi)	11/12/2015

	effective as of March 1, 2015.				
10.26(xxii)†	Amendment No. 20 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of June 1, 2015.	10-Q	001-36740	10.28(xxii)	11/12/2015
10.26(xxiii)†	Amendment No. 21 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of May 29, 2015.	10-Q	001-36740	10.28(xxiii)	11/12/2015

10.26(xxiv)†	Amendment No. 23 to the Process Development and Clinical Supply Agreement by and between FibroGen, Inc. and Boehringer Ingelheim Pharma GmbH & Co. KG, effective as of September 1, 2015.	10-Q	001-36740	10.28(xxiv)	11/12/2015
10.26(xxv)†	Amendment No. 22 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of April 14, 2016.	10-Q	001-36740	10.26(xxv)	8/8/2016
10.26(xxvi)†	Amendment No. 24 to the Process Development and Clinical Supply Agreement, by and between Fibrogen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, retroactively effective as of September 15, 2015.	10-Q	001-36740	10.26(xxvi)	8/8/2016
10.26(xxvii)†	Amendment No. 25 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, retroactively effective as of October 15, 2015.	10-Q	001-36740	10.26(xxvii)	8/8/2016
10.26(xxviii)†	Amendment No. 26 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of June 30, 2016.	10-Q	001-36740	10.26(xxviii)	8/8/2016
10.26(xxix)†	Amendment No. 27 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of July 25, 2016.	10-Q	001-36740	10.26(xxix)	11/8/2016
10.26(xxx)†	Amendment No. 28 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of September 22, 2016.	10-Q	001-36740	10.26(xxx)	11/8/2016
10.26(xxxi)†	Amendment No. 29 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of December 20, 2016.	10-K	001-36740	10.26(xxxi)	3/1/2017
10.26(xxxii)†	Amendment No. 30 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of December 20, 2016.	10-K	001-36740	10.26(xxxii)	3/1/2017
10.26(xxxiii)†	Amendment No. 31 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of March 2, 2017	10-Q	001-36740	10.26(xxxiii)	5/9/2017

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10.26(xxxiv)†	Amendment No. 32 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of September 1, 2017	10-K	001-36740	10.26(xxxiv)	2/27/2018
10.26(xxxv)†	Work Order No. 1 to the Process Development and Clinical Supply Agreement, by and between FibroGen, Inc. and Boehringer Ingelheim Biopharmaceuticals GmbH, effective as of September 1, 2017	10-K	001-36740	10.26(xxxv)	2/27/2018
10.27†	State-Owned Construction Land Use Right Granting Contract by and between FibroGen (China) Medical Technology Development Co., Ltd. and The Bureau of Land and Resources of Cangzhou, dated as of February 24, 2017	10-Q	001-36740	10.32	5/9/2017
10.28+	Offer Letter, by and between FibroGen, Inc. and Frank Valone, dated as of November 3, 2008.	S-1	333-199069	10.29	10/1/2014
10.29+	Offer Letter, by and between FibroGen, Inc. and K. Peony Yu, dated as of November 21, 2008.	S-1	333-199069	10.30	10/1/2014
10.30+	Offer Letter, by and between FibroGen, Inc. and Pat Cotroneo, dated as of October 23, 2000.	S-1	333-199069	10.31	10/1/2014
10.31+	Form of Change in Control and Severance Agreement by and between FibroGen, Inc. and its officers.	S-1/A	333-199069	10.32	10/24/2014
10.32+	Form of Executive Officer Change in Control and Severance Agreement	10-Q	001-36740	10.33	5/9/2017
21.1	Subsidiaries of FibroGen, Inc.	S-1/A	333-199069	21.1	10/24/2014
23.1*	Consent of PricewaterhouseCoopers LLP.	—	—	—	—
24.1*	Power of Attorney (included in signature pages).	—	—	—	—
31.1*	Certification of Chief Executive Officer, as required by Rule 13a-14(a) or Rule 15d-14(a).	—	—	—	—
31.2*	Certification of Chief Financial Officer, as required by Rule 13a-14(a) or Rule 15d-14(a).	—	—	—	—
32.1*	Certification of Principal Executive Officer and Principal Financial Officer, as required by Rule 13a-14(b) or Rule 15d-14(b) and Section 1350 of Chapter 63 of Title 18 of the United States Code (18 U.S.C. §1350)(1).	—	—	—	—
101.INS*	XBRL Instance Document	—	—	—	—

101.SCH*	XBRL Taxonomy Schema Linkbase Document	—	—	—	—
101.CAL*	XBRL Calculation Linkbase Document	—	—	—	—
101.DEF*	XBRL Definition Linkbase Document	—	—	—	—
101.LAB*	XBRL Labels Linkbase Document	—	—	—	—
101.PRE*	XBRL Taxonomy Presentation Linkbase Document	—	—	—	—

* Filed herewith.
† Confidential Treatment Requested.

+Indicates a management contract or compensatory plan.

(1) This certification accompanies the Form 10-K to which it relates, is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of FibroGen, Inc. under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended (whether made before or after the date of the Form 10-K), irrespective of any general incorporation language contained in such filing.

(c) Financial Statement Schedules—See (a) 2 above. All other financial statement schedules are omitted because they are not applicable because the requested information is included in the consolidated financial statements or notes thereto.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the registrant has duly caused this Annual Report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of San Francisco, State of California.

FIBROGEN, INC.

Date: February 27, 2019	By:	/s/ Thomas B. Neff Thomas B. Neff Chairman of the Board and Chief Executive Officer (Principal Executive Officer)
Date: February 27, 2019	By:	/s/ Pat Cotroneo Pat Cotroneo Senior Vice President, Finance and Chief Financial Officer (Principal Financial and Accounting Officer)

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Thomas B. Neff and Pat Cotroneo, jointly and severally, his or her attorneys-in-fact, each with the power of substitution, for him or her in any and all capacities, to sign any amendments to this Annual Report on Form 10-K, and to file the same, with exhibits thereto and other documents in connection therewith with the Securities and Exchange Commission, hereby ratifying and confirming all that each of said attorneys-in-fact, or his substitute or substitutes, may do or cause to be done by virtue hereof.

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.

Signature	Title	Date
/s/ Thomas B. Neff Thomas B. Neff	Chairman of the Board and Chief Executive Officer (Principal Executive Officer)	February 27, 2019
/s/ Pat Cotroneo Pat Cotroneo	Senior Vice President, Finance and Chief Financial Officer (Principal Financial and Accounting Officer)	February 27, 2019
/s/ Jeffrey L. Edwards Jeffrey L. Edwards	Director	February 27, 2019
/s/ Jeffrey W. Henderson Jeffrey W. Henderson	Director	February 27, 2019
/s/ Maykin Ho, Ph.D. Maykin Ho, Ph.D.	Director	February 27, 2019
/s/ Thomas F. Kearns Jr. Thomas F. Kearns Jr.	Director	February 27, 2019
/s/ Kalevi Kurkijärvi, Ph.D. Kalevi Kurkijärvi, Ph.D.	Director	February 27, 2019
/s/ Gerald Lema Gerald Lema	Director	February 27, 2019
/s/ Rory B. Riggs Rory B. Riggs	Director	February 27, 2019
/s/ Roberto Pedro Rosenkranz, Ph.D. M.B.A. Roberto Pedro Rosenkranz, Ph.D. M.B.A.	Director	February 27, 2019

/s/ Jorma Routti, Ph.D. Jorma Routti, Ph.D.	Director	February 27, 2019
/s/ James A. Schoeneck James A. Schoeneck	Director	February 27, 2019
/s/ Toshinari Tamura, Ph.D. Toshinari Tamura, Ph.D.	Director	February 27, 2019