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, 2022

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 001-38266

SPERO THERAPEUTICS, INC.

(Exact name of registrant as specified in its charter)

Delaware	**46-4590683**
State or other jurisdiction of incorporation or organization	**(I.R.S. Employer Identification No.)**
675 Massachusetts Avenue, 14th Floor Cambridge, Massachusetts	**02139**
(Address of principal executive offices)	**(Zip Code)**

Registrant's telephone number, including area code (857) 242-1600

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

Title of each class	**Trading Symbol(s)**	**Name of each exchange on which registered**
Common Stock, $0.001 par value per share	SPRO	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 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 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 has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☐

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive o□cers during the relevant recovery period pursuant to §240.10D-1(b). ☐

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

The aggregate market value of Common Stock held by non-affiliates of the registrant computed by reference to the price of the registrant's Common Stock as of June 30, 2022, the last business day of the registrant's most recently completed second fiscal quarter, was approximately $22.0 million (based on the last reported sale price on the Nasdaq Global Market as of such date). As of March 1, 2023, there were 52,571,813 shares of the registrant's Common Stock, $0.001 par value per share, outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

None.

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Forward-Looking Information

This Annual Report on Form 10-K contains forward-looking statements that involve risks and uncertainties. We make such forward-looking statements pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995 and other federal securities laws. All statements other than statements of historical facts contained in this Annual Report on Form 10-K are forward-looking statements. In some cases, you can identify forward-looking statements by terminology such as "may," "will," "should," "expects," "intends," "plans," "anticipates," "believes," "estimates," "predicts," "potential," "continue" or the negative of these terms or other comparable terminology. These forward-looking statements include, but are not limited to, statements about:

- the initiation, timing, design, progress and results of, including interim data from, our preclinical studies and clinical trials, and our research and development programs;
- the regulatory path forward for tebipenem HBr and the potential approval of tebipenem HBr by the U.S. Food and Drug Administration ("FDA");
- the potential receipt of milestone payments and royalties on future sales under our License Agreement (the "GSK License Agreement") with GlaxoSmithKline Intellectual Property (No. 3) Limited ("GSK"), and the potential receipt of milestone payments under our other various license and collaboration agreements;
- our ability to retain the continued service of our key professionals and to identify, hire and retain additional qualified professionals;
- our ability to advance product candidates into, and successfully complete, clinical trials;
- the timing or likelihood of regulatory filings and approvals;
- the direct and indirect impact of the pandemic caused by an outbreak of coronavirus ("COVID-19") on our business and operations, including manufacturing, research and development costs, clinical trials, regulatory processes and employee expenses;
- the future development and commercialization of our product candidates, if approved;
- the pricing, coverage and reimbursement of our product candidates, if approved;
- the implementation of our business model and strategic plans for our business and product candidates;
- the scope of protection we are able to establish and maintain for intellectual property rights covering our product candidates;
- our ability to enter into strategic arrangements and/or collaborations and the potential benefits of such arrangements;
- our estimates regarding expenses, capital requirements and needs for additional financing;
- our financial performance;
- developments relating to our competitors and our industry; and
- other risks and uncertainties, including those listed under Part II, Item 1A. "Risk Factors".

Any forward-looking statements in this Annual Report on Form 10-K reflect our current views with respect to future events or to our future financial performance and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by these forward-looking statements. Factors that may cause actual results to differ materially from current expectations include, among other things, those listed under Part I Item 1A. "Risk Factors" and elsewhere in this Annual Report on Form 10-K. Given these uncertainties, you should not place undue reliance on these forward-looking statements. Except as required by law, we assume no obligation to update or revise these forward-looking statements for any reason, even if new information becomes available in the future.

This Annual Report on Form 10-K also contains estimates, projections and other information concerning our industry, our business, and the markets for certain diseases, including data regarding the estimated size of those markets, and the incidence and prevalence of certain medical conditions. Information that is based on estimates, forecasts, projections, market research or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances reflected in this information. Unless otherwise expressly stated, we obtained this industry, business, market and other data from reports, research surveys, studies and similar data prepared by market research firms and other third parties, industry, medical and general publications, government data and similar sources.

Risk Factor Summary

We are providing the following summary of the risk factors contained in this Annual Report on Form 10-K to enhance the readability and accessibility of our risk factor disclosures. We encourage you to carefully review the full risk factors contained in this Annual Report on Form 10-K in their entirety for additional information regarding the material factors that make an investment in our securities speculative or risky. These risks and uncertainties include, but are not limited to, the following:

- Our ability to realize the value of tebipenem HBr depends on us obtaining FDA approval. Even if such approval is obtained, the timeline of, and any requirements imposed as of part of, such approval may impact the attractiveness of eventual commercialization of tebipenem HBr through our partnership with GSK.
- Analyses of preliminary or interim data from our clinical studies that we announce or publish from time to time may change as more patient data become available and are subject to audit and verification procedures that could result in material changes in the final data.
- Serious adverse events or undesirable side effects or other unexpected properties of any of our product candidates may be identified during development or after approval that could delay, prevent or cause the withdrawal of regulatory approval, limit the commercial potential, or result in significant negative consequences following marketing approval.
- Even if a product candidate does obtain regulatory approval, it may never achieve the market acceptance by physicians, patients, hospitals, third-party payors and others in the medical community that is necessary for commercial success and the market opportunity may be smaller than we estimate.
- If we are unable to establish sales, marketing and distribution capabilities or enter into sales, marketing and distribution agreements with third parties, we may not be successful in commercializing any of our product candidates if such product candidates are approved.
- We face substantial competition from other pharmaceutical and biotechnology companies and our operating results may suffer if we fail to compete effectively.
- We have not generated any revenue from the sale of our products, have a history of losses and expect to incur substantial future losses.
- We expect that we will need substantial additional funding. If we are unable to raise capital when needed, or do not receive payment under our government awards, we could be forced to delay, reduce or eliminate our product development programs.
- We and certain of our executive officers have been named as defendants in two initiated lawsuits, which were ordered consolidated, that could result in substantial costs and divert management's attention.
- The COVID-19 pandemic has and could continue to adversely impact our business, including our preclinical studies and clinical trials.
- We may not achieve the milestones triggering payments to us in our license and collaboration agreements with third parties. We contract with third parties for the manufacture of preclinical and clinical supplies of our product candidates and expect to continue to do so in connection with any future commercialization and for any future clinical trials and commercialization of our other product candidates and potential product candidates. This reliance on third parties increases the risk that we will not have sufficient quantities of our product candidates or such quantities at an acceptable cost, which could delay, prevent or impair our development or commercialization efforts.
- Our use of government funding for certain of our programs adds complexity to our research and commercialization efforts with respect to those programs and may impose requirements that increase the costs of commercialization and production of product candidates developed under those government-funded programs.
- If we are unable to obtain and maintain sufficient patent protection for our technology or our product candidates, or if the scope of the patent protection is not sufficiently broad, our competitors could develop and commercialize technology and products similar or identical to ours, and our ability to successfully commercialize our technology and product candidates may be adversely affected.
- We have registered trademarks and pending trademark applications. Failure to enforce our registered marks or secure registration of our pending trademark applications could adversely affect our business.
- If we are not able to obtain, or if there are delays in obtaining, required regulatory approvals, we will not be able to commercialize our product candidates, and our ability to generate revenue will be materially impaired.

PART I

Item 1. Business.

Overview

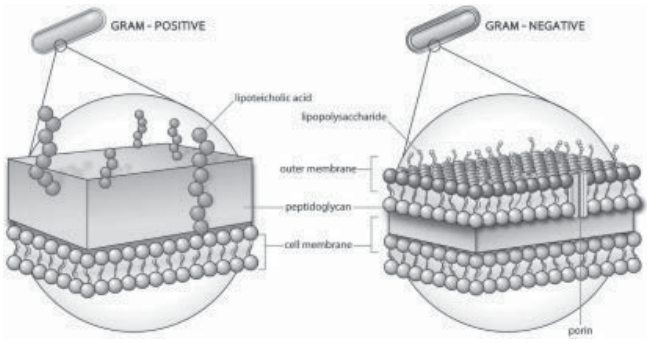
We are a multi-asset, clinical-stage biopharmaceutical company focused on identifying, developing and commercializing novel treatments for bacterial infections, including multi-drug resistant ("MDR") bacterial infections, and rare diseases. Our lead product candidate, SPR720, is an oral antimicrobial agent in development for the treatment of nontuberculous mycobacterial ("NTM") pulmonary disease, a rare orphan disease, where treatment failure is common, and no oral approved therapies exist. We believe that SPR720, if successfully developed and approved, has the potential to be the first approved oral agent for first-line treatment of NTM pulmonary disease. Our partnership-directed programs consist of tebipenem HBr and SPR206, which, through our business development efforts, each have partnership relationships supporting their ongoing development. Tebipenem HBr is designed to be the first broad-spectrum oral carbapenem-class antibiotic for use to treat certain bacterial infections that cause complicated urinary tract infections ("cUTIs"), including pyelonephritis, caused by certain microorganisms, in adult patients who have limited oral treatment options. SPR206 is an IV-administered antibiotic being developed as an innovative option to treat MDR Gram-negative bacterial infections in the hospital setting. First-line IV empiric antibiotics, such as levofloxacin, ceftazidime and piperacillin-tazobactam, have experienced diminished utility as the number of bacterial strains resistant to these antibiotics in the hospital has increased. SPR206, if successfully developed and approved, has the potential to offer broad-spectrum activity against Gram-negative pathogens, including carbapenem-resistant Enterobacterales, *Acinetobacter baumannii* and *Pseudomonas aeruginosa.*

We believe that our novel product candidates, if successfully developed and approved, would have meaningful impacts to patient health and significant commercial applications for the treatment of bacterial infections, including MDR infections, in both the community and hospital settings. Since our inception in 2013, we have focused substantially all our efforts and financial resources on organizing and staffing our company, business planning, raising capital, acquiring and developing product and technology rights, building our intellectual property portfolio and conducting research and development activities for our product candidates. We do not have any products approved for sale and have not generated any revenue from product sales.

Antibiotic Background

Antibiotics are drugs used to treat infections that are caused by bacteria. Prior to the introduction of the first antibiotics in the 1930s and 1940s, common bacterial infections, such as wound infections, urinary tract infections ("UTIs") and pneumonia were often fatal. Today, we rely on antibiotics to treat and prevent infections, which has led to progress in life expectancy, medical advances and global public health.

There are two main varieties of bacteria, Gram-negative bacteria and Gram-positive bacteria, which are distinguished by structural differences in their cellular envelope. Gram-positive bacteria are surrounded by a single lipid-based cell membrane and a thick cell wall, while Gram-negative bacteria are encircled by two lipid membranes, an inner membrane and an outer membrane, with a thinner cell wall in between, as shown in the illustration below.



Antibiotics that target Gram-negative bacteria must be specifically designed to cross both the inner and outer membranes to enter the bacteria. The outer membrane represents a significant barrier to the entry into the bacteria and is one factor for the reduced potency of many agents used to treat Gram-negative bacterial infections. Recent studies have found that Gram-negative bacteria in certain patient types, such as those with sepsis and interstitial lung disease ("ILD"), are associated with higher mortality and increased intensive care unit ("ICU") admission, while only limited therapeutic options are available.

Antibiotics are evaluated according to several criteria, including:

- ***Spectrum***. Antibiotics that are effective against a wide variety of bacteria are considered to be broad-spectrum, while those that act upon only a limited number of bacteria are considered to be narrow-spectrum.
- ***Potency***. Potency is the measure of the microbiological ability of an antibiotic to kill or inhibit growth of bacteria *in vitro*. Potency is commonly expressed as the minimum inhibitory concentration ("MIC") in µg/mL, which is the lowest concentration at which the drug inhibits growth of the bacteria. Antibiotics with lower MICs are considered to be more potent.
- ***Resistance***. Antibiotic resistance refers to the inability of an antibiotic to effectively control bacterial growth. Some bacteria are naturally resistant to certain types of antibiotics. Antibiotic resistance can also occur due to genetic mutations or changes in gene expression. There are numerous mechanisms responsible for antibiotic resistance, and resistance mechanisms are often found together and can be transferred between different bacteria, leading to multi-drug resistance.

Growing Antibiotic Resistance in the Hospital and Community Settings

Antibiotic resistance is one of the largest threats to global health, and resistance rates are increasing. Antibiotic resistance can affect anyone, of any age and in any country. In a systematic analysis examining the global burden of bacterial resistance published in The Lancet, there were an estimated 4.95 million deaths (95% Uncertainty Interval 3.62–6.57) associated with drug-resistant infections in 2019, of which 1.27 million (0.911–1.71) deaths were directly attributable to drug resistance. *Escherichia coli* ("*E. coli*"), a Gram-negative bacterium and the most common pathogen to cause cUTIs, was responsible for the most attributable deaths to antibiotic resistance in 2019. The Centers for Disease Control and Prevention ("CDC") estimates that the annual impact of antibiotic-resistant infections on the United States economy is $20-35 billion in excess direct health care costs.

According to the CDC, among all of the bacterial resistance problems, Gram-negative pathogens, which cause a majority of all bacterial infections, are particularly worrisome because they are becoming resistant to nearly all drugs that would be considered for treatment. In 2019, the CDC designated antibiotic-resistant Gram-negative bacteria such as carbapenem-resistant *Acinetobacter baumannii* ("CRAB"), carbapenem-resistant Enterobacterales ("CRE"), extended-spectrum-β-lactamase ("ESBL")-producing Enterobacterales, and MDR *Pseudomonas aeruginosa* ("MDR PA") as urgent or serious threats. These pathogens are associated with significant mortality because of the increased incidence of antibiotic resistance and the number of effective treatment options.

The challenge posed by bacteria resistant to antibiotics is not limited to Gram-negative pathogens. New antibiotics are also needed for infections caused by Gram-positive and atypical bacteria. For example, NTM pulmonary infection that occurs through inhalation of mycobacteria from environmental sources, especially in water and soil, may cause a chronic and progressive pulmonary disease. The American Lung Association estimates that there are about 50,000 to 90,000 people living with NTM pulmonary disease in the United States, with a higher frequency in older adults, and particularly in older women. Most NTM pulmonary disease is due to *Mycobacterium avium* complex ("MAC"), followed by *Mycobacterium abscessus* and *Mycobacterium kansasii*.

Our Pipeline:

SPR720: Novel Oral Antibiotic Designed for Treatment of Non-tuberculous Mycobacterial (NTM) Infection

Our current primary area of focus is NTM pulmonary disease, a rare orphan disease. We are developing SPR720, which represents a novel class of antibacterial agents that target enzymes essential for bacterial DNA replication, for the treatment of NTM pulmonary disease. NTM causes chronic and serious lung disease with debilitating symptoms. As the disease progresses, patients experience a decline in lung function. It can have a significant physical and emotional impact on patients. SPR720 is designed to be the first oral candidate for first-line treatment of NTM pulmonary disease.

NTM are ubiquitous environmental organisms that can cause progressive lung damage and respiratory failure, particularly in patients with compromised immune systems or underlying pulmonary disorders. NTM infection is also associated with high mortality and high healthcare costs. NTM infections represent a growing global health concern and major unmet medical need because of the lack of new medications being developed to combat these bacteria. MAC is the most common NTM to cause human infection, and it makes up around 80% of the infections. The current treatment for NTM pulmonary disease is lengthy and involves combination therapy, often three or more antibiotics.

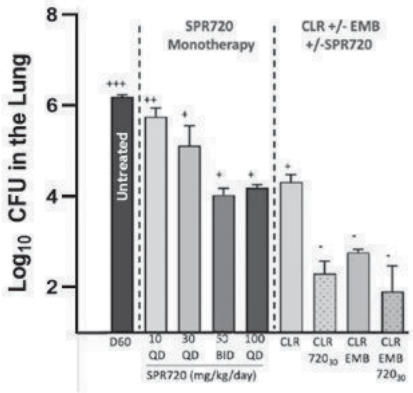
In addition, many patients go undiagnosed and could benefit from treatment with additional testing. The elderly and people with compromised immune or lung function are at greatest risk, as are patients with bronchiectasis for whom it is estimated that up to 50% may also have active lung infection caused by NTM. The most common treatment for NTM infections is prolonged combination therapy (continuing for approximately 12 to 24 months) with drugs traditionally used for tuberculosis ("TB") that have limited

efficacy and poor tolerability. In 2014, the annual cost in the United States of treating NTM infections alone was estimated at $1.7 billion. Treatment failure is common and is often due to poor compliance or inability to tolerate the regimen.

SPR720 Key Attributes:

- ***Acceptable safety and tolerability within therapeutic dose range.*** Data from the SPR720 Phase 1 trial, *in vitro* models and pharmacokinetic/pharmacodynamic ("PK/PD") analyses indicated that predicted therapeutic exposures could be attained with a 500 – 1,000 mg once daily oral dose. These doses in the Phase 1 trial were associated with a low incidence of adverse events with no serious adverse events reported. The most common adverse event among all cohorts was mild diarrhea not requiring discontinuation of therapy.
- ***Broad spectrum of activity.*** SPR720 has demonstrated a broad spectrum of activity in preclinical studies against the most common organisms causing NTM infections, including MAC, *Mycobacterium kansasii* and *Mycobacterium abscessus*. SPR720 is applicable to both non-refractory and refractory disease.
- ***Convenient for patients.*** SPR720 has high oral bioavailability. In addition to existing generic treatments, inhaled therapy has become an option, however, many patients can find inhalers difficult to use and poor inhalation technique can negatively impact drug delivery and response to therapy. Oral therapy is simple and more convenient.
- ***Novel mechanism.*** SPR720 employs a novel mechanism and has no known cross-resistance with marketed antibiotics. Drug resistance in NTM infection species to currently available treatments threatens adequate control of the disease. Novel mechanisms may help evade existing modes of resistance.
- ***Lung exposure.*** SPR720 is an oral drug that penetrates the pulmonary space. A bronchoalveolar lavage ("BAL") study in non-human primates ("NHPs") supports lung exposure. Furthermore, macrophage data from a 28-day hollow-fiber model of infection demonstrates the intracellular and extracellular activity of the drug.

SPR720 has shown potent activity against most common NTM infection species, such as *M. avium*, *M. abscessus* and *M. kansasii*. As shown in the exhibit below, SPR720 showed pulmonary activity against *M. avium* ATCC 700898 in a murine chronic infection model. In this model SPR720 was effective as a monotherapy, with dose response exhibited, and in combination with standard of care ("SOC") agents.



Market Opportunity for SPR720

NTM infection occurs in many different types of patients. NTM pulmonary disease often occurs in people with compromised immune systems, or those with respiratory conditions such as cystic fibrosis, bronchiectasis, chronic obstructive pulmonary disease and asthma. According to Winthrop et al., the average annual increases in incidence and prevalence in the United States of NTM pulmonary disease were 5.2% and 7.5% from 2008 to 2015. The estimated total NTM pulmonary disease prevalence in the United States, Europe and Japan is approximately 245,000. Women and people aged 65 years or older (a population that is growing in number) have higher incidence and prevalence rates than men and people aged less than 65 years. While relatively rare compared to other infectious diseases, the prevalence of NTM has more than doubled since 1997 and infections caused by NTM are often undiagnosed or misdiagnosed as another respiratory condition such as chronic obstructive pulmonary disease or asthma.

Many patients experience progressive lung disease and mortality is high. We believe there is a need for new, potent, orally available therapies for NTM pulmonary disease. While there are competitive compounds in development for NTM, these therapies are not effective in all patients.

We believe that our intellectual property portfolio for SPR720, which includes multiple issued patents and patent applications pending, will provide SPR720 protection globally, including in the United States and Europe, through 2033.

SPR720 Clinical Development Plan

Our strategy is to develop SPR720 to provide a treatment option for patients with NTM pulmonary disease to reduce their disease burden and improve their quality of life.

In March 2020, the FDA granted orphan drug designation for SPR720, a designation that is given to drugs intended to treat a rare disease or condition that affects fewer than 200,000 persons in the United States. An orphan drug designation can provide specific benefits including up to seven years of market exclusivity in the United States upon regulatory approval. In February 2019, we received qualified infectious disease product ("QIDP") designation for SPR720 for the treatment of lung infections caused by nontuberculous mycobacteria and for the treatment of lung infections caused by *M. tuberculosis*. QIDP designation entitles a future marketing application for SPR720 for this indication to priority review by the FDA. In September 2020, SPR720 was awarded Fast Track designation by the FDA for treatment of adult patients with NTM pulmonary disease. Neither the QIDP nor orphan drug designation nor Fast Track designation, however, guarantee a faster development process or ensure FDA approval.

The doses selected for the Phase 2a trial of SPR720 were supported by PK/PD analyses, as well as data from the Phase 1 clinical trial of SPR720, which evaluated the safety, tolerability and PK of orally administered SPR720 at single doses ranging from 100 mg to 2000 mg and repeat total daily doses ranging from 500 mg to 1500 mg for up to 7 to 14 days. Across seven single ascending dose ("SAD") and five multiple ascending dose ("MAD") cohorts, a total of 96 healthy volunteers (including a cohort of healthy elderly (age $\geq$ 65 years) volunteers) were randomized to receive SPR720 or placebo. There were no serious adverse events reported and all participants completed the trial. SPR720 was generally well-tolerated at doses up to 1000 mg over the maximum studied duration of 14 days. PK data across the cohorts showed no significant impact of either advanced age or administration with food on PK variables. At doses of 500 mg or higher, the mean plasma drug exposures of SPR719, the active metabolite of SPR720, are consistent with those suggested by *in vivo* and *in vitro* models of SPR720 to be necessary for clinical efficacy against target NTM pathogens. Data from this Phase 1 trial was presented at ID Week 2020 with the conclusion that SPR720 is generally well-tolerated with predicted therapeutic exposures attainable with a 500 – 1,000 mg once daily oral dose, supporting further development of SPR720 in NTM pulmonary disease.

In December 2020, we initiated a Phase 2a dose-ranging clinical trial (SPR720-201) of SPR720 in patients with nontuberculous mycobacterial pulmonary disease following the acceptance of our investigational new drug ("IND") application for SPR720 in August 2020. The Phase 2a clinical trial was designed as a multi-center, partially blinded, placebo-controlled proof-of-concept clinical trial of SPR720 that was expected to enroll approximately 90 treatment-inexperienced patients with NTM pulmonary disease due to MAC. Patients were randomized to receive either 500 mg or 1,000 mg of oral SPR720 once daily, placebo or SOC, consisting of a macrolide and ethambutol, plus the option of adding a rifamycin. The objectives of the trial were to evaluate the plasma pharmacokinetics, safety, tolerability, and microbiological response of SPR720 compared with placebo over 28 days of treatment, with the inclusion of the SOC arm to assess and ensure assay sensitivity for the trial design.

Update on Phase 2a Clinical Trial

On February 5, 2021, we announced that the FDA informed us that a clinical hold had been placed on our Phase 2a clinical trial of SPR720, following our notification to the FDA of our decision to pause dosing in our ongoing Phase 2a clinical trial of SPR720 as a precautionary measure related to events in our ongoing animal toxicology study of SPR720. We worked with the FDA throughout 2021 to evaluate the findings and determine the future development pathway for the SPR720 clinical program. The NHP study was completed in the third quarter of 2021, a study report was finalized and a complete response to the clinical hold was submitted to the FDA in the fourth quarter of 2021.

On January 4, 2022, we announced that the FDA lifted the clinical hold on the Phase 2a trial of SPR720. The FDA's decision to lift the clinical hold followed our submission of the comprehensive study report with detailed analyses from the NHP toxicology study. We engaged with the FDA in the first quarter of 2022 to discuss the re-initiation and planned protocol of the SPR720 Phase 2a trial in NTM pulmonary disease patients.

On November 14, 2022, we announced the re-initiation of a Phase 2a clinical trial of SPR720 (SPR720-202) and that we opened clinical trial sites. We continue to expect top line data from the Phase 2a clinical trial of SPR720 in the first half of 2024.

This second Phase 2a clinical trial of SPR720 (SPR720-202) is expected to enroll up to 35 treatment-naïve or treatment-inexperienced patients with NTM pulmonary disease across four cohorts. Cohorts will include a blinded placebo cohort, blinded SPR720 cohorts receiving either 500 or 1000 mg of study drug daily, and an open-label SPR720 intense PK cohort receiving 1000 mg of study drug daily. The primary endpoint of the trial is the slope of the weekly sputum bacterial load change from baseline to the end

of the trial's 56-day treatment period. Key secondary endpoints include assessments of clinical response, quality of life, PK and safety and tolerability. For more information on the trial and its design, see ClinicalTrials.gov identifier NCT05496374.

Tebipenem HBr (tebipenem pivoxil hydrobromide): Novel Antibiotic with Potential to be the First Oral Carbapenem for Use in Adults

Our most significant partnered product candidate, tebipenem HBr, is an oral carbapenem intended for use to treat cUTIs, including pyelonephritis, caused by certain microorganisms, in adult patients who have limited oral treatment options.

Tebipenem HBr Key Attributes

Tebipenem HBr is designed to be the first broad-spectrum oral carbapenem-class antibiotic for use in adults to treat cUTIs, including pyelonephritis. Unlike other carbapenems on the U.S. market, which are only available as IV-administered infusions, tebipenem HBr is an orally administered tablet. Oral administration may potentially allow physicians to avoid IV-administered antibiotics for otherwise healthy or stable patients, and the avoidance of IV administration could lead to reduced healthcare resource utilization. This attribute supports our confidence in tebipenem HBr's commercial prospects, if tebipenem HBr receives regulatory approval. We may pursue future studies of tebipenem HBr to treat other serious and life-threatening infections.

Fluroquinolones

Currently, fluoroquinolones are the most widely used antibiotic class in treating community and hospital Gram-negative infections, including UTIs, but they have encountered increasing resistance among MDR Gram-negative bacteria and are associated with significant adverse effects. In particular, *E.coli* non-susceptibility to fluoroquinolones, trimethoprim/sulfamethoxazole, and oral cephalosporins range from 25% to 36%, based on isolates collected from both nosocomial, or hospital-acquired, and community-acquired infections. Co-resistance further compounds the issue of antibiotic resistance, for instance more than 40% of *E.coli* isolates with trimethoprim/sulfamethoxazole resistance were co-resistant to levofloxacin.

As such, current UTI treatment guidelines published by the Infectious Diseases Society of America identify fluoroquinolones as an appropriate empirical therapy option. This recommendation, however, is contingent on local resistance rates being less than 10%. However, the high rates of fluoroquinolone-resistant *E.coli* found in the United States today in the community and hospital settings, as shown in the table below, would suggest that there is a need for an antibiotic that is effective on fluoroquinolone-resistant infections.

The table below reflects resistance rates in the United States in the community and hospital settings.

cUTIs in the United States	2019 *E. coli* Resistance Rates to Fluoroquinolones	2013-2014 *E. coli* Resistance Rates to Fluoroquinolones	2000-2004 *E. coli* Resistance Rates to Fluoroquinolones
Community Setting	21.2%	11.7%	0%
Hospital Setting	30.8%	34.5%	3.5%

In addition, the FDA has issued several warnings against the use of fluoroquinolones in certain patients. In particular, an FDA Advisory Committee stated in November 2015 that the risk of serious side effects caused by fluoroquinolones generally outweighs the benefits for patients with acute bacterial sinusitis, acute exacerbation of chronic bronchitis and uncomplicated UTIs, and the agency subsequently issued a drug safety communication to the public and required safety labeling revisions be made to all products within this drug class. The FDA has determined that fluoroquinolones should be reserved for use in patients with these conditions who have no alternative treatment options and safety warnings in the labeling of fluoroquinolone class products have been further strengthened over the past several years.

Market Opportunity for Tebipenem HBr

Complicated Urinary Tract Infections (cUTIs)

UTIs are among the most common bacterial diseases worldwide, and have significant clinical and economic burden. cUTIs describe UTIs that fail to respond to a standard course of treatment associated with the presence of any number of underlying factors in patients, such as anatomical abnormalities of the urinary tract, a higher likelihood of resistant pathogens, and/or medical comorbidities, which put patients at higher risk of complications. Patients with cUTI have a higher risk of recurrence and progression to severe infection, as well as a greater risk of morbidity and mortality, when compared to uncomplicated UTI.

With an estimated 3 million cases each year in the United States, cUTI is a leading cause of infection-related hospitalization. According to Simmering et al., there has been a concerning 52% (population-adjusted) increase in the incidence of hospital admission for UTI over the course of a decade (1998-2011) which is associated with additional costs. In a nationwide cohort study, the total median 30-day post index all-cause total healthcare costs for cUTI care ranged from $1,531 for patients initially identified in the

outpatient setting to $13,028 for patients initially identified in the inpatient setting. While drugs such as trimethoprim/sulfamethoxazole (Bactrim/Septra) and fluoroquinolones (levofloxacin, ciprofloxacin) have been the primary oral options for treatment of UTIs caused by Gram-negative organisms, nearly 30% to 35% of UTIs are resistant, which has led to increased use of IV-administered therapeutics such as carbapenems. Carbapenems have been utilized for more than 30 years and are considered the standard of care for many serious MDR Gram-negative bacterial infections, but have only been available as IV-administered formulations. Currently, there are no commercially available oral carbapenems for use in adults.

The growing challenges of limited effective oral treatment options for cUTI and pyelonephritis due to increasing rates of resistance amongst uropathogens place undue burden on both patients and the healthcare system, in terms of recurrent infections, hospitalizations, and cost, which can be significant.

A significant majority of cUTIs are caused by a group of MDR Gram-negative bacteria called Enterobacterales, against which tebipenem HBr has demonstrated antibacterial activity. Given the observed activity of tebipenem HBr against a broad spectrum of bacterial pathogens, healthcare providers may prescribe tebipenem HBr, if approved, for use in the following uses, if approved therefor:

- Community setting: Treating cUTIs acquired in the community setting without the need for patient hospitalization.
- Hospital setting: Transitioning appropriate patients hospitalized for cUTIs to an appropriate oral therapy as they are discharged from the hospital.

We believe tebipenem HBr is well positioned to meet an unmet need for an oral therapy for patients with cUTI infections, including pyelonephritis, caused by certain microorganisms. Physicians may prescribe tebipenem HBr, if approved, to treat MDR cUTIs and patients prescribed tebipenem HBr may avoid hospitalization.

Tebipenem HBr Clinical Development Program

Single Pivotal Phase 3 Clinical Trial (ADAPT-PO)

In September 2020, we announced positive data from the ADAPT-PO Phase 3 trial evaluating an oral regimen of tebipenem HBr head-to-head versus an IV regimen of ertapenem for the treatment of adults with cUTI, including acute pyelonephritis ("AP"). The global, randomized, placebo-controlled ADAPT-PO Phase 3 clinical trial evaluated the safety and efficacy of tebipenem HBr in hospitalized adult patients with cUTI or AP. Patients were randomized (1:1) to receive tebipenem HBr (600 mg) orally every 8 hours, or ertapenem (1 g) IV every 24 hours, for a total of 7 to 10 days.

The primary analysis and assessment of non-inferiority were evaluated using a pre-specified -12.5% non-inferiority ("NI") margin. The primary efficacy endpoint was overall response (composite of clinical cure and microbiologic response) at the test-of-cure ("TOC") in the microbiological intent-to-treat population. This NI margin was a modification of the original NI margin of -10% that was discussed and agreed upon with the FDA because of concern that the COVID-19 pandemic could have an adverse effect on the trial. As a result, the NI margin was modified prior to the database lock from the original NI margin.

Data presented at IDWeek 2020 demonstrated that all secondary endpoints, including both the clinical cure and microbiological eradication rates were comparable between treatment groups at the end of treatment ("EOT"), TOC and at late follow-up ("LFU"), visits. Specifically, clinical cure rates, which are the key determinant in routine clinical management of cUTI/AP patients, were >93% in both treatment groups at TOC. The high clinical cure rates at TOC were sustained through LFU (88.6% and 90% for tebipenem HBr and ertapenem, respectively), demonstrating a durable clinical response in patients with cUTI and AP. Favorable microbiological response rates at TOC were likewise comparable between treatment groups and were similarly sustained up to LFU in both treatment groups (57.2% and 58.2% for tebipenem HBr and ertapenem, respectively). There were no statistically significant differences between treatment groups in overall response rates across key subgroups of interest, including those determined by age, baseline diagnosis, and presence of bacteremia at baseline. Pathogen microbiological response rates were generally balanced across treatment groups for the predominant uropathogens observed.

Comparative safety and tolerability data from 1,372 hospitalized adult patients enrolled in the study were similar between the tebipenem HBr and ertapenem treatment groups. Treatment-emergent adverse events ("TEAEs"), were reported in approximately 26% of patients in both treatment groups and the most commonly reported TEAEs in both treatment groups were diarrhea (5.0%) and headache (3.8%). Serious TEAEs were infrequent (1.3% for tebipenem HBr vs. 1.7% for ertapenem) and no deaths were reported in the trial. Three Clostridioides difficile associated TEAEs were observed in the ertapenem group, while none were observed in the tebipenem HBr group.

FDA Status

We included data from our completed ADAPT-PO Phase 3 clinical trial of tebipenem HBr, together with requisite safety data, chemistry, manufacturing and controls ("CMC") information, clinical pharmacology and nonclinical studies, in our New Drug Application ("NDA") submission to the FDA, which was accepted by the FDA in late December 2022. The NDA was seeking approval for tebipenem HBr oral tablets for treatment of cUTI, including pyelonephritis, caused by certain microorganisms in adult patients who have limited oral treatment options. The FDA granted Priority Review designation with a PDUFA target action date of June 27, 2022.

Based upon feedback from an FDA Late Cycle Meeting in late April 2022, we determined to discontinue our own near-term commercialization activities for tebipenem HBr and to restructure our business, including focusing on potential partnership or other opportunities for tebipenem HBr.

In June 2022, we received a Complete Response Letter ("CRL") from the FDA regarding our NDA. In the CRL, the FDA communicated that it had completed its review of the NDA and determined that the NDA could not be approved in its present form. The FDA ultimately concluded that the Phase 3 cUTI clinical trial of tebipenem HBr (ADAPT-PO) was insufficient to support approval and that additional clinical study would be required.

On August 2, 2022, we held a Type A meeting with the FDA to gain further insights as to the pathway forward towards a potential regulatory approval for tebipenem HBr. The FDA indicated that positive results from a single additional Phase 3 clinical trial supported by confirmatory nonclinical evidence of efficacy could be sufficient to support the approval of tebipenem HBr for the treatment of cUTI, including pyelonephritis, for a limited use indication. We believe we also achieved alignment with the FDA on key components of the proposed pivotal Phase 3 trial design. We plan to engage with the FDA by means of a Special Protocol Assessment in the first half of 2023.

Tebipenem HBr License Agreement with GSK and Proposed New Phase 3 Clinical Trial of Tebipenem HBr

In September 2022, we entered into the GSK License Agreement with GSK for tebipenem HBr. Pursuant to the GSK License Agreement, we received a $66.0 million upfront payment from GSK and are eligible to receive up to $525.0 million in development, sales, and commercial milestones payments, as well as low single-digit to low double-digit tiered royalties on net product sales. In exchange, GSK received an exclusive license to develop and commercialize tebipenem pivoxil and tebipenem pivoxil HBr in all territories, except Japan, and certain other Asian countries, territories which will be retained by our partner Meiji Seika Pharma Co. Ltd. ("Meiji"). Concurrent with the GSK License Agreement, an affiliate of GSK purchased 7,450,000 shares of our common stock at a purchase price of approximately $1.20805 per share for an aggregate purchase price of $9.0 million.

Under the License Agreement, Spero is responsible for the execution and costs of the follow-up Phase 3 clinical trial of tebipenem HBr. GSK is responsible for the execution and costs of any additional further development, including additional Phase 3 regulatory filing and commercialization activities for tebipenem HBr in the GSK Territory (as defined below). See "Collaboration, License and Service Agreements - Tebipenem HBr Agreements - GSK License Agreement" below for additional information.

QIDP Designation

The FDA has also designated tebipenem HBr as a QIDP for the treatment of cUTI, Community-acquired pneumonia ("CABP") and diabetic foot infections ("DFI") under the Generating Antibiotic Incentives Now ("GAIN") Act. Among other benefits of a QIDP designation, the first marketing application for the QIDP-designated drug qualifies for priority review by the FDA. The QIDP designation for tebipenem HBr, however, does not guarantee a faster development process or ensure FDA approval. Further, if tebipenem HBr is approved for the treatment of cUTI, CABP or DFI, the FDA's QIDP designation previously granted to tebipenem HBr for those indications will entitle the drug product to receive a one-time five-year extension to any non-patent exclusivity period awarded to tebipenem HBr in the United States, such as a five-year New Chemical Entity exclusivity granted under the Hatch-Waxman Act, among other possible periods of regulatory exclusivity that would qualify for a GAIN exclusivity extension.

SPR206: IV-administered product candidate being developed as an innovative option to treat multi-drug resistant (MDR) Gram-negative bacterial infections in the hospital setting.

SPR206 is an IV-administered product candidate being developed as an innovative option to treat MDR Gram-negative bacterial infections in the hospital setting. Gram-negative bacteria represent a subset of bacterial organisms distinguished by the presence of an outer cell membrane. SPR206 is designed to treat MDR Gram-negative bacterial infections through interactions with the bacteria's outer cell membrane.

SPR206 is a direct acting IV-administered agent that has demonstrated single-agent antibacterial activity in both *in vitro* and *in vivo* models of infection against Gram-negative bacteria, including organisms identified by the CDC as urgent or serious threats to human health, including CRAB, CRE, MDR PA and ESBL-producing Enterobacterales.

In January 2020, we reported results from a Phase 1 clinical trial designed as a double-blind, placebo-controlled, ascending dose, multi-cohort study in healthy subjects. In the Phase 1 clinical trial, SPR206 was well-tolerated at doses that are likely to be within a therapeutic range for target MDR Gram-negative bacterial infections and demonstrated a safety profile that we believe supports the further development of SPR206. In this SAD and MAD Phase 1 clinical trial, a total of 96 healthy volunteers were randomized to receive SPR206 or a placebo. All reported adverse events were mild to moderate and there were no reported severe or serious adverse events. There were no subjects with clinically significant changes in laboratory tests during the study. SPR206 was well-tolerated at doses up to 100 mg administered three times a day, a total of 300 mg daily, for 14 consecutive days and no evidence of nephrotoxicity was observed at this dose and duration. Pharmacokinetic data across the cohorts indicate dose linearity and dose proportionality as well as mean plasma drug exposures of SPR206 that are concordant with preclinical models predictive for clinical efficacy against target Gram-negative pathogens.

SPR206 has been granted QIDP designation by the FDA for the treatment of cUTI and hospital-acquired bacterial pneumonia and ventilator-associated bacterial pneumonia (HABP/VABP). We have multiple patent applications pending for SPR206 that we believe will provide SPR206 protection globally through 2039, including the United States and Europe. In October 2022, the U.S. Patent and Trademark Office issued U.S. Patent No. 11,459,357, which covers the SPR206 composition of matter and formulations thereof as well as methods of treating a bacterial infection with SPR206. The patent is assigned to us and has a lifespan extending into at least June 2039.

In September 2022, we received a $5.0 million payment from Pfizer, Inc. (“Pfizer”) in connection with the achievement of a regulatory milestone specified in a license agreement for SPR206.

SPR206 Key Attributes

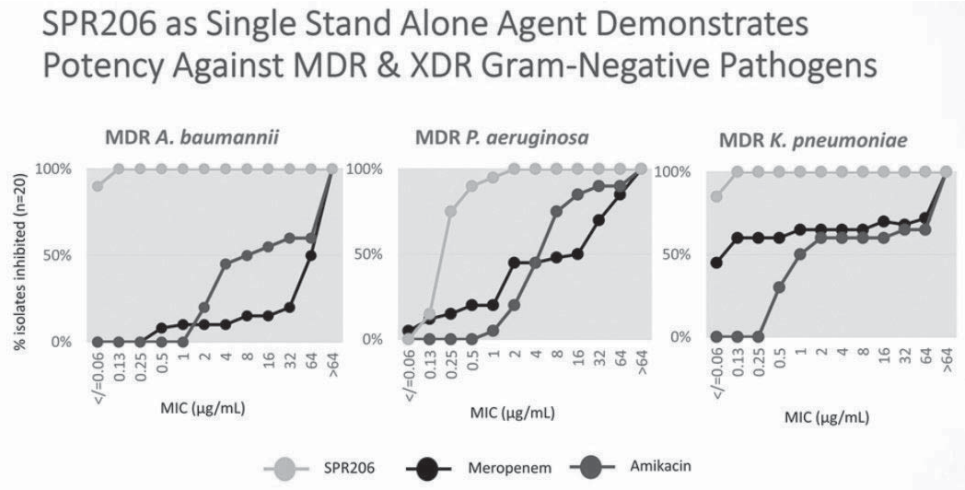
We believe that with the following key attributes, SPR206 has the potential to become a safe and effective treatment for serious Gram-negative infections:

- ***Potential to Expand the Potency of Standard-of-Care (SOC) Antibiotics***. SPR206 is designed to expand the potency of SOC antibiotics by restoring and expanding their Gram-negative activity. We believe that this novel mechanism could provide a new option for patients with resistant Gram-negative infections, thereby improving therapeutic outcomes, decreasing physicians’ reliance on older poorly tolerated and ineffective drugs.
- ***SPR206 appears to be a safe and potent IV-administered direct-acting agent***. SPR206 is designed to interact with lipopolysaccharide (“LPS”) to disrupt the outer membrane. SPR206 is also designed to have direct antibiotic activity, while retaining potentiator activity, including activity against *P.aeruginosa* and *A.baumannii*. Data from SPR206 *in vitro* and *in vivo* good laboratory practice (“GLP”) safety pharmacology and absorption, distribution, metabolism, and excretion (“ADME”) studies and 14-day, two-species GLP toxicology studies provide support for an acceptable safety profile, which led to SPR206’s designation as a clinical candidate and the initiation of Phase 1 clinical trial in December 2018. Phase 1 data demonstrates that SPR206 is well-tolerated at doses that are likely to be within a therapeutic range for target MDR Gram-negative bacterial infections and has a safety profile that we believe supports the further development of SPR206. We are developing SPR206 as a treatment for high-risk patients with suspected or known Gram-negative infections such as CRE, CRAB and MDR PA to prevent mortality and reduce the length of stay in the hospital setting.

SPR206 Development Plan

In Vitro Activity of SPR206 against MDR Gram-Negative Bacteria

Results from multiple susceptibility studies against contemporary clinical isolates suggest that SPR206 possesses potent activity against CRAB, MDR PA and MDR Enterobacterales.



Advancing SPR206 into Two Phase 1 Clinical Trials in 2021

In June 2021, we initiated a Phase 1 BAL clinical trial assessing the penetration of SPR206 into the pulmonary compartment and a RIS clinical trial of SPR206. Both studies were completed in the fourth quarter of 2021. On February 16, 2022, we announced positive topline results from the Phase 1 BAL clinical trial. Results showed that SPR206 was generally well-tolerated with a mean lung ELF to plasma concentration ratio of 0.264, with AUC from 0-8 hours used to estimate the total uptake of SPR206. Importantly, the mean concentration of SPR206 in the lung ELF exceeded the SPR206 MIC for targeted gram-negative pathogens for the entirety of the 8-hour dosing period. The Phase 1 RIS trial for SPR206 has been completed and final safety and PK data has been transferred, advancing the program forward. Final dose recommendations, including any adjustments for patients with renal impairment, are expected after completion of ongoing non-clinical studies and pharmacology analyses.

The Phase 1 BAL clinical trial was an open-label study that enrolled thirty healthy volunteers into five cohorts. Subjects received three 100 mg doses of SPR206 infused every eight hours over one day. The objectives of the study were to evaluate the intrapulmonary PK, including ELF and alveolar macrophage (“AM”) concentrations of SPR206 compared to plasma concentrations. These data are important to establish dose requirements for clinical efficacy of SPR206 in the setting of hospital-acquired pneumonia (“HAP”)/ventilator-associated pneumonia (“VAP”). This study was conducted in collaboration with, and with financial support from, the United States Department of Defense ("DoD") (Award No. W81XWH1910295). The initiation of this clinical trial triggered the first of two milestone payments related to the study from our development partner, Everest Medicines II Limited (“Everest”).

The Phase 1 RIS clinical trial was an open-label study that enrolled forty volunteers into five cohorts. Cohort 1 was healthy volunteers, cohorts 2-4 were clinically stable subjects with various degrees of renal impairment, and cohort 5 was clinically stable subjects with end stage renal disease (“ESRD”) on hemodialysis. Subjects received a single 100 mg infusion of SPR206. The objectives of the study were to evaluate the PK of SPR206 in healthy subjects and in those with various degrees of renal impairment, including ESRD. These data are important to establish if the concentrations of SPR206 are impacted by differences in renal function and whether dose adjustments for SPR206 would be recommended in such context. This study was conducted in collaboration with, and with financial support from, the DoD (Award No. W81XWH1910295).

We expect to submit an IND application to the FDA to support a Phase 2 clinical trial of SPR206 in the fourth quarter of 2023. The planned trial is designed to enroll patients with MDR pathogens. It is supported by preclinical data as well as the results of multiple Phase 1 clinical trials. These Phase 1 trials have demonstrated SPR206's lack of nephrotoxicity at predicted therapeutic dose levels and its ability to continuously achieve mean lung ELF exposures above the MIC for targeted Gram-negative pathogens, when administered three times daily at 100 mg.

Our Strategy

Our goal is to identify, develop and commercialize novel treatments for bacterial infections, including MDR bacterial infections, focusing on areas of high unmet medical need for safe and effective antibiotic treatments. Key elements of our strategy are as follows:

- ***Advance our lead product candidate SPR720 to regulatory approval for NTM pulmonary disease.*** We believe there is a significant opportunity to develop products for underserved "orphan" infectious disease areas, such as NTM pulmonary disease. These markets offer the attributes of fewer branded or generic competitors as well as chronic therapy. We believe our drug candidate SPR720 has the potential to be the first oral antibiotic approved for the treatment of NTM pulmonary disease. In June 2019, SPR720 was the focus of an equity investment by the Novo REPAIR Impact Fund for $10 million, as well as a collaboration with Gates MRI to further the development of SPR720 for TB. We may seek to acquire other product candidates for other underserved, debilitating orphan infectious diseases.
- ***In partnership with GSK, advance tebipenem HBr through completion of proposed Phase 3 clinical trial and advise and consult with GSK through the regulatory approval process.*** We granted GSK an exclusive license to develop and commercialize tebipenem pivoxil and tebipenem pivoxil HBr in all territories, except Japan, and certain other Asian countries, territories which will be retained by our partner Meiji. We will be responsible for execution and costs of the tebipenem HBr follow-up Phase 3 clinical trial in the United States. GSK will be responsible for the execution and costs of commercial activities for tebipenem HBr in the United States, as well as territories outside of the United States (not including the Meiji Territory (as defined below).
- ***Maximize the value of our pipeline through collaborations with other pharmaceutical companies. We may elect to pursue strategic collaborations with other pharmaceutical companies to leverage our pipeline.*** We believe it may be beneficial to develop and commercialize one or more of our product candidates through partnering opportunities. Such collaborations may include regional collaborations to advance our pipeline products, or product-specific deals pairing our product candidates with collaborators' antibiotics, whether generic or novel, with the intention of enhancing those antibiotics' performance and efficacy.
- ***Continue to pursue collaborations with non-commercial organizations for scientific expertise and funding support.*** We have received funding support from BARDA, the United States National Institute of Allergy and Infectious Diseases ("NIAID"), the DoD and the Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator ("CARB-X") a public-private partnership funded by BARDA within the United States Department of Health and Human Services. We intend to continue to collaborate with government agencies and non-profit foundations to support the development of our product candidates.
- ***Expand our portfolio of product candidates for the treatment of MDR infections.*** Since our inception, we have focused on identifying and developing antibiotics to treat bacterial infections, including MDR infections, and we are using our expertise to aggressively build and expand a portfolio of product candidates for the treatment of such infections where the unmet need exists, and no viable generic alternatives are available. Our management team has deep-rooted relationships in the academic, medical and corporate infectious disease community, which provide us visibility into new and innovative therapies under development. Our focus in assessing product candidates relies on three principles: 1) unmet medical need, 2) novel mechanism to overcome resistance and 3) convenience for patients. We believe the greatest unmet medical needs for safe and effective antibiotic treatments lie among infections due to MDR bacteria, as patients with these infections often have limited or inadequate therapeutic options, leading to high rates of mortality. The increasing prevalence of drug resistance and MDR bacteria, and the limitations of existing therapies and traditional drug development approaches, highlight the critical need for novel therapies capable of overcoming resistance, particularly orally administrable agents.

Collaboration, License and Service Agreements

In addition to our own patents and patent applications, we have acquired or licensed patents, patent applications and know-how from various third parties to access intellectual property covering product candidates that we are developing. We have certain obligations under these acquisitions or licensing agreements, including diligence obligations and payments, which are contingent upon achieving various development, regulatory and commercial milestones. Also, pursuant to the terms of some of these license agreements, when and if commercial sales of a product commence, we may be obligated to pay royalties to such third parties on net sales of the respective products. Some of our license agreements include sublicenses of rights owned by third-party head licensors. In addition, we have entered into license agreements (described below) pursuant to which we have granted certain development, manufacturing and commercialization rights with respect to certain of our product candidates.

SPR720 Agreements

Gates MRI Collaboration

In June 2019, we entered into a collaboration with the Bill and Melinda Gates Medical Research Institute (the "Gates MRI"), a nonprofit research institution wholly owned by the Bill and Melinda Gates Foundation, to develop SPR720 for the treatment of lung infections caused by *Mycobacterium TB*. In furtherance of the Gates MRI's charitable purposes, we also granted the Gates MRI a no cost, exclusive license to develop, manufacture and commercialize SPR720 for the treatment of TB in low- and middle- income countries. Gates MRI will conduct and fund preclinical and clinical studies for the development of SPR720 against TB, as well as certain collaborative research activities performed by us.

Vertex Assignment and License Agreement

In May 2016, we entered into an agreement with Vertex Pharmaceuticals Incorporated ("Vertex") pursuant to which Vertex assigned to us rights to patents relating to the oral prodrug SPR720 and SPR719 (an active metabolite). The acquired patent portfolio includes protection for composition of matter, method of use, and specific key intermediates used in the manufacture of SPR719 and SPR720. We also obtained certain know-how and a license to research, develop, manufacture and sell products for a proprietary compound, as well as a transfer of materials as part of the transaction. In return, we granted Vertex an exclusive license to the assigned patents and know-how for use outside of the diagnosis, treatment or prevention of bacterial infections. In exchange for the assigned patents, we paid Vertex an upfront, one-time, non-refundable, non-creditable fee of $0.5 million, which was recognized as research and development expense, and we also agreed to pay Vertex future clinical, regulatory and commercial milestones up to $81.3 million in the aggregate and a royalty on the net sales of licensed products ranging from mid-single digits to low double digits. During the year ended December 31, 2020, we paid and recorded $0.9 million in expenses related to the achievement of regulatory milestones for SPR720. The agreement continues in effect until the expiration of all payment obligations thereunder, with royalty payment obligations continuing on a product-by-product and country-by-country basis until the later of ten years after the first commercial sale of such product in such country or the date of expiration in such country of the last to expire applicable patent. Further, Vertex has the right to terminate the agreement if provided with notification from us of our intent to cease all development or if no material development or commercialization efforts occur for a period of 12 consecutive months.

Tebipenem HBr Agreements

GSK License Agreement

On November 7, 2022, we closed the transactions contemplated by the GSK License Agreement, which was entered into on September 21, 2022. Pursuant to the terms of the GSK License Agreement, we granted GSK an exclusive royalty-bearing license, with the right to grant sublicenses, under our intellectual property and regulatory documents and a sublicense under certain intellectual property of Meiji and Meiji's regulatory documents to develop, manufacture and commercialize tebipenem pivoxil and tebipenem HBr and products that contain tebipenem pivoxil and tebipenem HBr (the "GSK Licensed Products") in all territories, except certain Asian countries previously licensed to Meiji (Japan, Bangladesh, Brunei, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, South Korea, Taiwan, Thailand and Vietnam (the "Meiji Territory")) (the "GSK Territory"). If our license with Meiji is terminated, or if Meiji forfeits or loses its rights to develop, manufacture and commercialize tebipenem HBr and products that contain tebipenem HBr in any countries in the Meiji Territory, then GSK will have an exclusive first right to negotiate with us to add any such countries to the GSK Territory.

Under the terms of the GSK License Agreement, we received an upfront payment of $66.0 million for GSK to secure rights to the medicine, and GSK also invested $9.0 million in our common stock. Remaining potential payments are milestone and royalty based, and are as follows (in millions):

Event	Milestone payments (up to)
From FDA acceptance of clinical protocol, commencement of Phase 3 study through NDA submission	$150.0 (in tranched milestones)
Total commercial milestone payments based on first sale (US/EU)	$150.0
Total potential sales milestone payments	$225.0
Royalties	Low-single digit to low-double digit (if sales exceed $1.0 billion) tiered royalties on net product sales

Royalties are subject to reduction in the event of third-party licenses, entry of a generic product or expiration of patent and regulatory exclusivity prior to the tenth anniversary of the first commercial sale of a GSK Licensed Product in a particular country.

We will be responsible for the execution and costs of the follow-up Phase 3 clinical trial of tebipenem HBr. GSK will be responsible for the execution and costs of any additional further development, including additional Phase 3 regulatory filing and commercialization activities for tebipenem HBr in the GSK Territory. We will also be responsible for providing and paying for the clinical supply of tebipenem HBr while GSK will be responsible for the costs of the commercial supply of tebipenem HBr. A joint development committee has been established between GSK and us to coordinate and review development activities for tebipenem HBr in the United States.

Unless earlier terminated due to certain material breaches of the GSK License Agreement or by GSK for convenience, or otherwise, the GSK License Agreement will expire on a jurisdiction-by-jurisdiction and GSK Licensed Product-by-GSK Licensed Product basis on the latest to occur of (i) loss of patent exclusivity, (ii) loss of regulatory exclusivity or (iii) ten years following the date of the first commercial sale of such licensed product in such country (the "GSK Royalty Term"). During the GSK Royalty Term, we have agreed not to develop, manufacture or commercialize any oral carbapenem for any indication or any oral antibiotic for cUTI; this restriction does not apply to any third party which acquires control of us after the date of the GSK License Agreement if certain conditions are met.

We have the right to terminate the GSK License Agreement upon a material breach by, or bankruptcy of, GSK. GSK has the right to terminate the GSK License Agreement at any time upon a specified number of days' notice or upon a material breach by, or bankruptcy of, us. In addition, in the event that GSK has the right to terminate the GSK License Agreement due to a breach by us, GSK may elect not to terminate the GSK License Agreement and in lieu thereof may assume the responsibility and expense of development of tebipenem HBr in the United States, in which event GSK's obligation to make further development payments to us would cease, and/or to reduce all subsequent commercial and sales milestone payments and royalty payments otherwise due by GSK to us under the GSK License Agreement by 50%.

The GSK License Agreement contains representations and warranties, other covenants, indemnification provisions and other terms and conditions customary for transactions of the type contemplated by the GSK License Agreement. In support of certain of its rights to indemnification, GSK also has certain rights to suspend payments otherwise owed to us, as well as the right to offset payments otherwise owed to the Company against certain indemnifiable claims.

Meiji Agreements

To support our development of tebipenem HBr, in June 2017 we entered into an exclusive License Agreement with Meiji (the "Meiji License"). Pursuant to the Meiji License, we obtained know-how, data and regulatory documents that have supported the development of tebipenem HBr and which we believe will help support the regulatory approval of tebipenem HBr.

We and our collaboration partners retain exclusive rights to commercialize tebipenem HBr throughout the world, except in Japan, Bangladesh, Brunei, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, South Korea, Taiwan, Thailand and Vietnam, where Meiji will have exclusive rights to commercialize tebipenem HBr. With Meiji, we have established a joint development committee for the management of the development of tebipenem HBr, including any joint, cross-territory studies that may be undertaken by the parties, if any. In addition, the parties have established a joint commercialization committee to coordinate information sharing relative to the commercialization of tebipenem HBr.

Meiji and we have granted each other exclusive cross-licenses to our respective tebipenem intellectual property, including know-how and regulatory documentation. The license granted to us by Meiji includes certain know-how that Meiji received from a global pharmaceutical company, to which we refer as Global Pharma, as described below. As such, our rights to the Global Pharma know-how component are non-exclusive.

Under the Meiji License, we have paid Meiji a one-time non-refundable upfront fee of $0.6 million, a $1.0 million milestone payment to Meiji upon the enrollment of the first patient in our Phase 1 clinical trial of tebipenem HBr in October 2017 and a $1.0 million milestone payment upon submission of the NDA for tebipenem HBr in October 2021. We are obligated to pay Meiji future clinical and regulatory milestone payments up to an aggregate of $1.0 million and royalties of a low single-digit percentage based on net sales of tebipenem HBr. Additionally, we are obligated to pay Meiji a percentage of certain amounts received from any sublicensees, up to an aggregate of $7.5 million, of which we paid $6.6 million in the fourth quarter of 2022.

Some of the know-how that we received under the Meiji License to support tebipenem HBr development was originally obtained by Meiji through a license from Global Pharma, which we refer to as the head license. Prior to entering into the Meiji License with us, Meiji received written approval from Global Pharma permitting Meiji to enter into the Meiji License with us. Specifically, in a letter agreement between Global Pharma and Meiji entered into in January 2017, Global Pharma consented to Meiji assisting us with the transfer or license of the Global Pharma know-how and Meiji know-how on a non-exclusive basis outside of those Asian countries identified above, as well as certain related matters. This letter agreement did not contemplate us having any right to sublicense the Global Pharma know-how. Prior to our entering into the GSK License Agreement, in February 2022, Meiji received written approval from Global Pharma permitting Meiji to provide us the right to sublicense the Global Pharma know-how.

The Meiji License continues in effect until the expiration of all payment obligations thereunder (including royalty payments and licensee revenue) on a product-by-product and country-by-country basis, unless earlier terminated by the parties. Pursuant to the terms of the Meiji License, in addition to each party's right to terminate the agreement upon the other party's material breach (if not cured within a specified period after receipt of notice) or insolvency, we also have unilateral termination rights (i) in the event that we abandon the development and commercialization of tebipenem HBr for efficacy, safety, legal or business factors, and (ii) under certain circumstances arising out of the head license with Global Pharma.

Savior Service Agreement

In November 2018, we entered into a service agreement with Savior Lifetec Corporation ("Savior") to perform technology transfer, process development, analytical method development and testing and formulation development for tebipenem HBr. Per the terms of the agreement, we paid Savior a non-refundable supervision fee of approximately $2.0 million to manage the buildout of a commercial manufacturing facility. The supervision fee was classified as a prepaid asset on our balance sheet and was fully amortized as of December 31, 2021. We have paid Savior an additional $5.3 million for facility build out costs, which is classified as a long-term asset on our balance sheet as of December 31, 2022.

SPR206 Agreements

Cantab Agreements

In June 2016, we entered into a stock purchase agreement (the "Cantab Agreement") with Pro Bono Bio PLC, a corporation organized under the laws of England, and its affiliates, including PBB Distributions Limited ("PBB"), Cantab Anti-Infectives Ltd. ("CAI") and New Pharma License Holdings Limited ("NPLH"). This agreement allows us to acquire NPLH and its intellectual property rights and assets relating to our polymyxin products, and our next-generation potentiating agents in particular. The intellectual property portfolio we acquired includes patents that cover SPR206 as well as other novel potentiating agents, polymyxin derivatives and other LPS or outer-membrane bacterial disrupting agents. In exchange for the acquisition of NPLH, we paid PBB upfront consideration in the amount of $0.3 million and also agreed to make milestone payments of up to $5.8 million upon the achievement of specified clinical and regulatory milestones and a payment of £5.0 million ($6.0 million as of December 31, 2022) upon the achievement of a specified commercial milestone. We also agreed to pay royalties of a low single-digit percentage based on net sales of products licensed under the agreement. In addition, Spero Cantab issued equity interest in Spero Cantab and entered into a subscription agreement and shareholders agreement with PBB. In July 2017, we repurchased PBB's minority equity interest in Spero Cantab in exchange for a one-time non-refundable upfront fee of approximately $0.2 million and we also amended the Cantab Agreement to increase the contingent milestone payments to PBB by an aggregate of $0.1 million. The Cantab Agreement continues indefinitely, with royalty payment obligations thereunder continuing on a product-by-product and country-by-country basis until the later of ten years after the first commercial sale of such product in such country or the expiration in such country of the last to expire valid claim of any of the applicable patents.

In addition, we held a NIAID contract that partially funded the next-generation potentiating agent development program. That contract was novated from CAI to us in December 2017. Under the contract, which was closed out as of June 15, 2021, we were obligated to pay PBB a percentage of funds received from NIAID up to a maximum of $1.3 million, which was fulfilled as of December 31, 2021.

Everest Medicines License Agreement

On January 4, 2019, we, through NPLH, entered into a license agreement (the "Original Everest License Agreement") with Everest, which Original Everest License Agreement also included an option granted by our wholly-owned subsidiary, Spero Potentiator, Inc., a Delaware corporation. Under the terms of the Original Everest License Agreement, we granted Everest an exclusive license to develop, manufacture and commercialize SPR206 or products that contain SPR206 ("Licensed Products") in Greater China (which includes Mainland China, Hong Kong and Macau), South Korea and certain Southeast Asian countries, collectively referred to as the Territory. We retained development, manufacturing and commercialization rights with respect to SPR206 and Licensed Products in the rest of the world and also retained the right to develop or manufacture SPR206 and Licensed Products in the Territory for use outside the Territory. In addition to the license grant to SPR206, we granted Everest a 12-month exclusive option to negotiate with us for an exclusive license to develop, manufacture and commercialize SPR741 in the Territory. For the reasons discussed above, following an evaluation of the potentiator product candidates, we discontinued the development of SPR741, effective January 1, 2020, and decided to move forward with SPR206 as our lead potentiator product candidate. In addition, on October 29, 2019, Everest notified us that it did not intend to exercise its option with respect to SPR741 under the Original Everest License Agreement. Accordingly, effective January 1, 2020, we no longer have any intellectual property rights with respect to SPR741 and we no longer have any obligations for the cost of maintaining such intellectual property.

Under the terms of the Original Everest License Agreement, we received an upfront payment of $3.0 million. We also received a milestone payment of $2.0 million in the fourth quarter of 2020 upon completion and delivery of the results of a clinical study.

In January 2021, we entered into an amended and restated license agreement (the "Amended Everest License Agreement") with Everest and Spero Potentiator, Inc. which amended and restated in its entirety the Original Everest License Agreement. The Amended Everest License Agreement modified the dates and values of certain milestone events related to the development and commercialization of SPR206. Everest will now be making more significant investments in the development of SPR206 beyond what was contemplated at the time of the Original Everest License Agreement. The Original Everest License Agreement provided that we could receive up to $59.5 million upon achievement of certain milestones. The Amended Everest License Agreement provides that we may receive up to $38.0 million upon achievement of certain milestones, of which $2.0 million has been received to date. In addition, under the Amended Everest License Agreement, we assigned patents in the Territory to Everest, rather than licensing such patents to Everest, and the option related to SPR741 and related provisions have been removed. We are also entitled to receive high single-digit to low double-digit royalties on net sales, if any, of Licensed Products in the Territory following regulatory approval of SPR206. Everest has the right to sublicense to affiliates and third parties in the Territory.

Everest is responsible for all costs related to developing, obtaining regulatory approval of and commercializing SPR206 and Licensed Products in the Territory, and is obligated to use commercially reasonable efforts to develop, manufacture and commercialize Licensed Products, including to achieve certain specified diligence milestones within agreed-upon periods. A joint development committee has been established between us and Everest to coordinate and review the development, manufacturing and commercialization plans with respect to Licensed Products in the Territory.

Unless earlier terminated due to certain material breaches of the contract, or otherwise, the Amended Everest License Agreement will expire on a jurisdiction-by-jurisdiction and Licensed Product-by-Licensed Product basis until the latest to occur of expiration of the last valid claim under a licensed patent in such jurisdiction, the expiration of regulatory exclusivity in such jurisdiction or ten years after the first commercial sale of such Licensed Product in such jurisdiction. The Amended Everest License Agreement may be terminated in its entirety by Everest upon 90 or 180 days prior written notice, depending on the stage of development of the initial Licensed Product.

Pfizer License and Share Purchase Agreements

On June 30, 2021, we entered into a License Agreement (the "Pfizer License Agreement") and a Share Purchase Agreement (the "Pfizer Purchase Agreement") with Pfizer. Under the terms of the Pfizer License Agreement, we granted Pfizer an exclusive royalty-bearing license to develop, manufacture and commercialize SPR206 or products that contain SPR206 (the "Licensed Products") globally with some territorial exceptions (the "Pfizer Territory"). The Pfizer Territory excludes the United States and the Asian markets previously licensed to Everest, those being the People's Republic of China, including Hainan Island, the Hong Kong Special Administrative Region of the People's Republic of China, and the Macau Special Administrative Region of the People's Republic of China, Taiwan, the Republic of Korea (South Korea), the Republic of Singapore, Malaysian Federation, Kingdom of Thailand, the Republic of Indonesia, Socialist Republic of Vietnam and the Republic of the Philippines).

Under the terms of the Pfizer Purchase Agreement, Pfizer purchased 2,362,348 shares of our common stock at a price of $16.93 per share for a total investment of $40.0 million. Under the terms of the Pfizer License Agreement, we received no other upfront payments but are eligible to receive up to $80.0 million in development and sales milestones, and we may also receive high single-digit to low double-digit royalties on net sales of SPR206 in the Pfizer Territory. Achievement of these payments cannot be guaranteed. We and Pfizer agree that upon Pfizer's request, the parties will negotiate in good faith regarding procuring a clinical or commercial supply of the compound.

We are responsible for all costs related to developing and obtaining regulatory approval of SPR206 and Licensed Products in the Pfizer Territory, with a focus on the European market, and are obligated to use commercially reasonable efforts, including to achieve certain specified diligence milestones within agreed-upon periods. A joint development committee was established between Pfizer and us to coordinate and review the development, manufacturing and commercialization plans with respect to Licensed Products in the Pfizer Territory. Pfizer is responsible for commercializing SPR206 and the Licensed Products in the Pfizer Territory.

Unless earlier terminated due to certain material breaches of the contract or by Pfizer's convenience, or otherwise, the Pfizer License Agreement will expire on a jurisdiction-by-jurisdiction and licensed product-by-licensed product basis after ten years from the effective date. The Pfizer License Agreement will automatically renew for an additional ten-year term unless terminated.

Government Awards

Through December 31, 2022, we have committed funding support of up to an aggregate of $68.7 million in non-dilutive funding from BARDA, NIAID, the DoD and concluded awards from CARB-X, SBIR and the DoD, with the potential to receive a total of up to $98.8 million (inclusive of amounts we have already received) if certain options are exercised. The awards are subject to termination for convenience at any time by the granting government agency, and the granting government agency is not obligated to

provide funding to us beyond the base period amounts from Congressionally approved annual appropriations. These awards are structured in the following manner:

- ***BARDA award to support the further clinical development of tebipenem HBr.*** The BARDA award provides total reimbursement to us of up to $59.7 million for qualified expenses for tebipenem HBr development. The award initially committed funding of $15.7 million over a three-year base period from July 2018 to June 30, 2021 for cUTI development activities. In May 2019, the contract was modified to include additional funding of approximately $2.5 million for tebipenem HBr, increasing the amount of initial committed funding from $15.7 million to approximately $18.2 million. In January 2020, BARDA exercised its first option under the contract, committing $15.9 million for tebipenem HBr through November 2021. In October 2021, BARDA extended the period of performance for the first contract option through December 15, 2022. In October 2022, BARDA extended the period of performance for the first contract option through December 15, 2023. Total committed funding under the BARDA award as of December 31, 2021 was $34.0 million, including the first option exercised in 2020. There is a second option exercisable by BARDA for $12.7 million of funding, subject to specified milestones being achieved under the award agreement and program direction. On January 19, 2022, BARDA added, and exercised, a new option to the original award, increasing the total amount of committed funding by $12.9 million to $46.9 million, increasing the total potential contract value to $59.7 million. In September 2022, remaining funding from the $12.9 million option was reprogrammed to support clinical trials for patients with cUTIs, including acute pyelonephritis. The Defense Threat Reduction Agency ("DTRA") will provide up to $10.0 million in addition to the total potential $59.7 million from BARDA, to cover the cost of the nonclinical biodefense aspects of the collaboration program. While such funding would be for the purpose of developing tebipenem HBr in these areas, we will not receive any funds directly from DTRA.
- ***NIAID funding for SPR206.*** The NIAID contract for SPR206 awarded in 2016 provides for total development funding of up to $6.5 million over a base period and three option periods. To date, funding for the base period and the first two option periods, totaled $5.9 million before the contract was closed out in June 2021. In May 2021, a new NIAID contract was awarded for SPR206 providing total development funding of up to $23.4 million, of which $6.2 million has been committed. The award initially committed funding of $2.1 million over a two-year base period from May 2021 to January 2023 for non-clinical, regulatory, and CMC activities. In December 2022, NIAID extended period of performance for the base period until August 16, 2023. In December 2022, the contract was modified to include additional funding of approximately $0.1 million, increasing the amount of base period committed funding from $2.1 million to $2.2 million. This increased the total potential contract value to $23.5 million. In October 2022, NIAID exercised its first option under the contract, committing $4.0 million for SPR206 through April 2025.
- ***DoD funding for SPR206.*** In July 2019, we were awarded a $5.9 million award from the DoD Congressionally Directed Medical Research Programs ("CDMRP") Joint Warfighter Medical Research Program, which supported, over a four-year period, the development of SPR206. The funding covered the costs of select Phase 1 pharmacology studies, a 28-day GLP NHP toxicology study, and microbiological surveillance studies that would be required for a potential NDA submission with the FDA for SPR206. As of December 31, 2022, all activities under this award were completed and this award was closed out.

Intellectual Property

We strive to protect the proprietary technology that we believe is important to our business, including seeking and maintaining patents intended to cover our product candidates and compositions, their methods of use and processes for their manufacture and any other inventions that are commercially important to the development of our business. We also rely on trade secrets to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection.

Our success will significantly depend on our ability to obtain and maintain patent and other proprietary protection for commercially important technology and inventions and know-how related to our business, defend and enforce our patents, preserve the confidentiality of our trade secrets and operate without infringing the valid and enforceable patents and proprietary rights of third parties. We also rely on the know-how and continuing technological innovation to develop and maintain our proprietary position.

Spero-Owned Intellectual Property Relating to Compounds Under Development

We have patent applications directed to the composition of matter, formulation and/or use of SPR720, tebipenem HBr and SPR206 pending in the United States, Europe, Japan and other countries.

NTM Disease Program (SPR720)

Our intellectual property portfolio for our DNA Gyrase Inhibitor program includes issued patents and pending patent applications directed to composition of matter for SPR720, and its close analogs and prodrugs, novel solid forms of SPR720 and its prodrugs, methods of manufacture, and methods of treatment using SPR720 alone and in combination with other antibiotic compounds. All patents and patent applications in the portfolio are wholly owned by us. As of December 31, 2022, we owned 11 issued United States patents, 91 issued foreign patents, seven pending foreign patent applications and one pending PCT application. The issued and foreign patents are in a number of jurisdictions including the European Union and its member states, Argentina, Australia, Brazil, Canada, China, Hong Kong, Indonesia, Israel, India, Japan, South Korea, Mexico, New Zealand, the Philippines,

Russia, Singapore, South Africa, and Taiwan. Issued United States and foreign patents, and patents issuing from pending United States and foreign applications, will have statutory expiration dates of January 2032, June 2032, July 2033 and October 2042. Patent term adjustments or patent term extensions could result in later expiration dates.

Tebipenem HBr Oral Carbapenem (Tebipenem Pivoxil Hydrobromide)

Our tebipenem HBr program contains one issued and three pending United States patent applications, and eight issued and 37 pending foreign patent applications covering novel preparations of tebipenem pivoxil hydrobromide as of December 31, 2022, all wholly owned by us. The issued foreign patents are issued in Australia (2), Brazil, Japan, Mexico, New Zealand and South Africa (2). Foreign patent applications are pending in Australia, Brazil, Canada, China, Colombia, the Eurasian Patent Office, the European Patent Office, Egypt, Indonesia, Israel, India, Japan, South Korea, Mexico, New Zealand, the Philippines, Singapore, Thailand, Vietnam, and South Africa. United States and foreign patents covering our tebipenem pivoxil hydrobromide preparations will have statutory expiration dates of December 2037, February 2038, and November 2041. Patent term adjustments or patent term extensions could result in later expiration dates.

In January 2021, the United States Patent and Trademark Office ("USPTO") issued U.S. Patent No, 10,889,587, which is directed to the crystalline formulation of tebipenem HBr, our oral carbapenem in development for the treatment of cUTI and AP. This patent covers a crystalline form of tebipenem pivoxil HBr, pharmaceutical compositions of tebipenem pivoxil HBr and methods of use. The patent expires in February 2038.

Next-Generation Potentiator Product (SPR206)

The intellectual property portfolio for our next-generation polymyxin program contains patent applications and issued patents directed to a composition of matter for polymyxin-like compounds with different structural features, pharmaceutical compositions comprising the same, and methods of use for these novel compounds and compositions. As of December 31, 2022, we owned two United States patent and three pending United States patent applications, 57 foreign patents, and 30 pending foreign patent applications in a number of jurisdictions including Argentina, Australia, Brazil, Canada, China, Colombia, the European Patent Office, India, Israel, Japan, Mexico, New Zealand, the Philippines, Russia, Singapore, South Africa, Taiwan, Ukraine and Venezuela. Issued United States or foreign patents and any patents issued from pending United States or foreign applications covering our next-generation polymyxin program will have a statutory expiration date of May 2034, March 2035, November 2035 or June 2039. Patent term adjustments or patent term extensions could result in later expiration dates.

In October 2022, the USPTO issued U.S. Patent No. 11,459,357, which covers the SPR206 composition of matter and formulations thereof, as well as methods of treating a bacterial infection with SPR206. The patent is assigned to us and has a lifespan extending into at least June 2039.

In 2019, we entered into an agreement with Everest, by which Everest would develop, manufacture, and commercialize SPR206 in China, South Korea, and certain Southeast Asian countries. Our agreement with Everest has since been amended to include an obligation by us to assign its SPR206 patent rights to Everest in these countries and assignments to Everest have now been executed.

Patent Term and Patent Term Extensions

The term of individual patents depends upon the legal term for patents in the countries in which they are obtained. In most countries, including the United States, the patent term is 20 years from the earliest filing date of a non-provisional patent application. In the United States, a patent's term may be lengthened by patent term adjustment, which compensates a patentee for administrative delays by the USPTO in examining and granting a patent, or may be shortened if a patent is terminally disclaimed over an earlier-filed patent. The term of a patent that covers a drug, biological product or medical device approved pursuant to a pre-market approval may also be eligible for patent term extension when FDA approval is granted, provided statutory and regulatory requirements are met. The length of the patent term extension is related to the length of time the drug is under regulatory review while the patent is in force. The Hatch-Waxman Act permits a patent term extension of up to five years beyond the expiration date set for the patent. Patent extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval, only one patent applicable to each regulatory review period may be granted an extension and only those claims reading on the approved drug are extended. Similar provisions are available in Europe and other foreign jurisdictions to extend the term of a patent that covers an approved drug.

Russian, Eurasian Patent Office and Ukrainian Patents

Due to the war in Ukraine and sanctions between the United States and Russia, patents and patent applications in Russia, the Eurasian Patent Office ("EAPO") and Ukraine currently have an uncertain fate. Further, the Kremlin has stated it will no longer enforce patents held by businesses in "unfriendly" countries, in effect giving a royalty free license to all patents and patent applications filed by United States entities in Russia. Unless the conflict with Ukraine ends quickly it is unlikely our Russian and EAPO patent and patent applications will remain in effect.

Ukraine is currently under martial law and not processing patent applications. It is expected all patent deadlines in Ukraine will be extended.

Trade Secrets

We rely, in some circumstances, on trade secrets to protect our unpatented technology. However, trade secrets can be difficult to protect. We seek to protect our trade secrets and proprietary technology and processes, in part, by confidentiality agreements with our employees, consultants, scientific advisors, and contractors. We also seek to preserve the integrity and confidentiality of our data and trade secrets by maintaining the physical security of our premises and the physical and electronic security of our information technology systems. While we have confidence in these individuals, organizations, and systems, agreements or security measures may be breached. We may not have adequate remedies for any breach and could lose our trade secrets through such a breach. In addition, our trade secrets may otherwise become known or be independently discovered by competitors. To the extent that our consultants, contractors, or collaborators use intellectual property owned by others in their work for us, disputes may arise as to the rights in related or resulting trade secrets, know-how, and inventions.

Competition

The biopharmaceutical industry is characterized by intense competition and rapid innovation. Our potential competitors include large pharmaceutical and biotechnology companies, specialty pharmaceutical companies, and generic drug companies. Many of our potential competitors have greater financial, technical, and human resources than we do, as well as greater experience in the discovery and development of product candidates, obtaining FDA and other regulatory approvals of products, and the commercialization of those products. Accordingly, our potential competitors may be more successful than us in obtaining FDA approval of drugs and achieving widespread market acceptance. We anticipate that we will face intense and increasing competition as new drugs enter the market and advanced technologies become available. Finally, the development of new treatment methods for the diseases we are targeting could render our product candidates non-competitive or obsolete.

We are developing SPR720 to be the first approved oral treatment for NTM pulmonary disease. There are currently no oral agents approved to treat NTM pulmonary disease. Only one drug is approved to treat NTM infection that would potentially compete with SPR720 called Arikayce from Insmed, an inhaled version of a commonly used drug in the hospital setting called amikacin. It should be noted that combination therapy is recommended for treating this condition. There are also a number of late-stage product candidates in clinical development by Paratek Pharmaceuticals, Inc., AN2 Therapeutics, Inc. and Insmed, Inc. that are intended to treat refractory disease and first-line treatment of disease due to MAC or *M. absesssus.*

We believe the key competitive factors that will affect the development and commercial success of our partnered product candidate, tebipenem HBr, if approved, will be efficacy, coverage of drug-resistant strains of bacteria, safety, and tolerability profile, reliability, the convenience of oral dosing, price, availability of reimbursement from governmental and other third-party payers and susceptibility to drug resistance.

We are developing tebipenem HBr as an oral antibiotic for use as a monotherapy for the treatment of resistant and MDR infections. If approved, there are a variety of available oral therapies for the treatment of cUTIs that we would expect would compete with tebipenem HBr, such as Levaquin, Cipro and Bactrim and several antibiotics currently in clinical development for cUTI. We also expect that tebipenem HBr, if approved, would compete with future and current generic versions of marketed antibiotics. If approved, we believe that tebipenem HBr would compete effectively against these compounds on the basis of tebipenem HBr's potential:

- broad range of activity against a wide variety of resistant and MDR Gram-negative bacteria;
- low probability of drug resistance;
- a favorable safety and tolerability profile supported by years of post-marketing experience in Japan;
- oral dosing regimen and opportunity to step-down from IV-administered therapy; and
- as a monotherapy treatment for MDR Gram-negative infections.

We are also developing SPR206 as an innovative IV-administered agent for Gram-negative infections in the hospital. If approved, SPR206 would compete with several IV-administered products marketed for the treatment of Gram-negative infections, including ceftazidime-avibactam (Avycaz) from Allergan plc and Pfizer Inc., ceftolozane-tazobactam (Zerbaxa) from Merck & Co., plazomicin (Zemdri) from Cipla Therapeutics, Inc., eravacycline (Xerava) from Tetraphase Pharmaceuticals, Inc., meropenem-vaborbactam (Vabomere) from Melinta Therapeutics, Inc, cefiderocol (Fetroja) from Shionogi & Co. Ltd., and imipenem-relebactam (Recarbrio) from Merck & Co. Each of these products and product candidates employs a mechanism of action that differs from the mechanism of action employed by SPR206.

Government Regulation and Product Approval

Government authorities in the United States, at the federal, state and local level, and in other countries, extensively regulate, among other things, the research, development, clinical trials, testing, manufacture, including any manufacturing changes, authorization, pharmacovigilance, adverse event reporting, recalls, packaging, storage, recordkeeping, labeling, advertising, promotion, distribution, marketing, import and export of pharmaceutical products and product candidates such as those we are developing. The processes for obtaining regulatory approvals in the United States and in foreign countries, along with subsequent compliance with applicable statutes and regulations, require the expenditure of substantial time and financial resources.

United States Government Regulation

In the United States, the FDA regulates drugs under the Federal Food, Drug, and Cosmetic Act ("FDCA") and implementing regulations. The process of obtaining regulatory approvals and the subsequent compliance with appropriate federal, state, local and foreign statutes and regulations requires the expenditure of substantial time and financial resources. Failure to comply with the applicable United States requirements at any time during the product development process, approval process or after approval, may subject an applicant to a variety of administrative or judicial sanctions, such as the FDA's refusal to approve pending NDAs, withdrawal of an approval, imposition of a clinical hold, issuance of warning letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, refusals of government contracts, restitution, disgorgement or civil and/or criminal penalties.

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

- completion of preclinical laboratory tests, animal studies and formulation studies in compliance with GLPs and other applicable regulations;
- submission to the FDA of an IND which must become effective before human clinical trials may begin;
- approval by an independent institutional review board ("IRB") at each clinical site before each trial may be initiated;
- performance of adequate and well-controlled human clinical trials in accordance with good clinical practices ("GCPs") to establish the safety and efficacy of the proposed drug product for each indication;
- submission to the FDA of an NDA and payment of user fees;
- satisfactory completion of an FDA advisory committee review, if applicable;
- satisfactory completion of an FDA pre-approval inspection of the manufacturing facility or facilities at which the product is produced to assess compliance with current good manufacturing practices ("cGMPs") and to assure that the facilities, methods and controls are adequate to preserve the drug's identity, strength, quality and purity;
- satisfactory completion of audits of clinical trial sites conducted by FDA to assure compliance with GCPs and the integrity of clinical data; and
- FDA review and approval of the NDA.

Preclinical Studies

Preclinical studies include laboratory evaluation of product chemistry, toxicity and formulation, as well as animal studies to assess potential safety and efficacy. Preclinical tests intended for submission to the FDA to support the safety of a product candidate must be conducted in compliance with GLP regulations and the United States Department of Agriculture's Animal Welfare Act. A drug sponsor must submit the results of the preclinical tests, together with manufacturing information, analytical data and any available clinical data or literature, among other things, to the FDA as part of an IND. Some nonclinical testing may continue even after the IND is submitted and human clinical trials have begun. An IND automatically becomes effective 30 days after receipt by the FDA, unless before that time the FDA raises concerns or questions related to one or more proposed clinical trials and places the clinical trial on a clinical hold. In such a case, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial can begin. As a result, submission of an IND may not result in the FDA allowing clinical trials to commence. A clinical hold may occur at any time during the life of an IND and may affect one or more specific studies or all studies conducted under the IND.

Clinical Trials

Clinical trials involve the administration of the investigational new drug to human subjects under the supervision of qualified investigators in accordance with GCP requirements, which include the requirement that all research subjects provide their informed consent in writing for their participation in any clinical trial along with the requirement to ensure that the data and results reported from the clinical trials are credible and accurate. Clinical trials are conducted under protocols detailing, among other things, the objectives of the trial, the criteria for determining subject eligibility, the dosing plan, the parameters to be used in monitoring safety, the procedure for timely reporting of adverse events, and the effectiveness criteria to be evaluated. A protocol for each clinical trial and any subsequent protocol amendments must be submitted to the FDA as part of the IND. In addition, an IRB at each institution participating in the clinical trial must review and approve the plan for any clinical trial before it commences at that institution.

Information about certain clinical trials and clinical trial results must be submitted within specific timeframes to the National Institutes of Health ("NIH") for public dissemination on the Clinicaltrials.gov registry. Failure to timely register a covered clinical study or to submit study results as provided for in the law can give rise to civil monetary penalties and also prevent the non-compliant

party from receiving future grant funds from the federal government. The government has recently begun enforcing these registration and results reporting requirements against non-compliant clinical trial sponsors.

Human clinical trials are typically conducted in three sequential phases, which may overlap or be combined:

Phase 1: The drug is initially introduced into healthy human subjects or patients with the target disease or condition and tested for safety, dosage tolerance, absorption, metabolism, distribution, excretion and, if possible, to gain an early indication of its effectiveness. During Phase 1 clinical trials, sufficient information about the investigational drug's pharmacokinetics and pharmacological effects may be obtained to permit the design of well-controlled and scientifically valid Phase 2 clinical trials.

Phase 2: The drug is administered to a larger, but still limited patient population to identify possible adverse effects and safety risks, to preliminarily evaluate the efficacy of the product for specific targeted indications and to determine dosage tolerance and optimal dosage. Phase 2 clinical trials are typically well-controlled and closely monitored.

Phase 3: The drug is administered to an expanded patient population, generally at geographically dispersed clinical trial sites, in well-controlled clinical trials to generate enough data to statistically evaluate the efficacy and safety of the product for approval, to establish the overall risk-benefit profile of the product, and to provide adequate information for the labeling of the product. Phase 3 clinical trials usually involve a larger number of participants than a Phase 2 clinical trial.

Interactions with FDA During the Clinical Development Program

Following the clearance of an IND and the commencement of clinical trials, the sponsor will continue to have interactions with the FDA. Progress reports detailing the results of clinical trials must be submitted at least annually to the FDA and more frequently if serious AEs occur. In addition, IND safety reports must be submitted to the FDA for any of the following: serious and unexpected suspected adverse reactions; findings from other studies or potentially animal studies to assess toxicity or in vitro testing that suggest a significant risk in humans exposed to the product; and any clinically important increase in the occurrence of a serious suspected adverse reaction over that listed in the protocol or investigator brochure. The Consolidated Appropriations Act for 2023, signed into law on December 29, 2022 (P.L. 117-328), amended both the FDCA and PHSA to specify that nonclinical testing for drugs and biologics, respectively, may, but is not required to, include in vivo animal testing. According to the amended language, a sponsor may fulfill nonclinical testing requirements by completing various in vitro assays (e.g., cell-based assays, organ chips, or microphysiological systems), in silico studies (i.e., computer modeling), other human or non-human biology-based tests (e.g., bioprinting), or in vivo animal tests. Phase 1, Phase 2 and Phase 3 clinical trials may not be completed successfully within any specified period, or at all. The FDA will typically inspect one or more clinical sites to assure compliance with GCP and the integrity of the clinical data submitted. Results from one trial may not be predictive of results from subsequent trials. Furthermore, the FDA or the sponsor may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution if the clinical trial is not being conducted in accordance with the IRB's requirements or if the drug has been associated with unexpected serious harm to patients.

In addition, sponsors are given opportunities to meet with the FDA at certain points in the clinical development program. Specifically, sponsors may meet with the FDA prior to the submission of an IND (pre-IND meeting), at the end of Phase 2 clinical trial (EOP2 meeting) and before an NDA is submitted (pre-NDA meeting). Meetings at other times may also be requested. There are four types of meetings that occur between sponsors and the FDA. Type A meetings are those that are necessary for an otherwise stalled product development program to proceed or to address an important safety issue. Type B meetings include pre-IND and pre-NDA meetings, as well as end of phase meetings such as EOP2 meetings. A Type C meeting is any meeting other than a Type A or Type B meeting regarding the development and review of a product, including, for example, meetings to facilitate early consultations on the use of a biomarker as a new surrogate endpoint that has never been previously used as the primary basis for product approval in the proposed context of use.

These meetings provide an opportunity for the sponsor to share information about the data gathered to date with the FDA and for the FDA to provide advice on the next phase of development. For example, at an EOP2, a sponsor may discuss its Phase 2 clinical results and present its plans for the pivotal Phase 3 clinical trial(s) that it believes will support the approval of the new product. Such meetings may be conducted in person, via teleconference/videoconference or written response only with minutes reflecting the questions that the sponsor posed to the FDA and the agency's responses. The FDA has indicated that its responses, as conveyed in meeting minutes and advice letters, only constitute mere recommendations and/or advice made to a sponsor and, as such, sponsors are not bound by such recommendations and/or advice. Nonetheless, from a practical perspective, a sponsor's failure to follow the FDA's recommendations for design of a clinical program may put the program at significant risk of failure.

Acceptance of NDAs

Assuming successful completion of the required clinical testing, the results of the preclinical studies and clinical trials, along with information relating to the product's chemistry, manufacturing, controls, safety updates, patent information, abuse information

and proposed labeling, are submitted to the FDA as part of an application requesting approval to market the product candidate for one or more indications. Data may come from company-sponsored clinical trials intended to test the safety and efficacy of a product's use or from a number of alternative sources, including studies initiated by investigators. To support marketing approval, the data submitted must be sufficient in quality and quantity to establish the safety and efficacy of a drug product. The fee required for the submission and review of an application under the Prescription Drug User Fee Act (the "PDUFA"), is substantial (for example, for fiscal year 2022 this application fee is approximately $3.1 million), and the sponsor of an approved application is also subject to an annual program fee, currently more than $369,000 per eligible prescription product. These fees are typically adjusted annually, and exemptions and waivers may be available under certain circumstances, such as where a waiver is necessary to protect the public health, where the fee would present a significant barrier to innovation, or where the applicant is a small business submitting its first human therapeutic application for review.

The FDA conducts a preliminary review of all applications within 60 days of receipt and must inform the sponsor at that time or before whether an application is sufficiently complete to permit substantive review. In pertinent part, the FDA's regulations state that an application "shall not be considered as filed until all pertinent information and data have been received" by the FDA. In the event that FDA determines that an application does not satisfy this standard, it will issue a Refuse to File ("RTF") determination to the applicant. Typically, an RTF will be based on administrative incompleteness, such as clear omission of information or sections of required information; scientific incompleteness, such as omission of critical data, information or analyses needed to evaluate safety and efficacy or provide adequate directions for use; or inadequate content, presentation, or organization of information such that substantive and meaningful review is precluded. The FDA may request additional information rather than accept an application for filing. In this event, the application must be resubmitted with the additional information. The resubmitted application is also subject to review before the FDA accepts it for filing.

Review of NDAs

After the submission is accepted for filing, the FDA begins an in-depth substantive review of the application. The FDA reviews the application to determine, among other things, whether the proposed product is safe and effective for its intended use, whether it has an acceptable purity profile and whether the product is being manufactured in accordance with cGMP.

Under the goals and policies agreed to by the FDA under PDUFA, the FDA has ten months from the filing date in which to complete its initial review of a standard application that is a new molecular entity, and six months from the filing date for an application with "priority review", such as our NDA seeking approval for tebipenem HBr for treatment of cUTI, including pyelonephritis, caused by certain microorganisms, in adult patients who have limited oral treatment options. The review process may be extended by the FDA for three additional months to consider new information or in the case of a clarification provided by the applicant to address an outstanding deficiency identified by the FDA following the original submission. Despite these review goals, it is not uncommon for FDA review of an application to extend beyond the PDUFA target action date.

In connection with its review of an application, the FDA will typically submit information requests to the applicant and set deadlines for responses thereto. The FDA will also conduct a pre-approval inspection of the manufacturing facilities for the new product to determine whether the manufacturing processes and facilities comply with cGMPs. The FDA will not approve the product unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and are adequate to assure consistent production of the product within required specifications.

The FDA also may inspect the sponsor and one or more clinical trial sites to assure compliance with IND and GCP requirements and the integrity of the clinical data submitted to the FDA. To ensure cGMP and GCP compliance by its employees and third-party contractors, an applicant may incur significant expenditure of time, money and effort in the areas of training, record keeping, production and quality control. The FDA generally accepts data from foreign clinical trials in support of an NDA if the trials were conducted under an IND. If a foreign clinical trial is not conducted under an IND, the FDA nevertheless may accept the data in support of an NDA if the study was conducted in accordance with GCPs and the FDA is able to validate the data through an on-site inspection, if deemed necessary. Although the FDA generally requests that marketing applications be supported by some data from domestic clinical trials, the FDA may accept foreign data as the sole basis for marketing approval if (1) the foreign data are applicable to the United States population and United States medical practice, (2) the studies were performed by clinical investigators with recognized competence, and (3) the data may be considered valid without the need for an on-site inspection or, if the FDA considers the inspection to be necessary, the FDA is able to validate the data through an on-site inspection or other appropriate means.

Additionally, the FDA may refer an application, including applications for novel product candidates which present difficult questions of safety or efficacy, to an advisory committee for review, evaluation and recommendation as to whether the application should be approved and under what conditions. Typically, an advisory committee is a panel of independent experts, including clinicians and other scientific experts that reviews, evaluates and provides a recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendation of an advisory committee, but it considers such recommendations when making final decisions on approval.

Data from clinical trials are not always conclusive, and the FDA or its advisory committee may interpret data differently than the sponsor interprets the same data. The FDA may also re-analyze the clinical trial data, which could result in extensive discussions between the FDA and the applicant during the review process or delay, limit or prevent regulatory approval. The FDA may not grant approval on a timely basis, or at all.

The FDA also may require submission of a Risk Evaluation and Mitigation Strategy ("REMS") if it determines that a REMS is necessary to ensure that the benefits of the product outweigh its risks and to assure the safe use of the product. The REMS could include medication guides, physician communication plans, assessment plans and/or elements to assure safe use, such as restricted distribution methods, patient registries or other risk minimization tools. The FDA determines the requirement for a REMS, as well as the specific REMS provisions, on a case-by-case basis. If the FDA concludes a REMS is needed, the sponsor of the application must submit a proposed REMS and the FDA will not approve the application without a REMS.

In addition, under the Pediatric Research Equity Act of 2003, as amended and reauthorized, certain NDAs or supplements to an NDA must contain data that are adequate to assess the safety and effectiveness of the drug for the claimed indications in all relevant pediatric subpopulations, and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults or full or partial waivers from the pediatric data requirements. Unless otherwise required by regulation, the pediatric data requirements do not apply to products with orphan designation.

Decisions on NDAs

The FDA reviews an applicant to determine, among other things, whether the product is safe and whether it is effective for its intended use(s), with the latter determination being made on the basis of substantial evidence. The term “substantial evidence” is defined under the FDCA as “evidence consisting of adequate and well-controlled investigations, including clinical investigations, by experts qualified by scientific training and experience to evaluate the effectiveness of the product involved, on the basis of which it could fairly and responsibly be concluded by such experts that the product will have the effect it purports or is represented to have under the conditions of use prescribed, recommended, or suggested in the labeling or proposed labeling thereof.”

The FDA has interpreted this evidentiary standard to require at least two adequate and well-controlled clinical investigations to establish effectiveness of a new product. Under certain circumstances, however, the FDA has indicated that a single trial with certain characteristics and additional information may satisfy this standard. This approach was subsequently endorsed by Congress in 1998 with legislation providing, in pertinent part, that “If [FDA] determines, based on relevant science, that data from one adequate and well-controlled clinical investigation and confirmatory evidence (obtained prior to or after such investigation) are sufficient to establish effectiveness, the FDA may consider such data and evidence to constitute substantial evidence.” This modification to the law recognized the potential for the FDA to find that one adequate and well controlled clinical investigation with confirmatory evidence, including supportive data outside of a controlled trial, is sufficient to establish effectiveness. In December 2019, the FDA issued draft guidance further explaining the studies that are needed to establish substantial evidence of effectiveness. It has not yet finalized that guidance.

After evaluating the application and all related information, including the advisory committee recommendations, if any, and inspection reports of manufacturing facilities and clinical trial sites, the FDA will issue either a CRL or an approval letter. To reach this determination, the FDA must determine that the drug is effective and that its expected benefits outweigh its potential risks to patients. This “benefit-risk” assessment is informed by the extensive body of evidence about the product’s safety and efficacy in the NDA. This assessment is also informed by other factors, including: the severity of the underlying condition and how well patients’ medical needs are addressed by currently available therapies; uncertainty about how the premarket clinical trial evidence will extrapolate to real-world use of the product in the post-market setting; and whether risk management tools are necessary to manage specific risks. In connection with this assessment, the FDA review team will assemble all individual reviews and other documents into an “action package,” which becomes the record for FDA review. The review team then issues a recommendation, and a senior FDA official makes a decision.

A CRL indicates that the review cycle of the application is complete, and the application will not be approved in its present form. A CRL generally outlines the deficiencies in the submission and may require substantial additional testing or information in order for the FDA to reconsider the application. The CRL may require additional clinical or other data, additional pivotal Phase 3 clinical trial(s) and/or other significant and time- consuming requirements related to clinical trials, preclinical studies or manufacturing. If a CRL is issued, the applicant will have one year to respond to the deficiencies identified by the FDA, at which time the FDA can deem the application withdrawn or, in its discretion, grant the applicant an additional six-month extension to respond. The FDA has committed to reviewing resubmissions in response to an issued CRL in either two or six months depending on the type of information included. Even with the submission of this additional information, however, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval. The FDA has taken the position that a CRL is not final agency action making the determination subject to judicial review.

An approval letter, on the other hand, authorizes commercial marketing of the product with specific prescribing information for specific indications. That is, the approval will be limited to the conditions of use (e.g., patient population, indication) described in the FDA-approved labeling. Further, depending on the specific risk(s) to be addressed, the FDA may require that contraindications, warnings or precautions be included in the product labeling, require that post-approval trials, including Phase 4 clinical trials, be conducted to further assess a product's safety after approval, require testing and surveillance programs to monitor the product after commercialization or impose other conditions, including distribution and use restrictions or other risk management mechanisms under a REMS which can materially affect the potential market and profitability of the product. The FDA may prevent or limit further marketing of a product based on the results of post-marketing trials or surveillance programs. After approval, some types of changes to the approved product, such as adding new indications, manufacturing changes and additional labeling claims, are subject to further testing requirements and FDA review and approval.

Under the Ensuring Innovation Act, which was signed into law in April 2021, the FDA must publish action packages summarizing its decisions to approve new drugs within 30 days of approval of such products. To date, CRLs are not publicly available documents.

Special FDA Expedited Review

The FDA is authorized to designate certain products for expedited development or review if they are intended to address an unmet medical need in the treatment of a serious or life-threatening disease or condition. These programs include fast track designation, breakthrough therapy designation, QIDP designation, and priority review designation. The purpose of these programs is to provide important new drugs to patients earlier than under standard FDA review procedures.

To be eligible for a fast track designation, the FDA must determine, based on the request of a sponsor, that a product is intended to treat a serious or life-threatening disease or condition and demonstrates the potential to address an unmet medical need, or if the drug qualifies as a QIDP under the GAIN Act. The FDA will determine that a product will fill an unmet medical need if it will provide a therapy where none exists or provide a therapy that may be potentially superior to existing therapy based on efficacy or safety factors. Fast track designation provides additional opportunities for interaction with the FDA's review team and may allow for a rolling review of NDA components before the completed application is submitted, if the sponsor provides a schedule for the submission of the sections of the NDA, the FDA agrees to accept sections of the NDA and determines that the schedule is acceptable, and the sponsor pays any required user fees upon submission of the first section of the NDA. In addition, fast track designation may be withdrawn by the sponsor or rescinded by the FDA if the designation is no longer supported by data emerging in the clinical trial process. Tebipenem HBr has been granted fast track designation by the FDA for the treatment of cUTI, including pyelonephritis, caused by certain microorganisms in adult patients who have limited oral treatment options. In September 2020, SPR720 received fast track designation for treatment of adult patients with NTM pulmonary disease.

In addition, as part of the Consolidated Appropriations Act for 2023, Congress provided FDA additional statutory authority to mitigate potential risks to patients from continued marketing of ineffective drugs previously granted accelerated approval. Under these recent amendments to the FDCA, the agency may require a sponsor of a product granted accelerated approval to have a confirmatory trial underway prior to approval. The sponsor must also submit progress reports on a confirmatory trial every six months until the trial is complete, and such reports will be published on FDA's website. Congress also recently amended the law to give FDA the option of using expedited procedures to withdraw product approval if the sponsor's confirmatory trial fails to verify the claimed clinical benefits of the product.

In addition, with the enactment of the FDA Safety and Innovation Act ("FDASIA") in 2012, Congress created a new regulatory program for therapeutic candidates designated by FDA as "breakthrough therapies" upon a request made by the IND sponsors. A breakthrough therapy is defined as a drug that is intended, alone or in combination with one or more other drugs, to treat a serious or life-threatening disease or condition, and preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. The FDA must take certain actions with respect to breakthrough therapies, such as holding timely meetings with and providing advice to the product sponsor, intended to expedite the development and review of an application for approval of a breakthrough therapy.

FDASIA also included the Generating Antibiotics Incentives Now Act (the "GAIN Act") which directed the FDA to implement the QIDP designation program. The GAIN Act created incentives for the development of antibacterial and antifungal drug products for the treatment of serious or life-threatening infections. A therapeutic candidate designated as a QIDP is eligible for fast track designation, and the first marketing application submitted for a specific drug product and indication for which QIDP designation was granted will be granted priority review. A subsequent application from the same sponsor for the same product and indication will receive priority review designation only if it otherwise meets the criteria for priority review. As discussed further below under "Qualified Infectious Disease Product Exclusivity," the GAIN Act also provides the possibility of a five-year exclusivity extension that is added to any other marketing exclusivity for which a QIDP-designated drug qualifies upon FDA approval.

Finally, the FDA may designate a product for priority review if it is a drug or biologic that treats a serious condition and, if approved, would provide a significant improvement in safety or effectiveness. The FDA determines at the time that the marketing application is submitted, on a case-by-case basis, whether the proposed drug represents a significant improvement in treatment, prevention or diagnosis of disease when compared with other available therapies. Significant improvement may be illustrated by evidence of increased effectiveness in the treatment of a condition, elimination or substantial reduction of a treatment-limiting drug reaction, documented enhancement of patient compliance that may lead to improvement in serious outcomes, or evidence of safety and effectiveness in a new subpopulation. A priority review designation is intended to direct overall attention and resources to the evaluation of such applications, and to shorten the FDA's goal for taking action on a marketing application from ten months to six months for an NDA for a new molecular entity from the date of filing.

Even if a product qualifies for one or more of these programs, the FDA may later decide that the product no longer meets the conditions for qualification or decide that the time period for FDA review or approval will not be shortened. Furthermore, fast track designation, breakthrough therapy designation and priority review do not change the standards for approval and may not ultimately expedite the development or approval process.

Accelerated Approval Pathway

In addition, a product studied for its safety and effectiveness in treating serious or life-threatening illnesses and that provide meaningful therapeutic benefit over existing treatments may receive accelerated approval, meaning that it may be approved on (i) the basis of adequate and well-controlled clinical trials establishing that the drug product has an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit, or (ii) on an intermediate clinical endpoint that can be measured earlier than irreversible morbidity or mortality ("IMM") and that is reasonably likely to predict an effect on IMM or other clinical benefits, taking into account the severity, rarity or prevalence of the condition and the availability or lack of alternative treatments. As a condition of approval, the FDA may require a sponsor of a drug receiving accelerated approval to perform post-marketing studies to verify and describe the predicted effect on IMM or other clinical endpoints, and the drug may be subject to expedited withdrawal procedures. Drugs granted accelerated approval must meet the same statutory standards for safety and effectiveness as those granted traditional approval.

The accelerated approval pathway is usually contingent on a sponsor's agreement to conduct, in a diligent manner, additional post-approval confirmatory studies to verify and describe the drug's clinical benefit. As a result, a therapeutic candidate approved on this basis is subject to rigorous post-marketing compliance requirements, including the completion of Phase 4 or post-approval clinical trials to confirm the effect on the clinical endpoint. Failure to conduct required post-approval studies, or to confirm the predicted clinical benefit of the product during post-marketing studies, would allow the FDA to withdraw approval of the drug. All promotional materials for drug products being considered and approved under the accelerated approval program are subject to prior review by the FDA. Lawmakers, FDA officials, and other stakeholders have recently been evaluating the accelerated approval program and have proposed potential reforms to improve certain aspects. Scrutiny of the accelerated approval pathway is likely to continue and may lead to legislative and/or administrative changes in the future.

Post-Approval Requirements

Drugs manufactured or distributed pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product sampling and distribution, advertising and promotion and reporting of adverse experiences with the product. After approval, most changes to the approved product, such as adding new indications or other labeling claims, are subject to prior FDA review and approval. Certain modifications to the product, including changes in indications or manufacturing processes or facilities, may require the applicant to develop additional data or conduct additional preclinical studies and clinical trials to support the submission to FDA. There also are continuing, annual user fee requirements for any marketed products, 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. 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, FDA regulations require that products be manufactured in specific approved facilities and in accordance with cGMPs. The cGMP regulations include requirements relating to the organization of personnel, buildings and facilities, equipment, control of components and drug product containers and closures, production and process controls, packaging and labeling controls,

holding and distribution, laboratory controls, records and reports and returned or salvaged products. Drug manufacturers and other entities involved in the manufacture and distribution of approved drugs are required to register their establishments with the FDA and some state agencies and are subject to periodic unannounced inspections by the FDA for compliance with cGMP requirements and other laws. Changes to the manufacturing process are strictly regulated and, depending on the significance of the change, may require prior FDA approval before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP and impose reporting and documentation requirements upon the sponsor and any third-party manufacturers. Accordingly, manufacturers must continue to expend time, money, and effort in production and quality control to maintain compliance with cGMP and other aspects of quality control and quality assurance.

The FDA strictly regulates the marketing, labeling, advertising and promotion of drug products that are placed on the market. A product cannot be commercially promoted before it is approved, and approved drugs may generally be promoted only for their approved indications and for use in patient populations described in the product's approved labeling. Promotional claims must also be consistent with the product's FDA-approved label, including claims related to safety and effectiveness. The government also closely scrutinizes the promotion of prescription drugs in specific contexts such as direct-to-consumer advertising, industry-sponsored scientific and educational activities, and promotional activities involving the Internet and social media. Although physicians may prescribe legally available products for off-label uses, manufacturers may not market or promote such uses. After 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 result in mandatory 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 of regulatory non-compliance include, among other things:

- restrictions on, or suspensions of, the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- interruption of production processes, including the shutdown of manufacturing facilities or production lines or the imposition of new manufacturing requirements;
- fines, warning letters or other enforcement letters or clinical holds on post-approval clinical trials;
- mandated modification of promotional materials and labeling and the issuance of corrective information;
- refusal of the FDA to approve pending NDAs or supplements to approved NDAs, or suspension or revocation of product approvals;
- product seizure or detention, or refusal to permit the import or export of products;
- injunctions or the imposition of civil or criminal penalties; or
- consent decrees, corporate integrity agreements, debarment, or exclusion from federal health care programs.

In addition, the distribution of prescription 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 by the states. Both the PDMA and state laws limit the distribution of prescription pharmaceutical product samples and impose requirements to ensure accountability in distribution. More recently, the Drug Supply Chain Security Act (the "DSCSA"), was enacted with the aim of building an electronic system to identify and trace certain prescription drugs distributed in the United States. The DSCSA mandates phased-in and resource-intensive obligations for pharmaceutical manufacturers, wholesale distributors, and dispensers over a 10-year period that is expected to culminate in November 2023. From time to time, new legislation and regulations may be implemented that could significantly change the statutory provisions governing the approval, manufacturing and marketing of products regulated by the FDA. For example, FDA released proposed regulations in February 2022 to amend the national standards for licensing of wholesale drug distributors by the states; establish new minimum standards for state licensing third-party logistics providers; and create a federal system for licensure for use in the absence of a State program, each of which is mandated by the DSCSA. It is impossible to predict whether further legislative or regulatory changes will be enacted, or FDA regulations, guidance or interpretations changed or what the impact of such changes, if any, may be.

Regulatory Exclusivity and Approval of Follow-on Products

Hatch-Waxman Exclusivity

In 1984, with passage of the Hatch-Waxman Amendments to the FDCA, Congress enacted Section 505(b)(2) of the FDCA and also established an abbreviated regulatory scheme authorizing the FDA to approve generic drugs that are shown to contain the same active ingredients as, and to be bioequivalent to, drugs previously approved by the FDA pursuant to NDAs. To obtain approval of a generic drug, an applicant must submit an abbreviated new drug application ("ANDA") to the agency. An ANDA is a comprehensive submission that contains, among other things, data and information pertaining to the active pharmaceutical ingredient, bioequivalence, drug product formulation, specifications and stability of the generic drug, as well as analytical methods, manufacturing process validation data and quality control procedures. ANDAs are “abbreviated” because they cannot include preclinical and clinical data to demonstrate safety and effectiveness. Instead, in support of such applications, a generic manufacturer must rely on the preclinical and clinical testing previously conducted for a drug product previously approved under an NDA, known as the reference listed drug ("RLD").

Specifically, in order for an ANDA to be approved, the FDA must find that the generic version is identical to the RLD with respect to the active ingredients, the route of administration, the dosage form, the strength of the drug and the conditions of use of the drug. At the same time, the FDA must also determine that the generic drug is “bioequivalent” to the innovator drug. Under the statute, a generic drug is bioequivalent to an RLD if “the rate and extent of absorption of the drug do not show a significant difference from the rate and extent of absorption of the listed drug.”

Upon approval of an ANDA, the FDA indicates whether the generic product is “therapeutically equivalent” to the RLD in its publication “Approved Drug Products with Therapeutic Equivalence Evaluations,” also referred to as the “Orange Book.” Physicians and pharmacists consider a therapeutic equivalent generic drug to be fully substitutable for the RLD. In addition, by operation of certain state laws and numerous health insurance programs, the FDA’s designation of therapeutic equivalence often results in substitution of the generic drug without the knowledge or consent of either the prescribing physician or patient.

In contrast, Section 505(b)(2) permits the filing of an NDA where at least some of the information required for approval comes from studies not conducted by or for the applicant and for which the applicant has not obtained a right of reference. A Section 505(b)(2) applicant may eliminate the need to conduct certain preclinical or clinical studies if it can establish that reliance on studies conducted for a previously-approved product is scientifically appropriate. Unlike the ANDA pathway used by developers of bioequivalent versions of innovator drugs, which does not allow applicants to submit new clinical data other than bioavailability or bioequivalence data, the 505(b)(2) regulatory pathway does not preclude the possibility that a follow-on applicant would need to conduct additional clinical trials or nonclinical studies; for example, it may be seeking approval to market a previously approved drug for new indications or for a new patient population that would require new clinical data to demonstrate safety or effectiveness.

As part of the NDA review and approval process, applicants are required to list with the FDA each patent that has claims that cover the applicant’s product or method of therapeutic use. Upon approval of a new drug, each of the patents listed in the application for the drug is then published in the Orange Book. Drugs listed in the Orange Book can, in turn, be cited by potential follow-on competitors in support of approval of an ANDA or 505(b)(2) NDA.

When an ANDA applicant submits its application to the FDA, it is required to certify to the FDA concerning any patents listed for the reference product in the FDA’s Orange Book. Specifically, the applicant must certify that: (i) the required patent information has not been filed; (ii) the listed patent has expired; (iii) the listed patent has not expired but will expire on a particular date and approval is sought after patent expiration; or (iv) the listed patent is invalid or will not be infringed by the new product. Moreover, to the extent that the Section 505(b)(2) NDA applicant is relying on studies conducted for an already approved product, the applicant also is required to certify to the FDA concerning any patents listed for the NDA-approved product in the Orange Book to the same extent that an ANDA applicant would.

If the follow-on applicant does not challenge the innovator’s listed patents, the FDA will not approve the ANDA or 505(b)(2) application until all the listed patents claiming the referenced product have expired. A certification that the new product will not infringe the already approved product’s listed patents, or that such patents are invalid, is called a Paragraph IV certification. If the follow-on applicant has provided a Paragraph IV certification to the FDA, the applicant must also send notice of the Paragraph IV certification to the NDA and patent holders once the ANDA has been accepted for filing by the FDA. The NDA and patent holders may then initiate a patent infringement lawsuit in response to the notice of the Paragraph IV certification. The filing of a patent infringement lawsuit within 45 days of the receipt of a Paragraph IV certification automatically prevents the FDA from approving the ANDA or 505(b)(2) NDA until the earlier of 30 months, expiration of the patent, settlement of the lawsuit, or a decision in the infringement case that is favorable to the ANDA/505(b)(2) applicant.

An ANDA or 505(b)(2) application also will not be approved until any applicable non-patent exclusivities listed in the Orange Book for the referenced product have expired. The Hatch-Waxman Amendments to the FDCA provided a five-year period of non-patent data exclusivity within the United States to the first applicant to gain approval of an NDA for a new chemical entity ("NCE"). For the purposes of this provision, an NCE is a drug that contains no active moiety that has previously been approved by the FDA in any other NDA. An active moiety is the molecule or ion responsible for the physiological or pharmacological action of the drug substance. In cases where such NCE exclusivity has been granted, an ANDA or 505(b)(2) NDA may not be filed with the FDA until the expiration of five years unless the submission is accompanied by a Paragraph IV certification, in which case the applicant may submit its application four years following the original product approval.

The FDCA also provides for a period of three years of data exclusivity if an NDA or NDA supplement includes reports of one or more new clinical investigations, other than bioavailability or bioequivalence studies, that were conducted or sponsored by the applicant are deemed by the FDA to be essential to the approval of the application. This three-year exclusivity period often protects changes to a previously approved drug product, such as new indications, dosage forms, route of administration or combination of ingredients. Three-year exclusivity would be available for a drug product that contains a previously approved active moiety, provided the statutory requirement for a new clinical investigation is satisfied. Unlike five-year NCE exclusivity, an award of three-year exclusivity does not block the FDA from accepting ANDAs or 505(b)(2) NDAs seeking approval for generic versions of the drug as of the date of approval of the original drug product; rather, this three-year exclusivity covers only the conditions of use associated with the new clinical investigations and, as a general matter, does not prohibit the FDA from approving follow-on applications for drugs containing the original active ingredient.

Five-year and three-year exclusivity also will not delay the submission or approval of a traditional NDA filed under Section 505(b)(1) of the FDCA; however, an applicant submitting a traditional NDA would be required to conduct or obtain a right of reference to all of the preclinical studies and adequate and well-controlled clinical trials necessary to demonstrate safety and effectiveness. For drug products that contain an “antibiotic” ingredient approved prior to 1997, the statute imposes certain limitations on the award of non-patent exclusivity. However, we do not believe these limitations would apply to tebipenem HBr or any of our other investigational antibiotics currently in preclinical and clinical development.

Qualified Infectious Disease Product Exclusivity

Under the GAIN Act, the FDA may designate a product as a QIDP. In order to qualify for designation as a QIDP, the drug product candidate must be an antibiotic or antifungal drug for human use intended to treat serious or life-threatening infections, including those caused by either (i) an antibiotic or antifungal resistant pathogen, including novel or emerging infectious pathogens, or (ii) a so-called “qualifying pathogen” found on a list of potentially dangerous, drug-resistant organisms to be established and maintained by the FDA. We obtained a QIDP designation for the oral formulation of tebipenem HBr for cUTI in November 2016 and CABP and DFI in April 2017. We were granted QIDP designation by the FDA for SPR206 in October 2018 for the treatment of cUTI and hospital-acquired bacterial pneumonia and ventilator-associated bacterial pneumonia (HABP/VABP). In February 2019, we were granted QIDP designation for SPR720 capsule for oral use for the treatment of lung infections caused by nontuberculous mycobacteria and for the treatment of lung infections caused by *Mycobacterium tuberculosis*.

In addition to the expedited review benefits for which a QIDP-designated drug candidate may be eligible, such a drug that is approved for the use for which the QIDP designation was granted will receive a five-year extension to any non-patent marketing exclusivity period for which the drug qualified upon approval, such as five-year NCE exclusivity, three-year new clinical data exclusivity, seven-year orphan exclusivity, or six-month pediatric exclusivity. This so-called GAIN exclusivity extension is not available to a QIDP-designated drug that has previously received the five-year extension period, such as when an applicant is seeking approval for a new indication or new strength.

Orphan Drug Designation and Exclusivity

In March 2020, the FDA granted orphan drug designation for SPR720 for the treatment of NTM infection. Under the Orphan Drug Act, the FDA may grant orphan drug designation to a drug intended to treat a rare disease or condition, which is generally a disease or condition that affects either (i) fewer than 200,000 individuals in the United States, or (ii) more than 200,000 individuals in the United States and for which there is no reasonable expectation that the cost of developing and making available in the United States a drug for this type of disease or condition will be recovered from sales in the United States for that drug. Legislative proposals are currently being considered that would revise or revoke the second option available for a drug candidate to receive an orphan designation, the so-called “cost recovery” pathway. Orphan drug designation must be requested before submitting an NDA. After the FDA grants orphan drug designation, the identity of the therapeutic agent and its potential orphan use will be disclosed publicly by the FDA; the posting will also indicate whether a drug is no longer designated as an orphan drug.

More than one product candidate may receive an orphan drug designation for the same indication, and the same product candidate can be designated for more than one qualified orphan indication. The benefits of orphan drug designation include research

and development tax credits and exemption from FDA prescription drug user fees. Orphan drug designation does not convey any advantage in or shorten the duration of the regulatory review and approval process if or when an NDA for the drug candidate is filed.

If a product that has orphan drug designation subsequently receives the first FDA approval for the indication for which it has such designation, the product is entitled to orphan product exclusivity, which means that for seven years, the FDA may not approve any other marketing applications for the same drug for the same indication, except under limited circumstances described further below. Orphan exclusivity does not block the approval of a different drug for the same rare disease or condition, nor does it block the approval of the same drug for different conditions. As a result, even if one of our product candidates receives orphan drug exclusivity, the FDA can still approve different drugs for use in treating the same indication or disease, which could create a more competitive market for our drug products, if approved for marketing in the future. Additionally, if a drug designated as an orphan product receives marketing approval for an indication broader than what was designated, it may not be entitled to orphan drug exclusivity. Recent court cases have challenged FDA's approach to determining the scope of orphan drug exclusivity; however, at this time the agency continues to apply its long-standing interpretation of the governing regulations and has stated that it does not plan to change any orphan drug implementing regulations.

Orphan exclusivity will not bar approval of another product with the same drug for the same condition under certain circumstances, including if a subsequent product with the same drug for the same condition is shown to be clinically superior to the approved product on the basis of greater efficacy or safety or a major contribution to patient care, or if the company with orphan drug exclusivity cannot assure the availability of sufficient quantities of the drug to meet the needs of persons with the disease or condition for which the drug was designated. Following amendments made to the statute as part the FDA Reauthorization Act of 2017, the FDA is required to publish a summary of the clinical superiority findings when a drug is eligible for orphan product exclusivity on the basis of a demonstration of clinical superiority.

In addition, the FDA has finalized guidance indicating that it does not expect to grant any additional orphan drug designation to products for pediatric subpopulations of common diseases. Nevertheless, FDA intends to still grant orphan drug designation to a drug that otherwise meets all other criteria for designation when it prevents, diagnoses or treats either (i) a rare disease that includes a rare pediatric subpopulation, (ii) a pediatric subpopulation that constitutes a valid orphan subset, or (iii) a rare disease that is, in fact, a different disease in the pediatric population as compared to the adult population.

Pediatric Exclusivity

Pediatric exclusivity is another type of non-patent marketing exclusivity available in the United States and, if granted, it provides for the attachment of an additional six months of marketing protection to the term of any existing regulatory exclusivity or listed patents. Under the Best Pharmaceuticals for Children Act ("BPCA"), certain therapeutic candidates may obtain an additional six months of exclusivity if the sponsor submits information requested in writing by the FDA, referred to as a Written Request, relating to the use of the active moiety of the product candidate in children. The data do not need to show the product to be effective in the pediatric population studied; rather, the additional protection is granted if the pediatric clinical trial is deemed to have fairly responded to the FDA's Written Request. Although the FDA may issue a Written Request for studies on either approved or unapproved indications, it may only do so where it determines that information relating to that use of a product candidate in a pediatric population, or part of the pediatric population, may produce health benefits in that population. The issuance of a Written Request does not require the sponsor to undertake the described trials. This is not a patent term extension, but it effectively extends the regulatory period during which the FDA cannot approve another application.

Foreign Regulation

In addition to regulations in the United States, we will be subject to a variety of foreign regulations governing clinical trials and commercial sales and distribution of our products. Whether or not we obtain FDA approval for a product, we must obtain approval by the comparable regulatory authorities of foreign countries or economic areas, such as the European Union ("EU") and Australia, before we may commence clinical trials or market products in those countries or areas. The approval process and requirements governing the conduct of clinical trials, product authorization, pricing and reimbursement vary greatly from place to place, and the time may be longer or shorter than that required for FDA approval.

Before clinical trials may be conducted in any EU Member State, a sponsor must submit a clinical trial authorization application ("CTA"), which must be approved in each country in which the sponsor intends to perform a clinical trial. The procedure for submitting a CTA was set forth in an existing EU Clinical Trial Directive. However, the way clinical trials are conducted in the EU underwent a major change when the Clinical Trial Regulation became effective, which occurred on January 31, 2022. The Regulation harmonizes the assessment and supervision processes for clinical trials throughout the EU, via an EU portal and database. Under the EU Clinical Trials Regulation, a harmonized assessment and supervision processes was implemented as of January 31, 2022 for clinical trials throughout the EU, via a Clinical Trials Information System ("CTIS"). The CTIS contains the centralized EU portal and database for clinical trials conducted in the EU and will allow for a centralized review process. This harmonized submission process is

mandatory for new CTA submissions as of February 1, 2023. For ongoing clinical trials, if a clinical trial continues for more than three years from the day on which the Clinical Trials Regulation became applicable, the Clinical Trials Regulation will at that time begin to apply to the clinical trial.

The goal of Clinical Trial Regulation is to create an environment that is favorable to conducting clinical trials in the EU, with the highest standards of safety for participants and increased transparency of trial information. The Regulation will require consistent rules for conducting clinical trials throughout the EU and information on the authorization, conduct and results of each clinical trial carried out in the EU to be publicly available.

The United Kingdom left the European Union on January 31, 2020 (commonly referred to as "Brexit"), with a transitional period that expired on December 31, 2020. The United Kingdom and the European Union entered into a trade agreement known as the Trade and Cooperation Agreement, which went into effect on January 1, 2021. We are currently evaluating the potential impacts on our business of the Trade and Cooperation Agreement and guidance issued to date by the United Kingdom's Medicines and Healthcare products Regulatory Agency ("MHRA") regarding the requirements for licensing and marketing medicinal products and drugs in the United Kingdom. Since the regulatory framework in the United Kingdom covering the quality, safety and efficacy of pharmaceutical products, clinical trials, marketing authorization, commercial sales and distribution of medicinal products is derived from EU Directives and Regulations, Brexit could materially impact the future regulatory regime which applies to products and the approval of product candidates in the United Kingdom.

Under EU regulatory systems, a company may submit marketing authorization applications either under a centralized or decentralized procedure. The centralized procedure is compulsory for medicinal products produced by biotechnology or those medicinal products containing new active substances for specific indications such as the treatment of AIDS, cancer, neurodegenerative disorders, diabetes, viral diseases and designated orphan medicines, and optional for other medicines which are highly innovative. Under the centralized procedure, a marketing application is submitted to the EMA where it will be evaluated by the Committee for Medicinal Products for Human Use and a favorable opinion typically results in the grant by the European Commission of a single marketing authorization that is valid for all EU Member States within 67 days of receipt of the opinion. The initial marketing authorization is valid for five years, but once renewed is usually valid for an unlimited period. The decentralized procedure provides for approval by one or more "concerned" member states based on an assessment of an application performed by one member state, known as the "reference" member state. Under the decentralized approval procedure, an applicant submits an application, or dossier, and related materials to the reference member state and concerned member states. The reference member state prepares a draft assessment and drafts of the related materials within 120 days after receipt of a valid application. Within 90 days of receiving the reference member state's assessment report, each concerned member state must decide whether to approve the assessment report and related materials. If a member state does not recognize the marketing authorization, the disputed points are eventually referred to the European Commission, whose decision is binding on all member states.

Pharmaceutical Coverage, Pricing and Reimbursement

Sales of our products, if approved for marketing, will depend, in part, on the availability and extent of coverage and reimbursement by third-party payors, such as government health programs, including Medicare and Medicaid, commercial insurance and managed healthcare organizations. These third-party payors are increasingly challenging the price and limiting the coverage and reimbursement amounts for medical products and services. There may be significant delays in obtaining coverage and reimbursement for approved products, and coverage may be more limited than the purposes for which the product is approved by the FDA or regulatory authorities in other countries. It is time-consuming and expensive to seek reimbursement from third-party payors. Moreover, eligibility for reimbursement does not imply that any product will be paid for in all cases or at a rate that covers our costs, including research, development, manufacture, sale and distribution. Interim payments for new products, if applicable, may also not be sufficient to cover our costs and may not be made permanent. Payment rates may vary according to the use of the product and the clinical setting in which it is used, may be based on payments allowed for lower-cost products that are already reimbursed and may be incorporated into existing payments for other services. Net prices for products may be reduced by mandatory discounts or rebates required by third-party payors and by any future relaxation of laws that presently restrict imports of products from countries where they may be sold at lower prices than in the United States. In the United States, third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own reimbursement policies, but they also have their own methods and approval process apart from Medicare coverage and reimbursement determinations. Accordingly, one third-party payor's determination to provide coverage for a product does not assure that other payors will also provide coverage for the product.

In addition, the containment of healthcare costs has become a priority for federal and state governments, and the prices of drugs have been a focus in this effort. The United States government, state legislatures and foreign governments have shown significant interest in implementing cost-containment programs, including price controls, restrictions on coverage and reimbursement, and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit our net revenue and results. Decreases in third-party reimbursement for our product candidates or a decision by a third-party payor to not cover our product candidates could reduce physician usage of the product candidate and have a material adverse effect on our sales, results of operations and financial condition. Moreover, there has been heightened governmental scrutiny over the manner in which manufacturers set prices for their

marketed products, which has resulted in several Congressional inquiries and proposed and enacted federal and state legislation designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drug products. Individual states in the United States have also increasingly passed legislation and implemented regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. In December 2020, the U.S. Supreme Court held unanimously that federal law does not preempt the states' ability to regulate pharmaceutical benefit managers ("PBMs") and other members of the health care and pharmaceutical supply chain, an important decision that may lead to further and more aggressive efforts by states in this area.

In the United States, the federal government provides health insurance for people who are 65 years or older, and certain people with disabilities or certain conditions irrespective of their age, through the Medicare program, which is administered by the Centers for Medicare & Medicaid Services ("CMS"). Coverage and reimbursement for products and services under Medicare are determined in accordance with the Social Security Act and pursuant to regulations promulgated by CMS, as well as the agency's coverage and reimbursement guidance and determinations. Drugs and other products that are utilized within the hospital in-patient setting are typically reimbursed under a prospective payment system, or a predetermined payment amount that is based on diagnosis-related groups ("DRGs") for Medicare patients and under a bundled payment for commercially insured patients. These payment amounts differ by type of diagnoses, procedures performed and the severity of the patient's condition, among other things. A drug that is used in a treatment or procedure under a specific DRG or bundled payment is generally not eligible for any separate payment. For catastrophic cases where costs greatly exceed the bundled payment amount, the hospital may be eligible for an outlier payment that is intended to cover part of the expense above the standard payment.

Medicaid is a health insurance program for low-income children, families, pregnant women, and people with disabilities that is jointly funded by the federal and state governments but administered by the states. In general, state Medicaid programs are required to cover drugs and biologicals of manufacturers that have entered into a Medicaid Drug Rebate Agreement, although such drugs and biologicals may be subject to prior authorization or other utilization controls.

The United States Congress and state legislatures from time to time propose and adopt initiatives aimed at cost containment, which could impact our ability to sell our products profitably. For example, the federal Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, known collectively as the ACA, among other things, contains provisions that may reduce the profitability of drug products through increased rebates for drugs reimbursed by Medicaid programs, an extension of Medicaid rebates to Medicaid managed care plans, mandatory discounts for certain Medicare Part D beneficiaries and annual fees based on pharmaceutical companies' share of sales to federal health care programs. Adoption of general controls and measures, coupled with the tightening of restrictive policies in jurisdictions with existing controls and measures, could limit payments for pharmaceutical drugs. The Medicaid Drug Rebate Program requires pharmaceutical manufacturers to enter into and have in effect a national rebate agreement with the Secretary of the Department of Health and Human Services ("DHHS") as a condition for states to receive federal matching funds for manufacturers' outpatient drugs furnished to Medicaid patients. The ACA also expanded the universe of Medicaid utilization subject to drug rebates by requiring pharmaceutical manufacturers to pay rebates on Medicaid managed care utilization and by enlarging the population potentially eligible for Medicaid drug benefits. As another example, the 2021 Consolidated Appropriations Act signed into law on December 27, 2020, incorporated extensive healthcare provisions and amendments to existing laws, including a requirement that all manufacturers of drug products covered under Medicare Part B report the product's average sales price ("ASP") to DHHS beginning on January 1, 2022, subject to enforcement via civil money penalties.

Since its enactment, there have been judicial and Congressional challenges to certain aspects of the ACA and as a result certain sections of the ACA have not been fully implemented or effectively repealed. However, following several years of litigation in the federal courts, in June 2021, the U.S. Supreme Court upheld the ACA when it dismissed a legal challenge to the ACA's constitutionality. Further legislative and regulatory changes under the ACA remain possible, although it is unknown what form any such changes or any law would take, and how or whether it may affect the biopharmaceutical industry as a whole or our business in the future. We expect that changes or additions to the ACA, the Medicare and Medicaid programs, and changes stemming from other healthcare reform measures, especially with regard to healthcare access, financing or other legislation in individual states, could have a material adverse effect on the health care industry in the United States. In addition to the Inflation Reduction Act of 2022 (the "IRA") drug price negotiation provisions summarized above, President Biden's Executive Order 14087, issued in October 2022, called for the CMS innovation center to prepare and submit a report to the White House on potential payment and delivery modes that would complement to IRA, lower drug costs, and promote access to innovative drugs. As of February 1, 2023 the report had not been released but it is expected to further inform the current Administration's priorities and activities in this area.

In August 2022, President Biden signed into the law the IRA. Among other things, the IRA has multiple provisions that may impact the prices of drug products that are both sold into the Medicare program and throughout the United States. Starting in 2023, a manufacturer of drugs or biological products covered by Medicare Parts B or D must pay a rebate to the federal government if their drug product's price increases faster than the rate of inflation. This calculation is made on a drug product by drug product basis and the amount of the rebate owed to the federal government is directly dependent on the volume of a drug product that is paid for by Medicare Parts B or D. Additionally, starting for payment year 2026, CMS will negotiate drug prices annually for a select number of single source Part D drugs without generic or biosimilar competition. CMS will also negotiate drug prices for a select number of Part B drugs starting for payment year 2028. If a drug product is selected by CMS for negotiation, it is expected that the revenue generated from such drug will decrease. CMS has begun to implement these new authorities but their impact on the biopharmaceutical industry in the United States remains highly uncertain.

In addition, in some foreign countries, 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, in the EU, the sole legal instrument at the EU level governing the pricing and reimbursement of medicinal products is Council Directive 89/105/EEC (the "Price Transparency Directive"). The aim of this Directive is to ensure that pricing and reimbursement mechanisms established in the EU Member States are transparent and objective, do not hinder the free movement of and trade in medicinal products in the EU, and do not hinder, prevent or distort competition on the market. The Price Transparency Directive does not provide any guidance concerning the specific criteria on the basis of which pricing and reimbursement decisions are to be made in the individual EU Member States, nor does it have any direct consequence for pricing or reimbursement levels in the individual EU Member States. The EU Member States are free to restrict the range of medicinal products for which their national health insurance systems provide reimbursement, and to control the prices and/or reimbursement levels of medicinal products for human use. An EU Member State may approve a specific price or level of reimbursement for the medicinal product, or alternatively adopt a system of direct or indirect controls on the profitability of the company responsible for placing the medicinal product on the market, including volume-based arrangements, caps and reference pricing mechanisms.

Health Technology Assessment ("HTA") of medicinal products is becoming an increasingly common part of the pricing and reimbursement procedures in some EU Member States, including France, Germany, Ireland, Italy and Sweden. The HTA process in the EU Member States is governed by the national laws of these countries. HTA is the procedure according to which the assessment of the public health impact, therapeutic impact, and the economic and societal impact of the use of a given medicinal product in the national healthcare systems of the individual country is conducted. HTA generally focuses on the clinical efficacy and effectiveness, safety, cost, and cost-effectiveness of individual medicinal products as well as their potential implications for the healthcare system. Those elements of medicinal products are compared with other treatment options available on the market. The outcome of HTA regarding specific medicinal products will often influence the pricing and reimbursement status granted to these medicinal products by the competent authorities of individual EU Member States. The extent to which pricing and reimbursement decisions are influenced by the HTA of the specific medicinal product vary between the EU Member States. A negative HTA of one of our products by a leading and recognized HTA body could not only undermine our ability to obtain reimbursement for such product in the EU Member State in which such negative assessment was issued, but also in the other EU Member States. For example, EU Member States that have not yet developed HTA mechanisms could rely to some extent on the HTA performed in countries with a developed HTA framework when adopting decisions concerning the pricing and reimbursement of a specific medicinal product.

Other Healthcare Laws

Our current and future business operations are subject to healthcare regulation and enforcement by the federal government and the state and foreign governments where we research, and, if approved, market, sell and distribute our therapeutic candidates. These laws include, without limitation, state and federal anti-kickback, fraud and abuse, false claims, privacy and security, physician sunshine and drug pricing transparency laws and regulations such as:

- The federal Anti-Kickback Statute prohibits, among other things, any person from knowingly and willfully offering, soliciting, receiving or providing remuneration, directly or indirectly, to induce either the referral of an individual, for an item or service or the purchasing or ordering of a good or service, for which payment may be made under federal healthcare programs such as the Medicare and Medicaid programs. The federal Anti-Kickback Statute is subject to evolving interpretations. In the past, the government has enforced the federal Anti-Kickback Statute to reach large settlements with healthcare companies based on sham consulting and other financial arrangements with physicians. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation. In addition, the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the civil False Claims Act;
- The federal civil and criminal false claims laws, including the civil False Claims Act, and civil monetary penalty laws, prohibit, among other things, knowingly presenting or causing the presentation of a false, fictitious or fraudulent claim for payment to the U.S. government, knowingly making, using, or causing to be made or used a false record or statement material to a false or fraudulent claim to the U.S. government, or from knowingly making a false statement to avoid, decrease or conceal an obligation to pay money to the U.S. government. Actions under these laws may be brought by the Attorney General or as a qui tam action by a private individual in the name of the government. The federal government uses these laws, and the accompanying threat of significant liability, in its investigation and prosecution of pharmaceutical and biotechnology companies throughout the U.S., for example, in connection with the promotion of products for unapproved uses and other allegedly unlawful sales and marketing practices;
- The U.S. federal Health Insurance Portability and Accountability Act of 1996 ("HIPAA") created new federal, civil and criminal statutes that prohibit among other actions, knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program, including private third-party payors, knowingly and willfully embezzling or stealing from a healthcare benefit program, willfully obstructing a criminal investigation of a healthcare offense, 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. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;

- The Physician Payments Sunshine Act, enacted as part of the ACA, among other things, imposes reporting requirements on manufacturers of FDA-approved drugs, devices, biologics and medical supplies covered by Medicare or Medicaid to report, on an annual basis, to DHHS information related to payments and other transfers of value to physicians (defined to include doctors, dentists, optometrists, podiatrists, chiropractors and certain advanced non-physician health care practitioners), teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act ("HITECH") and their respective implementing regulations impose specified requirements relating to the privacy and security of individually identifiable health information that is protected under HIPAA, called "protected health information" or "PHI". HIPAA, as amended by HITECH, also requires notification to affected individuals and to federal regulators in the event of a breach of unsecured protected health information. HIPAA applies to "covered entities" or health care providers engaging in certain electronic standard transactions, such as electronic billing; health plans and healthcare clearinghouses. Among other things, HITECH makes HIPAA's privacy and security standards directly applicable to "business associates," defined as independent contractors or agents of covered entities that create, receive, maintain or transmit protected health information in connection with providing a service for or on behalf of a covered entity. HITECH also increased the civil and criminal penalties that may be imposed against covered entities, business associates and third parties who acquire PHI unlawfully, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce HIPAA and seek attorney's fees and costs associated with pursuing federal civil actions; and
- Analogous state laws and regulations, such as state anti-kickback and false claims laws which may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers; state laws which require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government in addition to requiring drug and therapeutic biologics manufacturers to report information related to payments to physicians and other healthcare providers or marketing expenditures and pricing information; state and local laws which require the registration of pharmaceutical sales representatives; and state laws and non-United States laws and regulations that govern the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways, thus complicating compliance efforts.

Healthcare Reform

Healthcare Trends Affecting Pharmaceutical Pricing, Reimbursement and Access

In the United States and some foreign jurisdictions, there have been, and continue to be, legislative and regulatory policy proposals focused on controlling pharmaceutical pricing. Key issues include:

- Proposals to alter to how Medicare Part B and Part D drugs are priced and roles of the Centers for Medicare and Medicaid services in controlling growth rates, coverage, and access;
- Proposals related to the Medicare drug benefit and the role and application of manufacturer and pharmacy rebates;
- Proposals to disclosure proprietary information related to price setting, price increases and associated manufacturing and marketing expenses;
- Proposals to reduce patent and non-patent exclusivity periods;
- State-level policy regarding pricing, access and rebates; and
- Coronavirus response policy that affects distribution, pricing and access of related therapeutics and vaccines as well as infrastructure build out

In the United States and some foreign jurisdictions, there have been, and continue to be, several legislative and regulatory changes and proposed changes regarding the healthcare system that could prevent or delay marketing approval of product candidates, restrict or regulate post-approval activities, and affect the ability to profitably sell product candidates that obtain marketing approval. The FDA's and other regulatory authorities' policies may change, and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our current or future product candidates.

Antimicrobial Policy

Efforts to respond to the growth of antimicrobial resistance ("AMR") have taken various forms, from non-dilutive financing of discovery, research, and development to proposals to reward innovation and enhance reimbursement. Several pending efforts in the U.S. Congress include the: Pioneering Antimicrobial Subscriptions to End Upsurging Resistance ("PASTEUR") Act that would direct large federal payments for critical need antimicrobials and the Developing an Innovative Strategy for Antimicrobial Resistant Microorganisms (DISARM) Act that would provide for separate market-rate payments for antimicrobials used in hospital settings; as well as additional funding streams provided in pandemic response efforts linked to the coronavirus. AMR remains a focus of the many policymakers internationally as well, including efforts in the United Kingdom to discover new antibacterial and a recent G7 Finance Ministers statement supporting new product development.

Manufacturing

We do not own or operate manufacturing facilities for the production of any of our product candidates, nor do we have plans to develop our own manufacturing operations in the foreseeable future. We currently rely on a limited number of third-party contract manufacturers for all of our required raw materials, drug substance, and finished drug product for our preclinical research and clinical trials. We currently employ internal resources to manage our manufacturing. We currently have two suppliers for tebipenem HBr's active pharmaceutical ingredient. Each supplier would be capable of producing kilogram quantities for commercial scale and would be able to produce over 10kg of an active pharmaceutical ingredient under cGMP conditions.

Human Capital

As of December 31, 2022, we had 35 employees, including a total of 10 employees with M.D. or Ph.D. degrees. Of these employees, 18 employees were primarily engaged in research and development activities, and 17 provide administrative, business and operations support. All of these employees were based in the United States. None of our employees are represented by labor unions or covered by collective bargaining agreements. We consider our employee relations to be good.

We hire and maintain an experienced, committed, diverse, inclusive and highly motivated workforce. Effective attraction, development, and retention of human resource talent, or human capital, is vital to the success of our mission-driven growth strategy. We face intense competition for qualified individuals from numerous pharmaceutical and biotechnology companies, universities, governmental entities and other research institutions, and we believe that our future success will depend in large part on our continued ability to attract and retain highly skilled employees. To attract qualified applicants to our company and retain our employees, we offer a competitive rewards package consisting of base salary and cash target bonus, a comprehensive benefits package and equity compensation.

We want our employees to learn, grow and look for ways to help develop skills through industry, company and functional training, as well as mentoring opportunities. We offer a robust set of career-enhancing learning experiences and initiatives to all employees, aligned with our mission, vision, and values.

Our Corporate Information

We were formed as Spero Therapeutics, LLC in December 2013 under the laws of the State of Delaware. On June 30, 2017, through a series of transactions, Spero Therapeutics, LLC merged with and into Spero Therapeutics, Inc. (formerly known as Spero OpCo, Inc.), a Delaware corporation. Our principal executive offices are located at 675 Massachusetts Avenue, Cambridge, Massachusetts 02139, and our telephone number is (857) 242-1600. Our website address is www.sperotherapeutics.com.

Available Information

Financial and other information about us is available on our website. We make available on our website, free of charge, copies of our Annual Report 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 Exchange Act as soon as reasonably practicable after we electronically file such material with, or furnish it to, the United States Securities and Exchange Commission (the "SEC"). The information contained in our website is not intended to be a part of this filing.

Item 1A. Risk Factors.

Careful consideration should be given to the following risk factors, in addition to the other information set forth in this Annual Report on Form 10-K, including the section of this Annual Report on Form 10-K titled "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our consolidated financial statements and related notes, and in other documents that we file with the SEC, in evaluating our company and our business. Investing in our securities involves a high degree of risk. If any of the events described in the following risk factors and the risks described elsewhere in this Annual Report on Form 10-K actually occurs, our business, financial condition, results of operations and future growth prospects could be materially and adversely affected, and the trading price of our securities could decline. Our actual results could differ materially from those anticipated in the forward-looking statements as a result of factors that are described below and elsewhere in this Annual Report on Form 10-K.

Risks Related to Product Development and Commercialization

Our ability to realize the value of tebipenem HBr depends on us obtaining FDA approval. Even if such approval is obtained, the timeline of, and any requirements imposed as of part of, such approval may impact the attractiveness of eventual commercialization of tebipenem HBr through our partnership with GSK.

We currently have no products approved for sale and have invested a significant portion of our efforts and financial resources in the development of tebipenem HBr as a product candidate for the treatment of bacterial infections causing cUTI. Our ability to realize the value of tebipenem HBr depends on the potential FDA approval, and the expected timeline and other requirements that would affect the attractiveness of eventual commercialization of tebipenem HBr through our partnership with GSK. Further, as part of any approval, the FDA could impose labeling requirements restricting the use of tebipenem HBr, which could reduce its commercial prospects, unless such requirements are subsequently modified to reduce such restrictions. If any of these outcomes occur, our business could be materially harmed.

If our clinical trials fail to produce favorable results, we may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of such product candidates.

We may not commercialize, market, promote or sell any product candidate in the United States without obtaining marketing approval from the FDA or in other countries without obtaining approvals from comparable foreign regulatory authorities, such as the EMA, and we may never receive such approvals. We must complete extensive preclinical development and clinical trials to demonstrate the safety and efficacy of our product candidates in humans before we will be able to obtain these approvals. Clinical testing is expensive, difficult to design and implement, can take many years to complete and is inherently uncertain as to outcome.

The clinical development of any of our product candidates is susceptible to the risk of failure inherent at any stage of drug development, including failure to demonstrate efficacy in a trial or across a broad population of patients, the occurrence of severe adverse events, failure to comply with protocols or applicable regulatory requirements, and determination by the FDA or any comparable foreign regulatory authority that a drug product is not approvable. A number of companies in the pharmaceutical industry, including biotechnology companies, have suffered significant setbacks in clinical trials, even after promising results in earlier nonclinical studies or clinical trials. The results of preclinical and other nonclinical studies and/or early clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials. Notwithstanding any promising results in early nonclinical studies or clinical trials, we cannot be certain that we will not face similar setbacks.

In addition, preclinical and clinical data are often susceptible to varying interpretations and analyses. Many companies that believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval for the product candidates. Even if we believe that the results of our clinical trials warrant marketing approval, the FDA or comparable foreign regulatory authorities may disagree and may not grant marketing approval of our product candidates.

In some instances, there can be significant variability in safety and/or efficacy results between different trials of the same product candidate due to numerous factors, including changes in trial procedures set forth in protocols, differences in the size and type of the patient populations, adherence to the dosing regimen and other trial protocols and the rate of dropout among clinical trial participants, among others. It is possible that even if one or more of our product candidates has a beneficial effect, that effect will not be detected during clinical evaluation as a result of one of the factors listed or otherwise. Conversely, as a result of the same factors, our clinical trials may indicate an apparent positive effect of a product candidate that is greater than the actual positive effect, if any. Similarly, in our clinical trials, we may fail to detect toxicity of or intolerability of our product candidates or may determine that our product candidates are toxic or not well tolerated when that is not in fact the case. In the case of our clinical trials, results may differ on the basis of the type of bacteria with which patients are infected. We cannot make assurances that any clinical trials that we may conduct will demonstrate consistent or adequate efficacy and safety to obtain regulatory approval to market our product candidates.

We may encounter unforeseen events prior to, during, or as a result of, clinical trials that could delay or prevent us from obtaining regulatory approval for any of our product candidates, including:

- the FDA or other comparable foreign regulatory authorities may disagree as to the design or implementation of our clinical trials;
- we may be delayed in or fail to reach agreement on acceptable terms with prospective CROs and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- clinical trials of our product candidates may produce unfavorable or inconclusive results;
- we may decide, or regulators may cause us, to conduct additional clinical trials or abandon product development programs;
- the number of patients required for clinical trials of our product candidates may be larger than we anticipate, enrollment in these clinical trials may be slower than we anticipate, participants may drop out of these clinical trials at a higher rate than we anticipate or we may fail to recruit suitable patients to participate in clinical trials;
- our third-party contractors, including those manufacturing our product candidates or conducting clinical trials on our behalf, may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;
- the FDA or institutional review boards may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;
- regulators or institutional review boards may require that we or our investigators suspend or terminate clinical trials of our product candidates for various reasons, including noncompliance with regulatory requirements or a finding that the participants are being exposed to unacceptable health risks, undesirable side effects or other unexpected characteristics of the product candidate;
- the FDA or comparable foreign regulatory authorities may fail to approve the manufacturing processes or facilities of third-party manufacturers with which we enter into agreements for clinical and commercial supplies;
- the supply or quality of our product candidates or other materials necessary to conduct clinical trials of our product candidates may be insufficient or inadequate; and
- the approval policies or regulations of the FDA or comparable foreign regulatory authorities may significantly change in a manner rendering our clinical data insufficient for approval.

We could also encounter delays if a clinical trial is suspended or terminated by us, by the institutional review boards ("IRBs") of the institutions in which such trials are being conducted, by the Data Safety Monitoring Board ("DSMB") if any, for such trial or by the FDA or other regulatory authorities. Such authorities may suspend or terminate a clinical trial due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a drug or changes in governmental regulations or administrative actions.

If we are required to conduct additional clinical trials or other testing of any of our product candidates beyond the trials and testing that we contemplate, if we are unable to successfully complete clinical trials or other testing of our product candidates, if the results of these trials or tests are unfavorable or are only modestly favorable or if there are safety concerns associated with any of our product candidates, we may:

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

Our failure to successfully initiate and complete clinical trials of our product candidates and to demonstrate the efficacy and safety necessary to obtain regulatory approval to market any of our product candidates would significantly harm our business. Our product candidate development costs will also increase if we experience delays in testing or marketing approvals and we may be required to obtain additional funds to complete clinical trials. We cannot make assurances that our clinical trials will begin as planned or be completed on schedule, if at all, or that we will not need to restructure our trials after they have begun. Significant clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize our product candidates or allow our competitors to bring products to market before we do and impair our ability to successfully commercialize our product candidates, which may harm our business and results of operations. In addition, many of the factors that cause, or lead to, delays of clinical trials may ultimately lead to the denial of regulatory approval of any of our product candidates.

If we experience delays or difficulties in the enrollment of patients in clinical trials, clinical development activities could be delayed or otherwise adversely affected.

The timely completion of clinical trials in accordance with their protocols depends, among other things, on our ability to enroll a sufficient number of patients who remain in the study until its conclusion. We may not be able to initiate, continue or complete clinical trials of our product candidates if we are unable to locate and enroll a sufficient number of eligible patients to participate in clinical trials as required by the FDA or comparable foreign regulatory authorities, such as the EMA. Patient enrollment is a significant factor in the timing of clinical trials, and is affected by many factors, including:

- the size and nature of the target patient population;
- the severity of the disease under investigation;
- the proximity of patients to clinical sites;
- the patient eligibility criteria for participation in the clinical trial;
- the design of the clinical trial;
- our ability to recruit clinical trial investigators with appropriate competencies and experience;
- competing clinical trials and clinicians' and patients' perceptions as to the potential advantages and risks of the product candidate being studied in relation to other available therapies, including any new drugs that may be approved for the indications that we are investigating;
- our ability to obtain and maintain patient consents; and
- the risk that participants enrolled in clinical trials will drop out of the trials before completion.

Our inability to enroll a sufficient number of patients for our clinical trials would result in significant delays or might require us to abandon one or more clinical trials altogether. Enrollment delays in our clinical trials may result in increased development costs for our product candidates, slow down or halt our product candidate development and approval process and jeopardize our ability to seek and obtain the marketing approval required to commence product sales and generate revenue, which would cause the value of our company to decline and limit our ability to obtain additional financing if needed.

Analyses of preliminary or interim data from our clinical studies that we announce or publish from time to time may change as more patient data become available and are subject to audit and verification procedures that could result in material changes in the final data.

We currently have no products approved for sale and we cannot guarantee that we will ever have marketable products. Clinical failure can occur at any stage of clinical development. Clinical trials may produce negative or inconclusive results, and we or any future collaborators may decide, or regulators may require us, to conduct additional clinical trials or preclinical studies. We will be required to demonstrate through well-controlled clinical trials that our product candidates are safe and effective for use in a diverse population before we can seek marketing approvals for their commercial sale. Success in preclinical studies and early-stage clinical trials does not mean that future larger registration clinical trials will be successful. This is because product candidates in later-stage clinical trials may fail to demonstrate sufficient safety and efficacy to the satisfaction of the FDA and comparable foreign regulatory authorities despite having progressed through preclinical studies and early-stage clinical trials.

Analyses of preliminary or interim data from our clinical studies are not necessarily predictive of analyses of final data. Analyses of preliminary and interim data are subject to the risk that one or more of the clinical outcomes may materially change, as more patient data become available and we issue our final clinical study report. Preliminary or interim data also remain subject to audit and verification procedures that may result in the final data being materially different from the preliminary data we previously published. As a result, analyses of interim and preliminary data should be viewed with caution until the analyses of final data are available. Adverse differences between preliminary or interim data and final data could affect our planned clinical path for any of our product candidates we advance into clinical trials, including potentially increasing cost and/or causing delay in such development.

In some instances, there can be significant variability in safety and efficacy results between different clinical trials of the same product candidate due to numerous factors, including changes in trial protocols, differences in size and type of the patient populations, differences in and adherence to the dosing regimen and other trial protocols and the rate of dropout among clinical trial participants. We therefore do not know whether any clinical trials we may conduct will demonstrate consistent or adequate efficacy and safety sufficient to obtain marketing approval to market our product candidates.

Serious adverse events or undesirable side effects or other unexpected properties of any of our product candidates may be identified during development or after approval that could delay, prevent or cause the withdrawal of regulatory approval, limit the commercial potential, or result in significant negative consequences following marketing approval.

Serious adverse events or undesirable side effects caused by, or other unexpected properties of, our product candidates could cause us, an IRB, or regulatory authorities to interrupt, delay or halt our clinical trials and could result in a more restrictive label, the imposition of distribution or use restrictions or the delay or denial of regulatory approval by the FDA or comparable foreign regulatory authorities. If any of our other product candidates are associated with serious or unexpected adverse events or undesirable side effects, the FDA, the IRBs at the institutions in which our studies are conducted, or a DSMB, could suspend or terminate our clinical trials or the FDA or comparable foreign regulatory authorities could order us to cease clinical trials or deny approval of our product candidates for any or all targeted indications. Treatment-related side effects could also affect patient recruitment or the ability of enrolled patients to complete the trial or result in potential product liability claims. Any of these occurrences may harm our business, financial condition and prospects significantly.

If unexpected adverse events occur in any of our ongoing or planned clinical trials, we may need to abandon development of our product candidates, or limit development to lower doses or to certain uses or subpopulations in which the undesirable side effects or other unfavorable characteristics are less prevalent, less severe or more acceptable from a risk-benefit perspective. Many compounds that initially showed promise in clinical or earlier stage testing are later found to cause undesirable or unexpected side effects that prevented further development of the compound.

Undesirable side effects or other unexpected adverse events or properties of any of our other product candidates could arise or become known either during clinical development or, if approved, after the approved product has been marketed. If such an event occurs during development, our trials could be suspended or terminated and the FDA or comparable foreign regulatory authorities could order us to cease further development of, or could deny approval of our product candidates. If such an event occurs after such product candidates are approved, a number of potentially significant negative consequences may result, including:

- regulatory authorities may withdraw or limit their approval of such product;
- we may decide to or be required to recall a product or change the way such product is administered to patients;
- regulatory authorities may require additional warnings on the label, such as a “black box” warning or a contraindication, or impose distribution or use restrictions;
- regulatory authorities may require one or more post-market studies to monitor the safety and efficacy of the product;
- we may be required to implement a REMS, including the creation of a medication guide outlining the risks of such side effects for distribution to patients;
- we could be sued and held liable for harm caused to patients exposed to or taking our product candidates;
- our product may become less competitive; and
- our reputation may suffer.

We believe that any of these events could prevent us from achieving or maintaining market acceptance of the affected product candidate, if approved, or could substantially increase commercialization costs and expenses, which could delay or prevent us from generating revenue from the sale of our products and harm our business and results of operations.

Even if a product candidate does obtain regulatory approval, it may never achieve the market acceptance by physicians, patients, hospitals, third-party payors and others in the medical community that is necessary for commercial success and the market opportunity may be smaller than we estimate.

Even if we obtain FDA or other regulatory approvals and are able to launch any of our product candidates commercially, the approved product candidate may nonetheless fail to gain sufficient market acceptance among physicians, patients, hospitals (including pharmacy directors) and third-party payors and, ultimately, may not be commercially successful. For example, physicians are often reluctant to switch their patients from existing therapies even when new and potentially more effective or convenient treatments enter the market. Further, patients often acclimate to the therapy that they are currently taking and do not want to switch unless their physicians recommend switching products or they are required to switch therapies due to lack of coverage and reimbursement for existing therapies. If an approved product candidate does not achieve an adequate level of acceptance, we may not generate significant product revenues or any profits from operations. The degree of market acceptance of any product candidate for which we receive approval depends on a number of factors, including:

- the efficacy and safety of the product candidate as demonstrated in clinical trials;
- relative convenience and ease of administration;
- the clinical indications for which the product candidate is approved;
- the potential and perceived advantages and disadvantages of the product candidates, including cost and clinical benefit relative to alternative treatments;
- the willingness of physicians to prescribe the product and of the target patient population to try new therapies;
- the willingness of hospital pharmacy directors to purchase the product for their formularies;
- acceptance by physicians, patients, operators of hospitals and treatment facilities and parties responsible for coverage and reimbursement of the product;
- the availability of coverage and adequate reimbursement by third-party payors and government authorities;
- the effectiveness of our sales and marketing efforts;
- the strength of marketing and distribution support;
- limitations or warnings, including distribution or use restrictions, contained in the product's approved labeling or an approved risk evaluation and mitigation strategy;
- whether the product is designated under physician treatment guidelines as a first-line therapy or as a second- or third-line therapy for particular infections;
- the approval of other new products for the same indications;
- the timing of market introduction of the approved product as well as competitive products;
- adverse publicity about the product or favorable publicity about competitive products;
- the emergence of bacterial resistance to the product; and
- the rate at which resistance to other drugs in the target infections grows.

Any failure of any of our product candidates that obtains regulatory approval to achieve market acceptance or commercial success would adversely affect our business prospects.

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

Because we have limited financial and managerial resources, we intend to focus on developing product candidates for specific indications that we identify as most likely to succeed, in terms of both their potential for marketing approval and commercialization. As a result, we may forego or delay pursuit of opportunities with other product candidates or for other indications that may prove to have greater commercial potential.

Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable product candidates. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to the product candidate.

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

To achieve commercial success for any approved product, we must either develop a sales and marketing organization or outsource those functions to third parties. The development of sales, marketing and distribution capabilities will require substantial resources, will be time-consuming and could delay any product launch. If the commercial launch of a product candidate for which we recruit a sales force and establish marketing and distribution capabilities is delayed or does not occur for any reason, we would have prematurely or unnecessarily incurred these commercialization costs. This may be costly, and our investment would be lost if we cannot retain or reposition our sales and marketing personnel. In addition, we may not be able to hire a sales force in the United States that is sufficient in size or has adequate expertise in the medical markets that we intend to target. If we are unable to establish a sales force and marketing and distribution capabilities, our operating results may be adversely affected.

Factors that may inhibit our efforts to commercialize our products on our own include:

- our inability to recruit and retain adequate numbers of effective sales and marketing personnel;
- the inability of sales personnel to obtain access to or persuade adequate numbers of physicians to prescribe any future products;
- 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.

We intend to use collaborators to assist with the commercialization of any of our product candidates, including the GSK License Agreement with GSK for the development and commercialization of tebipenem HBr. As a result of entering into arrangements with third parties to perform sales, marketing and distribution services, our product revenues or the profitability of these product revenues to us would likely be lower than if we were to directly market and sell products in those markets. Furthermore, we may be unsuccessful in entering into the necessary arrangements with third parties or may be unable to do so on terms that are favorable to us. In addition, we likely would have little control over such third parties, and any of them might fail to devote the necessary resources and attention to sell and market our products effectively.

If we do not establish sales and marketing capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our product candidates.

We face substantial competition from other pharmaceutical and biotechnology companies and our operating results may suffer if we fail to compete effectively.

The development and commercialization of new drug products is highly competitive. We face competition from major pharmaceutical companies, specialty pharmaceutical companies and biotechnology companies worldwide with respect to our product candidates that we may seek to develop and commercialize in the future. There are a number of large pharmaceutical and biotechnology companies that currently market and sell products or are pursuing the development of product candidates for the treatment of resistant infections. Potential competitors also include academic institutions, government agencies and other public and private research organizations. Our competitors may succeed in developing, acquiring or licensing technologies and drug products that are more effective or less costly than the product candidates that we are currently developing or that we may develop, which could render our product candidates obsolete and noncompetitive.

There are a variety of available oral therapies marketed for the treatment of cUTIs that we would expect would compete with tebipenem HBr, if approved, such as Levaquin, Cipro and Bactrim. Many of the available therapies are well established and widely accepted by physicians, patients and third-party payors. Insurers and other third-party payors may also encourage the use of generic products, for example in the fluoroquinolone class. However, the susceptibility of urinary tract pathogens to the existing treatment alternatives is waning. If tebipenem HBr is approved, the pricing may be at a significant premium over other competitive products. This may make it difficult for tebipenem HBr to compete with these products.

There are also a number of oral product candidates in clinical development by third parties that are intended to treat cUTIs. One such product candidate is ceftibuten/clavulanate ("C-Scape") from Cipla Therapeutics, Inc. If our competitors obtain marketing approval from the FDA or comparable foreign regulatory authorities for their product candidates more rapidly than us, it could result in our competitors establishing a strong market position before we are able to enter the market.

There are several IV-administered products marketed for the treatment of infections resistant to first-line therapy for Gram-negative infections, including ceftazidime-avibactam ("Avycaz") from Allergan plc and Pfizer Inc., ceftolozane-tazobactam ("Zerbaxa") from Merck & Co., imipenem/cilastatin and relebactam ("Recarbrio") from Merck & Co., plazomicin ("Zemdri") from Cipla Therapeutics, Inc., cefiderocol ("Fetroja") from Shionogi & Co. Ltd., eravacycline ("Xerava") from Tetraphase Pharmaceuticals, Inc. and meropenem-vaborbactam ("Vabomere") from Melinta Therapeutics, Inc.

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

Even if we or our partners are able to commercialize any of our product candidates, the product may become subject to unfavorable pricing regulations, or third-party payor coverage and reimbursement policies that could harm our business.

Marketing approvals, pricing, coverage and reimbursement for new drug products vary widely from country to country. Some countries require approval of the sale price of a drug before it can be marketed. In many countries, the pricing review period begins after marketing or product licensing approval is granted. In some foreign markets, prescription pharmaceutical pricing remains subject to continuing governmental control even after initial approval is granted. As a result, we might obtain marketing approval for a product in a particular country, but then be subject to price regulations that delay our commercial launch of the product, possibly for lengthy time periods, which may negatively affect the revenues that we are able to generate from the sale of the product in that country. Adverse pricing limitations may hinder our ability to recoup our investment in one or more product candidates, even if our product candidates obtain marketing approval.

We currently expect that some of our product candidates, if approved, will be administered in a hospital inpatient setting. In the United States, governmental and other third-party payors generally reimburse hospitals a single bundled payment established on a prospective basis intended to cover all items and services provided to the patient during a single hospitalization. Hospitals bill third-party payors for all or a portion of the fees associated with the patient's hospitalization and bill patients for any deductibles or co-payments. Because there is typically no separate reimbursement for drugs administered in a hospital inpatient setting, some of our target customers may be unwilling to adopt our product candidates in light of the additional associated cost. If we are forced to lower the price we charge for our product candidates, if approved, our gross margins may decrease, which would adversely affect our ability to invest in and grow our business.

To the extent any of our product candidates we develop are used in an outpatient setting, the commercial success of our product candidates will depend substantially, both domestically and abroad, on the extent to which coverage and reimbursement for these products and related treatments are available from government health programs and third-party payors. If coverage is not available, or reimbursement is limited, we may not be able to successfully commercialize our product candidates. Even if coverage is provided, the approved reimbursement amount may not be high enough to allow us to establish or maintain pricing sufficient to realize a sufficient return on our investments. Government authorities and third-party payors, such as health insurers and managed care organizations, publish formularies that identify the medications they will cover and the related payment levels. The healthcare industry is focused on cost containment, both in the United States and elsewhere. Government authorities and third-party payors have attempted to control costs by limiting coverage and the amount of reimbursement for particular medications, which could affect our ability to sell our product candidates profitably.

Increasingly, third-party payors are requiring higher levels of evidence of the benefits and clinical outcomes of new technologies and are challenging the prices charged. We cannot be sure that coverage will be available for any product candidate that we commercialize and, if available, that the reimbursement rates will be adequate. Further, the net reimbursement for outpatient drug products may be subject to additional reductions if there are changes to laws that presently restrict imports of drugs from countries where they may be sold at lower prices than in the United States. An inability to promptly obtain coverage and adequate payment rates from both government-funded and private payors for any approved products used on an outpatient basis that we develop could have a material adverse effect on our operating results, our ability to raise capital needed to commercialize products and our overall financial condition.

We cannot predict whether bacteria may develop resistance to our product candidates, if approved, which could affect their revenue potential.

Certain of our product candidates are designed to treat bacterial infections, including drug-resistant infections. The bacteria responsible for these infections evolve quickly and readily transfer their resistance mechanisms within and between species. We cannot predict whether or when bacterial resistance to any of such product candidates may develop.

For example, as a carbapenem, tebipenem HBr is not active against organisms expressing a resistance mechanism mediated by enzymes known as carbapenemases. Although occurrence of this resistance mechanism is currently rare, we cannot predict whether carbapenemase-mediated resistance will become widespread in regions where we tebipenem HBr may be marketed if it is approved. The growth of drug resistant infections in community settings or in countries with poor public health infrastructures, or the potential use of any of our product candidates outside of controlled hospital settings, could contribute to the rise of resistance. If resistance to any of our product candidates becomes prevalent, our ability to generate revenue from such product candidates could suffer.

If we are not successful in discovering, developing and commercializing additional product candidates, our ability to expand our business and achieve our strategic objectives would be impaired.

Although a substantial amount of our efforts will focus on our ongoing and planned clinical trials and potential approval of our product candidates, SPR720, tebipenem HBr and SPR206, a key element of our strategy is to discover, develop and commercialize a portfolio of therapeutics to treat drug resistant bacterial infections. We are seeking to do so through our internal research programs and are exploring, and intend to explore in the future, strategic partnerships for the development of new product candidates.

Research programs to identify product candidates require substantial technical, financial and human resources, whether or not any product candidates are ultimately identified. Our research programs may initially show promise in identifying potential product candidates, yet fail to yield product candidates for clinical development for many reasons, including the following:

- the research methodology used may not be successful in identifying potential product candidates;
- we may be unable to successfully modify candidate compounds to be active in Gram-negative bacteria or defeat bacterial resistance mechanisms or identify viable product candidates in our screening campaigns;
- competitors may develop alternatives that render our product candidates obsolete;
- product candidates that we develop may nevertheless be covered by third parties' patents or other exclusive rights;
- a product candidate may, on further study, be shown to have harmful side effects or other characteristics that indicate it is unlikely to be effective or otherwise does not meet applicable regulatory criteria;
- a product candidate may not be capable of being produced in commercial quantities at an acceptable cost, or at all;
- a product candidate may not be accepted as safe and effective by patients, the medical community or third-party payors; and
- the development of bacterial resistance to potential product candidates may render them ineffective against target infections.

If we are unsuccessful in identifying and developing additional product candidates, our potential for growth may be impaired.

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

We face an inherent risk of product liability claims as a result of the clinical testing of our product candidates despite obtaining appropriate informed consents from our clinical trial participants. We will face an even greater risk if we obtain marketing approval for and commercially sell any of our product candidates. For example, we may be sued if any product that we develop allegedly causes injury or is found to be otherwise unsuitable during clinical testing, manufacturing, marketing or sale. Any such product liability claims may include allegations of defects in manufacturing, defects in design, a failure to warn of dangers inherent in the product, negligence, strict liability or a breach of warranties. Claims could also be asserted under state consumer protection acts. If we cannot successfully defend ourselves against product liability claims, we may incur substantial liabilities or be required to limit commercialization of our product candidates. Regardless of the merits or eventual outcome, liability claims may result in:

- reduced resources for our management to pursue our business strategy;
- decreased demand for our product candidates or products that we may develop;
- injury to our reputation and significant negative media attention;

- withdrawal of clinical trial participants;
- initiation of investigations by regulators;
- product recalls, withdrawals or labeling, marketing or promotional restrictions;
- significant costs to defend resulting litigation;
- substantial monetary awards to trial participants or patients;
- loss of revenue; and
- the inability to commercialize any products that we may develop.

Although we maintain general liability insurance and clinical trial liability insurance, this insurance may not fully cover potential liabilities that we may incur. The cost of any product liability litigation or other proceeding, even if resolved in our favor, could be substantial. We will need to increase our insurance coverage if and when we receive marketing approval for and begin selling any of our product candidates. In addition, insurance coverage is becoming increasingly expensive. If we are unable to obtain or maintain sufficient insurance coverage at an acceptable cost or to otherwise protect against potential product liability claims, it could prevent or inhibit the development and commercial production and sale of our product candidates, which could adversely affect our business, financial condition, results of operations and prospects.

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 have a material adverse effect on 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. From time to time and in the future, our operations may involve the use of hazardous and flammable materials, including chemicals and biological materials, and may also produce hazardous waste products. Even if we contract with third parties for the disposal of these materials and wastes, we cannot completely eliminate the risk of contamination or injury resulting 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 maintain workers' compensation insurance to cover us for costs and expenses that we may incur due to injuries to our employees resulting from the use of hazardous materials, but this insurance may not provide adequate coverage against potential liabilities. Moreover, we do not currently maintain insurance for environmental liability or toxic tort claims that may be asserted against us.

In addition, we may incur substantial costs in order to comply with current or future environmental, health and safety laws and regulations. Current or future environmental laws and regulations may impair our research, development or production efforts, which could adversely affect our business, financial condition, results of operations or prospects. In addition, failure to comply with these laws and regulations may result in substantial fines, penalties or other sanctions.

Our internal computer systems, or those of our contract research organizations or other contractors or consultants, may fail or suffer security breaches, which could result in a material disruption of our product development programs, and could subject us to liability.

We utilize information technology systems and networks to process, transmit and store electronic information in connection with our business activities. As the use of digital technologies has increased, cyber incidents, including deliberate attacks and attempts to gain unauthorized access to computer systems and networks, have increased in frequency and sophistication. These threats pose a risk to the security of our systems and networks and the confidentiality, availability and integrity of our data. There can be no assurance that we will be successful in preventing cyber-attacks or successfully mitigating their effects.

Despite the implementation of security measures, our internal computer systems and those of our contract research organizations and other contractors and consultants are vulnerable to damage or disruption from hacking, computer viruses, software bugs, unauthorized access, natural disasters, terrorism, war, and telecommunication, equipment and electrical failures. While we have not, to our knowledge, experienced any significant system failure, accident or security breach to date, if such an event were to occur and cause interruptions in our operations or the operations of those third parties with which we contract, it could result in a material disruption of our programs and our business operations. For example, the loss of clinical trial data from completed or ongoing clinical trials for any of our product candidates could result in delays in our development and regulatory approval efforts and significantly increase our costs to recover or reproduce the data. Such a loss could also expose us to regulatory enforcement, civil liability and reputational damage. To the extent that any disruption or security breach results in a loss of or damage to our data or applications, or

inappropriate disclosure or theft of confidential or proprietary information, in addition to incurring liability, the further development of our product candidates could be delayed or our competitive position could be compromised.

Any such disruption or security breach, as well as any action by us or our employees or contractors that might be inconsistent with the rapidly evolving data privacy and security laws and regulations applicable within the United States and elsewhere where we conduct business, could result in enforcement actions by the United States, the United States Federal government or foreign governments, liability or sanctions under data privacy laws that protect personally identifiable information, regulatory penalties, other legal proceedings such as but not limited to private litigation, the incurrence of significant remediation costs, disruptions to our development programs, business operations and collaborations, diversion of management efforts and damage to our reputation, which could harm our business and operations. Because of the rapidly moving nature of technology and the increasing sophistication of cybersecurity threats, our measures to prevent, respond to and minimize such risks may be unsuccessful.

In addition, the European Parliament and the Council of the European Union adopted a comprehensive general data privacy regulation ("GDPR") in 2016 to replace the current European Union Data Protection Directive and related country-specific legislation. The GDPR took effect in May 2018 and governs the collection and use of personal data in the European Union, including by companies outside of the European Union. The GDPR, which is wide-ranging in scope, imposes several requirements relating to the consent of the individuals to whom the personal data relates, the information provided to the individuals, the security and confidentiality of the personal data, data breach notification and the use of third-party processors in connection with the processing of the personal data. The GDPR also imposes strict rules on the transfer of personal data out of the European Union to the United States, enhances enforcement authority and imposes large penalties for noncompliance, including the potential for fines of up to €20 million or 4% of the annual global revenues of the infringer, whichever is greater.

The GDPR also confers a private right of action on data subjects and consumer associations to lodge complaints with supervisory authorities, seek judicial remedies, and obtain compensation for damages resulting from violations of the GDPR. Compliance with the GDPR has been and will continue to be a rigorous and time-intensive process that has increased and will continue to increase our cost of doing business or require us to change our business practices, and despite those efforts, there is a risk that we or our collaborators may be subject to fines and penalties, litigation and reputational harm in connection with any European activities, which could adversely affect our business, prospects, financial condition and results of operations.

In addition, certain states have adopted privacy and security laws and regulations, some of which are more stringent than HIPAA and/or regulate information other than PHI. For example, in June 2018, California enacted the California Consumer Privacy Act (“CCPA”) which took effect on January 1, 2020. The CCPA gives California residents expanded rights to access and require deletion of their personal information, opt out of certain personal information sharing, and receive detailed information about how their personal information is used. The CCPA provides for civil penalties for violations, as well as a private right of action for data breaches that may increase data breach litigation. Although the CCPA includes exemptions for certain clinical trials data, and HIPAA protected health information, the law may increase our compliance costs and potential liability with respect to other personal information we collect about California residents. In addition, California voters also approved a new privacy law, the California Privacy Rights Act, (“CPRA”), on November 3, 2020. CPRA will modify CCPA significantly, potentially resulting in further uncertainty, additional costs and expenses stemming from efforts to comply, and additional potential for harm and liability for failure to comply. CPRA imposes additional obligations on companies covered by the legislation and will expand consumers’ rights with respect to certain sensitive personal information CPRA also creates a new state agency that will be vested with the authority to implement and enforce CCPA and CPRA. CCPA has prompted a number of proposals for new federal and state privacy legislation that, if passed, could increase our potential liability, increase our compliance costs and adversely affect our business. For example, in February 2021, the Virginia legislature became the second to enact a state-specific law called the Consumer Data Protection Act (“CDPA”), which includes key differences from California’s law, further complicating compliance by industry and other stakeholders. Many similar laws have been proposed in other states and at the federal level.

We or third parties upon whom we depend may be adversely affected by natural disasters and/or health epidemics, and our business, financial condition and results of operations could be adversely affected.

Natural disasters could severely disrupt our operations and have a material adverse effect on our business operations. If a natural disaster, health epidemic, such as COVID-19, or other events beyond our control occurred that prevented us from using all or a significant portion of our office, that damaged critical infrastructure, such as the manufacturing facilities of our third-party contract manufacturers, or that otherwise disrupted operations, it may be difficult for us to continue our business for a substantial period of time.

The COVID-19 pandemic has and could continue to adversely impact our business, including our preclinical studies and clinical trials.

In March 2020, the World Health Organization declared the global outbreak of COVID-19 to be a pandemic. We continue to closely monitor the recent COVID-19 developments, including the lifting of COVID-19 safety measures, the drop in COVID-19 vaccination rates, the implementation of, and reaction to, vaccine mandates, the spread of new strains or variants of the coronavirus, and supply chain and labor shortages. The COVID-19 pandemic has had, and is expected to continue to have, an adverse impact on our operations. As a result of the COVID-19 pandemic or similar pandemics, we have experienced, and may in the future experience, certain disruptions that could materially impact our business, preclinical studies and clinical trials.

We are continuing to monitor and assess the effects of the COVID-19 pandemic on our operations. However, we cannot at this time accurately predict what effects these conditions will ultimately have on our business, operations, preclinical studies and clinical trials due to uncertainties relating to variants, the severity of the disease, the duration of the outbreak, and the length of the travel restrictions and business closures imposed by the governments of impacted countries. In addition, the COVID-19 pandemic could continue to adversely affect the economies and financial markets of many countries, which could result in an economic downturn that could affect demand for our products and likely impact our operating results.

Risks Related to Our Financial Position and Need for Additional Capital

We have not generated any revenue from the sale of our products, have a history of losses and expect to incur substantial future losses; if we are unable to obtain additional capital, we may not be able to continue our operations on the scope or scale as currently conducted, and that could have a material adverse effect on our business, results of operations and financial condition.

We have not generated any revenue from the sale of our products and have incurred losses in each year since our inception in 2013. Our net loss was $46.4 million during the year ended December 31, 2022. All of our product candidates are in development, none have been approved for sale and we may never have a product candidate approved for commercialization.

In accordance with ASU 2014-15, Disclosure of Uncertainties about an Entity's Ability to Continue as a Going Concern (Subtopic 205-40), we are required to evaluate whether there are conditions and events, considered in the aggregate, that raise substantial doubt about our ability to continue as a going concern from the issuance date of our financial statements. We believe that our existing cash and cash equivalents will enable us to fund our operating expenses and capital expenditure requirements for at least 12 months from the issuance of the financial statements included in this report. Based on our current operating plans, we believe that our cash runway will be sufficient to fund us beyond 2024. Beyond this point we will need additional funding, which primarily consist of raising additional capital through some combination of equity or debt financings, potential new collaborations or partnerships, additional grant funding and/or reducing cash expenditures. If we are not able to secure adequate additional funding, we plan to make reductions in spending. In that event, we may have to delay, scale back, or eliminate some or all of our planned clinical trials, research stage programs and commercial activities.

We expect to continue to incur significant expenses and increasing operating losses for the foreseeable future; if we are unable to achieve commercialization, revenue from product sales, and, ultimately, profitability, the market value of our common stock will likely decline.

We expect to continue to incur significant expenses and increasing operating losses for the foreseeable future as we continue to advance our product candidates through preclinical and clinical development and marketing approval for such candidates whose clinical trials are successful. Our expenses will also increase substantially if and as we:

- conduct additional clinical trials and studies of our product candidates;
- continue to discover and develop additional product candidates;
- establish manufacturing and supply chain capacity sufficient to provide commercial quantities of any product candidates for which we may obtain marketing approval;
- maintain, expand and protect our intellectual property portfolio;
- hire additional clinical, scientific and commercial personnel;
- add operational, financial and management information systems and personnel, including personnel to support our product development and planned future commercialization efforts, face competing technological and market developments; and
- acquire or in-license other product candidates and technologies.

If our product candidates fail to demonstrate safety and efficacy in clinical trials, do not gain regulatory approval, or do not achieve market acceptance following regulatory approval and commercialization, we may never become profitable. Even if we achieve profitability in the future, we may not be able to sustain profitability in subsequent periods. 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. If we are unable to achieve and sustain profitability, the market value of our common stock will likely decline.

Because of the numerous risks and uncertainties associated with developing biopharmaceutical products, we are unable to predict the extent of any future losses or when, if ever, we will become profitable. Our expenses could increase if we are required by the FDA, or any comparable foreign regulatory authority to perform studies in addition to those currently expected, or if there are any delays in completing our clinical trials or the development of any of our product candidates.

We expect that we will need substantial additional funding. If we are unable to raise capital when needed, or do not receive payment under our government awards, we could be forced to delay, reduce or eliminate our product development programs.

Developing pharmaceutical products, including conducting preclinical studies and clinical trials, is a time-consuming, expensive and uncertain process that takes years to complete. We expect that our expenses will continue to increase as we commence and advance our ongoing and planned clinical trials and other studies of SPR720, tebipenem HBr and SPR206. If we obtain marketing approval for any product candidate, we expect to incur significant expenses related to development, product sales, marketing, distribution and manufacturing. Some of these expenses may be incurred in advance of marketing approval, and could be substantial. Accordingly, we will be required to obtain further funding through public or private equity offerings, debt financings, collaborations, licensing arrangements, government funding or other sources. Adequate additional financing may not be available to us on acceptable terms, or at all. Our failure to raise capital as and when needed would have a negative effect on our financial condition and our ability to pursue our business strategy.

We believe that our existing cash and cash equivalents will enable us to fund our operating expenses and capital expenditure requirements for at least 12 months from the issuance of the financial statements included in this report. Based on our current operating plans, we believe that our cash runway will be sufficient to fund us beyond 2024. Our cash forecasts are based on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect. Changing circumstances could cause us to consume capital significantly faster than we currently anticipate, and we may need to spend more than currently expected because of circumstances beyond our control. Our future funding requirements, both short-term and long-term, will depend on many factors, including:

- the timing and terms of the potential FDA approval of tebipenem HBr;
- the timing, costs and results of our ongoing, planned and potential clinical trials for our product candidates;
- the amount of funding that we receive under our government awards;
- the number and characteristics of product candidates that we pursue;
- the outcome, timing and costs of seeking regulatory approvals;
- the costs of commercialization activities for our product candidates if we receive marketing approval, including the costs and timing of establishing product sales, marketing, distribution and manufacturing capabilities;
- the terms and timing of any future collaborations, licensing or other arrangements that we may establish;
- the amount and timing of any payments we may be required to make, or that we may receive, in connection with the licensing, filing, prosecution, defense and enforcement of any patents or other intellectual property rights, including milestone and royalty payments and patent prosecution fees that we are obligated to pay pursuant to our license agreements;
- the costs of preparing, filing and prosecuting patent applications, maintaining and protecting our intellectual property rights and defending against any intellectual property related claims;
- the costs of our continued operation as a public company; and
- the extent to which we in-license or acquire other products and technologies.

As of December 31, 2022, our non-dilutive sources of funding consisted of an award from BARDA for tebipenem HBr, an award from NIAID for SPR206 and an award from the DoD CDMRP Joint Warfighter Medical Research Program for SPR206.

Raising additional capital may cause dilution to our stockholders, restrict our operations or require us to relinquish rights to our technologies or product candidates.

Unless and until we can generate a substantial amount of revenue from our product candidates, we expect to finance our future cash needs through public or private equity offerings, debt financings, collaborations, licensing arrangements and government funding arrangements. In addition, we may seek additional capital due to favorable market conditions or strategic considerations, even if we believe that we have sufficient funds for our current or future operating plans. We filed a universal shelf registration statement on Form S-3 (Registration No. 333-254170) with the SEC on March 11, 2021, which was declared effective on March 29, 2021 and pursuant to which we registered for sale up to $300.0 million of any combination of our common stock, preferred stock, debt securities, warrants, rights and/or units from time to time and at prices and on terms that we may determine, including up to $75.0 million of our common stock available for issuance pursuant to the Sales Agreement that we entered into with Cantor Fitzgerald & Co. ("Cantor"). Under the Sales Agreement, Cantor may sell shares of our common stock by any method permitted by law deemed to be an "at the market" offering as defined in Rule 415 of the Securities Act, subject to the terms of the Sales Agreement.

We may seek to raise additional capital at any time. To the extent that we raise additional capital through the sale of common stock, convertible securities or other equity securities, the ownership interest of our then existing stockholders may be materially diluted, and the terms of these securities could include liquidation or other preferences and anti-dilution protections that could adversely affect the rights of our stockholders. In addition, debt financing, if available, would result in increased fixed payment obligations and may involve agreements that include restrictive covenants that limit our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends, which could adversely affect our ability to conduct our business. In addition, securing additional financing would require a substantial amount of time and attention from our management and may divert a disproportionate amount of their attention away from day-to-day activities, which may adversely affect our management's ability to oversee the development of our product candidates.

If we raise additional funds through collaborations, strategic alliances or marketing, distribution or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams or product candidates or grant licenses on terms that may not be favorable to us.

Our ability to use our net operating loss carryforwards may be limited.

As of December 31, 2022, we had United States federal, state and foreign net operating loss carryforwards ("NOLs") of $291.9 million, $282.9 million and $4.6 million, respectively. The federal NOLs of $73.0 million will expire at various dates from 2033 to 2037 and approximately $218.9 million can be carried forward indefinitely. The state NOLs begin to expire in 2033 and will expire at various dates through 2039. The foreign NOLs do not expire. Utilization of these NOLs depends on many factors, including our future income, which cannot be assured. These NOLs could expire unused and be unavailable to offset our future income tax liabilities. In addition, under Section 382 of the Internal Revenue Code of 1986, as amended (the "Code") and corresponding provisions of state law, if a corporation undergoes an "ownership change," which is generally defined as a greater than 50% change, by value, in its equity ownership by 5% stockholders over a three-year period, the corporation's ability to use its pre-change NOLs and other pre-change tax attributes to offset its post-change income may be limited. We completed an analysis under Section 382 through December 31, 2022 and concluded we had experienced ownership changes in the past. However, the ownership changes did not result in a limitation that at this time would materially reduce the total amount of NOLs and credits that can be utilized. We believe we may also experience ownership changes in the future as a result of subsequent shifts in our stock ownership, some of which are outside our control. If additional ownership changes are identified in the future, our ability to use our historical NOLs may be materially limited and will impact our future operating results by effectively increasing our future tax obligations.

Under current United States federal tax legislation, although the treatment of NOLs arising in tax years beginning on or before December 31, 2017 has generally not changed, NOLs arising in tax years beginning after December 31, 2017 may be used to offset only 80% of taxable income. In addition, net operating losses arising in tax years beginning after December 31, 2017 may be carried forward indefinitely, as opposed to the 20-year carryforward under prior law.

We have a limited operating history and no history of commercializing pharmaceutical products, which may make it difficult to evaluate the prospects for our future viability.

We were established in 2013 and began operations in 2014. Our operations to date have been limited to financing and staffing our company, developing our technology and our product candidates. We have not yet demonstrated an ability to successfully obtain marketing approval, manufacture a commercial scale product, or arrange for a third party to do so on our behalf, or conduct sales and marketing activities necessary for successful product commercialization. Consequently, predictions about our future success or viability may not be as accurate as they could be if we had a longer operating history or a history of successfully developing and commercializing pharmaceutical products.

We may encounter unforeseen expenses, difficulties, complications, delays and other known or unknown factors in achieving our business objectives. We have begun to transition from a company with a development focus to a company capable of supporting commercial activities. We may not be successful in such a transition.

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

We and certain of our executive officers have been named as defendants in two initiated lawsuits, which were ordered consolidated, that could result in substantial costs and divert management's attention.

We, and certain of our executive officers, were named as defendants in two purported class action lawsuits that generally allege that we and certain of our officers violated Sections 10(b) and/or 20(a) of the Securities Exchange Act of 1934 and Rule 10b-5 promulgated thereunder by making allegedly false and/or misleading statements concerning the New Drug Application for tebipenem HBr in an effort to lead investors to believe that the drug would receive approval from the FDA. The parties moved to consolidate the two complaints on July 22, 2022, which were ordered consolidated on August 5, 2022. Both Kashif Memon and stockholder Nabil Saad filed motions for appointment of lead plaintiff/lead counsel on July 25, 2022. Mr. Saad withdrew his opposition on August 15, 2022, and Mr. Memon was appointed lead plaintiff on September 19, 2022. The complaint seeks unspecified damages, interest, attorneys' fees, and other costs. Mr. Memon filed an amended complaint on December 5, 2022. The amended complaint generally alleges the same arguments provided in the original complaint. We notified the Court of our intention to file a motion to dismiss the amended complaint in its entirety. The Court held a conference on February 22, 2023 and set a date of March 31, 2023 for us to file a motion to dismiss.

We intend to engage in a vigorous defense of the lawsuit. However, we are unable to predict the outcome of this matter at this time. Moreover, any conclusion of this matter in a manner adverse to us would have a material adverse effect on our financial condition and business. We could incur substantial costs not covered by our directors' and officers' liability insurance, suffer a significant adverse impact on our reputation and divert management's attention and resources from other priorities, including the execution of business plans and strategies that are important to our ability to grow our business, any of which could have a material adverse effect on our business. In addition, this matter could require payments that are not covered by, or exceed the limits of, our available directors' and officers' liability insurance, which could have a material adverse effect on our operating results or financial condition.

Risks Related to Our Dependence on Third Parties

We may not achieve the milestones triggering payments to us in our license and collaboration agreements with third parties.

We have and may continue to seek third-party collaborators for development and commercialization of certain of our product candidates. Currently we are party to license and collaboration agreements with third parties as described in Note 14 ("License, Collaboration and Service Agreements") to the audited financial statements filed herewith. Our likely collaborators for any other marketing, distribution, development, licensing or broader collaboration arrangements we may pursue include large and mid-size pharmaceutical companies, regional and national pharmaceutical companies and biotechnology companies.

We may derive revenue from research and development fees, license fees, milestone payments and royalties under any collaborative arrangement into which we enter. Our ability to generate revenue from these arrangements will depend on our collaborators' abilities to successfully perform the functions assigned to them in these arrangements. In addition, our collaborators may have the right to abandon research or development projects and terminate applicable agreements, including funding obligations, prior to or upon the expiration of the agreed upon terms. As a result, we can expect to relinquish some or all of the control over the future success of a product candidate that we license to a third party.

We face significant competition in seeking and obtaining appropriate collaborators. Collaborations involving our product candidates may pose a number of risks, including the following:

- collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations;
- collaborators may not perform their obligations as expected;
- collaborators may not pursue development and commercialization of our product candidates or may elect not to continue or renew development or commercialization programs based on clinical trial results, changes in the collaborators' strategic focus or available funding or external factors, such as an acquisition, that divert resources or create competing priorities;
- collaborators may not be able to develop, manufacture, market and sell our product candidates and use our intellectual property without infringing or misappropriating the intellectual property and other proprietary rights of third parties;

- collaborators may delay clinical trials, provide insufficient funding for a clinical trial program, stop a clinical trial or abandon a product candidate, repeat or conduct new clinical trials or require a new formulation of a product candidate for clinical testing;
- product candidates discovered in collaboration with us may be viewed by our collaborators as competitive with their own product candidates or products, which may cause collaborators to cease to devote resources to the commercialization of our product candidates;
- a collaborator with marketing and distribution rights to one or more products may not commit sufficient resources to the marketing and distribution of such product or products;
- disagreements with collaborators, including disagreements over proprietary rights, contract interpretation or the preferred course of development, might cause delays or termination of the research, development or commercialization of product candidates, might lead to additional responsibilities for us with respect to product candidates, or might result in litigation or arbitration, any of which would be time-consuming and expensive;
- collaborators may not properly maintain or defend our intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our intellectual property or proprietary information or expose us to potential litigation;
- collaborators may infringe the intellectual property rights of third parties, which may expose us to litigation and potential liability; and
- collaborations may be terminated and, if terminated, may result in a need for additional capital to pursue further development or commercialization of the applicable product candidates.

Collaboration agreements may not lead to development or commercialization of product candidates in the most efficient manner or at all. If a collaborator of ours is involved in a business combination, it could decide to delay, diminish or terminate the development or commercialization of any product candidate licensed to it by us.

We may have to alter our development and commercialization plans if we are not able to establish collaborations.

We will require additional funds to complete the development and potential commercialization of our product candidates. For some of our product candidates, we may decide to collaborate with pharmaceutical and biotechnology companies for the development and potential commercialization of those product candidates. Moreover, we intend to utilize a variety of types of collaboration arrangements for the potential commercialization of our product candidates outside the United States. Whether we reach a definitive agreement for a collaboration will depend, among other things, upon our assessment of the collaborator's resources and expertise, the terms and conditions of the proposed collaboration and the proposed collaborator's evaluation of a number of factors. Those factors may include:

- the design or results of clinical trials;
- the likelihood of approval by the FDA or comparable foreign regulatory authorities;
- the potential market for the subject product candidate;
- the costs and complexities of manufacturing and delivering such product candidate to patients;
- the potential for competing products;
- our patent position protecting the product candidate, including any uncertainty with respect to our ownership of our technology or our licensor's ownership of technology we license from them, which can exist if there is a challenge to such ownership without regard to the merits of the challenge;
- the need to seek licenses or sub-licenses to third-party intellectual property; and
- industry and market conditions generally.

The collaborator may also consider alternative product candidates or technologies for similar indications that may be available for collaboration and whether such a collaboration could be more attractive than the one with us for our product candidate. We may also be restricted under future license agreements from entering into agreements on certain terms with potential collaborators. In addition, there have been a significant number of recent business combinations among large pharmaceutical companies that have resulted in a reduced number of potential future collaborators.

If we are unable to reach agreements with suitable collaborators on a timely basis, on acceptable terms, or at all, we may have to curtail the development of a product candidate, reduce or delay its development program or one or more of our other development programs, delay its potential commercialization or reduce the scope of any sales or marketing activities, or increase our expenditures and undertake development or commercialization activities at our own expense. If we elect to fund and undertake development or

commercialization activities on our own, we may need to obtain additional expertise and additional capital, which may not be available to us on acceptable terms or at all. If we fail to enter into collaborations and do not have sufficient funds or expertise to undertake the necessary development and commercialization activities, we may not be able to further develop our product candidates or bring them to market and our business may be materially and adversely affected.

We rely on third parties to conduct all of our nonclinical studies and all of our clinical trials. If these third parties do not successfully carry out their contractual duties or meet expected deadlines, we may be unable to obtain regulatory approval for or commercialize any of our product candidates. If they do not perform satisfactorily, our business may be materially harmed.

We do not independently conduct nonclinical studies that comply with GLP requirements. We also do not have the ability to independently conduct clinical trials of any of our product candidates. We rely on third parties, such as contract research organizations, clinical data management organizations, medical institutions and clinical investigators, to conduct our clinical trials of our product candidates and potential product candidates. Any of these third parties may terminate their engagements with us at any time. If we need to enter into alternative arrangements, it would delay our product development activities and increase our costs.

Our reliance on these third parties for clinical development activities limits our control over these activities but we remain responsible for ensuring that each of our studies is conducted in accordance with the applicable protocol, legal, regulatory and scientific standards. For example, notwithstanding the obligations of a contract research organization for a trial of one of our product candidates, we remain responsible for ensuring that each of our clinical trials is conducted in accordance with the general investigational plan and protocols for the trial and applicable regulatory requirements. While we will have agreements governing their activities, we control only certain aspects of their activities and have limited influence over their actual performance. The third parties with whom we contract for execution of our GLP studies and our clinical trials play a significant role in the conduct of these studies and trials and the subsequent collection and analysis of data. Although we rely on these third parties to conduct our GLP-compliant nonclinical studies and clinical trials, we remain responsible for ensuring that each of our nonclinical studies and clinical trials are conducted in accordance with applicable laws and regulations, and our reliance on the CROs does not relieve us of our regulatory responsibilities. The FDA and regulatory authorities in other jurisdictions also require us to comply with standards, commonly referred to as good clinical practices ("GCPs") for conducting, monitoring, recording and reporting the results of clinical trials to assure that data and reported results are accurate and that the trial subjects are adequately informed of the potential risks of participating in clinical trials. The FDA enforces these GCPs through periodic inspections of trial sponsors, principal investigators, clinical trial sites and institutional review boards. If we or our third-party contractors fail to comply with applicable GCP standards, the clinical data generated in our clinical trials may be deemed unreliable and the FDA may require us to perform additional clinical trials before approving our product candidates, which would delay the regulatory approval process. We cannot make assurances that, upon inspection, the FDA will determine that any of our clinical trials comply with GCP. We are also required to register clinical trials and post the results of completed clinical trials on a government-sponsored database, ClinicalTrials.gov, within certain timeframes. Failure to do so can result in fines, adverse publicity and civil and criminal sanctions.

Furthermore, the third parties conducting clinical trials on our behalf are not our employees, and except for remedies available to us under our agreements with such contractors, we cannot control whether or not they devote sufficient time and resources to our ongoing development programs. These contractors may also have relationships with other commercial entities, including our competitors, for whom they may also be conducting clinical trials or other drug development activities, which could impede their ability to devote appropriate time to our clinical programs. If these third parties do not successfully carry out their contractual duties, meet expected deadlines or conduct our clinical trials in accordance with regulatory requirements or our stated protocols, we may not be able to obtain, or may be delayed in obtaining, marketing approvals for our product candidates. If that occurs, we may not be able to, or may be delayed in our efforts to, successfully commercialize our product candidates. In such an event, our financial results and the commercial prospects for our product candidates could be harmed, our costs could increase and our ability to generate revenue could be delayed, impaired or foreclosed.

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

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

We do not currently have nor do we plan to build the internal infrastructure or capability to manufacture our product candidates for use in the conduct of our preclinical research, our clinical trials or for commercial supply. We currently rely on and expect to continue to rely on third-party contract manufacturers to manufacture supplies of our product candidates, and we expect to rely on third-party contract manufacturers to manufacture commercial quantities of any product candidate that we commercialize following approval for marketing by applicable regulatory authorities, if any. Reliance on third-party manufacturers entails risks, including:

- manufacturing delays if our third-party manufacturers give greater priority to the supply of other products over our product candidates or otherwise do not satisfactorily perform according to the terms of the agreement between us;
- the possible termination or nonrenewal of the agreement by the third-party at a time that is costly or inconvenient for us;
- the possible breach of the manufacturing agreement by the third-party;
- the failure of the third-party manufacturer to comply with applicable regulatory requirements; and
- the possible misappropriation of our proprietary information, including our trade secrets and know-how.

We currently rely on a small number of third-party contract manufacturers and one supplier for all of our required raw materials, drug substance and finished product for our preclinical research and clinical trials. We do not have long-term agreements with any of these third parties. We also do not have any current contractual relationships for the manufacture of commercial supplies of any of our product candidates. If any of our existing manufacturers should become unavailable to us for any reason, we may incur delays in identifying or qualifying replacements.

In addition, because some of our manufacturers have manufacturing facilities in Taiwan, their ability to provide us with adequate supplies of high-quality products on a timely and cost-efficient basis is subject to a number of additional risks and uncertainties, including political, social and economic instability and factors that could impact the shipment of supplies. If our manufacturers are unable to provide us with adequate supplies of high-quality products on a timely and cost-efficient basis, our operations would be disrupted and our net revenue and profitability would suffer.

Our third-party contract manufacturers are based in Asia. Recently, our third-party contract manufacturers have been subject to various supply chain disruptions. These supply chain disruptions have increased the price of certain materials due to the significant increase in costs of raw materials and shipping costs. Our ability to produce and timely deliver our products may be materially impacted in the future if these supply chain disruptions continue or worsen.

Further, a major catastrophe, such as an earthquake or other natural disaster, labor strike, or work stoppage at any of our manufacturing facilities, or a manufacturing facility of our suppliers or customers, could result in a prolonged interruption of our business. A disruption resulting from any one of these events could cause significant delays in shipments of our products and the loss of revenue and customers, which could have a material adverse effect on our financial position, results of operations, and cash flows. Our facilities in Japan and Taiwan are located in seismically-active areas.

If any of our product candidates are approved by any regulatory agency, we intend to enter into agreements with third-party contract manufacturers for the commercial production of those products. This process is difficult and time consuming and we may face competition for access to manufacturing facilities as there are a limited number of contract manufacturers operating under cGMPs that are capable of manufacturing our product candidates. Consequently, we may not be able to reach agreement with third-party manufacturers on satisfactory terms, which could delay our commercialization.

Third-party manufacturers are required to comply with cGMPs and similar regulatory requirements outside the United States. Facilities used by our third-party manufacturers must be approved by the FDA after we submit an NDA and before potential approval of the product candidate. Similar regulations apply to manufacturers of our product candidates for use or sale in foreign countries. We do not control the manufacturing process and are completely dependent on our third-party manufacturers for compliance with the applicable regulatory requirements for the manufacture of our product candidates. The inability or failure of our manufacturers to successfully manufacture material that conforms to the strict regulatory requirements of the FDA and any applicable foreign regulatory authority, may require us to find alternative manufacturing facilities, which could result in delays in obtaining approval for the applicable product candidate. In addition, our manufacturers are subject to ongoing periodic unannounced inspections by the FDA and corresponding state and foreign agencies for compliance with cGMPs and similar regulatory requirements. Failure by any of our

manufacturers to comply with applicable cGMPs or other regulatory requirements could result in sanctions being imposed on us, including fines, injunctions, civil penalties, delays, suspensions or withdrawals of approvals, operating restrictions, interruptions in supply and criminal prosecutions, any of which could significantly and adversely affect supplies of our product candidates and have a material adverse effect on our business, financial condition and results of operations.

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

If we fail to comply with our obligations in the agreements under which we in-license or acquire development or commercialization rights to products, technology or data from third parties, we could lose such rights that are important to our business.

We are a party to agreements with Meiji and GSK for tebipenem HBr, Vertex Pharmaceuticals for SPR720 and Everest Medicines and PBB Distributions Limited for SPR206, and we may enter into additional agreements, including license agreements, with other parties in the future that impose diligence, development and commercialization timelines, milestone payments, royalties, insurance and other obligations on us.

For example, we have the Meiji License that gives us rights outside of the Meiji Territory to develop, manufacture, and commercialize tebipenem HBr as well as the right to use, cross-reference, file or incorporate by reference any information and relevant Meiji regulatory documentation to support any regulatory filings outside of the Meiji Territory. In addition, we have the right to develop, manufacture and have manufactured tebipenem HBr in the Meiji Territory solely for the purpose of furthering development, manufacturing and commercialization of tebipenem HBr outside of the Meiji Territory. In exchange for those rights, we are obligated to satisfy diligence requirements, including using commercially reasonable efforts to develop and commercialize tebipenem HBr and to implement a specified development plan, meeting specified development milestones and providing an update on progress on an annual basis. The Meiji License requires us to pay future milestone payments of up to $1.0 million upon the achievement of specified regulatory milestones and royalties of a low single-digit percentage on net sales on a country-by-country basis.

In addition, pursuant to our GSK License Agreement, we granted GSK an exclusive royalty-bearing license, with the right to grant sublicenses, under our intellectual property and regulatory documents and a sublicense under certain intellectual property of Meiji and Meiji's regulatory documents to develop, manufacture and commercialize the GSK Licensed Products in the GSK Territory. Under the terms of the GSK License Agreement, we received an upfront payment of $66.0 million for GSK to secure rights to the medicine. Remaining potential payments are milestone based, and are (i) approximately $150.0 million in payments for the achievement of development milestones, (ii) up to $150.0 million in commercial milestone payments, (iii) up to $225.0 million in sales milestone payments, and (iv) tiered low single-digit to low double-digit royalties on net sales of GSK Licensed Products in the GSK Territory.

We will be responsible for the execution and costs of the follow-up Phase 3 clinical trial of tebipenem HBr. GSK will be responsible for the execution and costs of additional further development, including Phase 3 regulatory filing and commercialization activities for tebipenem HBr in the balance of the GSK Territory outside of the United States. We will also be responsible for providing and paying for the clinical supply of tebipenem HBr while GSK will be responsible for the costs of the commercial supply of tebipenem HBr.

If we fail to comply with our obligations to Meiji, GSK, or any of our other partners, our counterparties may have the right to terminate these agreements, in which event we might not be able to develop, manufacture or market any product candidate that is covered by these agreements, which could materially adversely affect the value of the product candidate being developed under any such agreement. Termination of these agreements or reduction or elimination of our rights under these agreements may result in our having to negotiate new or reinstated agreements with less favorable terms, or cause us to lose our rights under these agreements, including our rights to important intellectual property or technology.

Risks Related to Our United States Government Contracts and to Certain Grant Agreements

Our use of government funding for certain of our programs adds complexity to our research and commercialization efforts with respect to those programs and may impose requirements that increase the costs of commercialization and production of product candidates developed under those government-funded programs.

We have received significant non-dilutive financing from various government agencies for the further development of our product candidates. Such funding sources may pose risks to us not encountered in other commercial contracts, including significant regulatory compliance risks. Contracts funded by the United States government and its agencies include provisions that reflect the government's substantial public policy and compliance requirements, and substantial rights and remedies, many of which are not typically found in commercial contracts, including powers of the government to:

- terminate agreements, in whole or in part, for any reason or no reason;
- reduce or modify the government's obligations under such agreements without the consent of the contractor;
- claim rights, including intellectual property rights, in products and data developed under such agreements;
- audit contract-related costs and fees, including allocated indirect costs;
- suspend the contractor from receiving new contracts pending resolution of alleged violations of procurement laws or regulations;
- impose United States manufacturing requirements for products that embody inventions conceived or first reduced to practice under such agreements;
- suspend or debar the contractor or grantee from doing future business with the government;
- control and potentially prohibit the export of products; and
- pursue criminal or civil remedies under the False Claims Act (the "FCA"), the False Statements Act and similar remedy provisions specific to government agreements.

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

In addition, government contracts and grants, and subcontracts and subawards awarded in the performance of those contracts and grants, normally contain additional requirements that may increase our costs of doing business, reduce our profits, and expose us to liability for failure to comply with these terms and conditions. These requirements include, for example:

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

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

United States government agencies have special contracting requirements that give them the ability to unilaterally control our contracts.

United States government contracts typically contain unfavorable termination provisions and are subject to audit and modification by the government at its sole discretion, which will subject us to additional risks. These risks include the ability of the United States government to unilaterally:

- audit and object to our government contract-related costs and fees, and require us to reimburse all such costs and fees;
- suspend or prevent us for a set period of time from receiving new contracts or extending our existing contracts based on violations or suspected violations of laws or regulations;

- cancel, terminate or suspend our contracts based on violations or suspected violations of laws or regulations;
- terminate our contracts if in the government's interest, including if funds become unavailable to the applicable governmental agency;
- reduce the scope and value of our contract; and
- change certain terms and conditions in our contract.

The United States government will be able to terminate any of its contracts with us, either for convenience or if we default by failing to perform in accordance with or to achieve the milestones set forth in the contract schedules and terms. Termination-for-convenience provisions generally enable us to recover only our costs incurred or committed and settlement expenses on the work completed prior to termination. Except for the amount of services received by the government, termination-for-default provisions do not permit these recoveries and would make us liable for excess costs incurred by the United States government in procuring undelivered items from another source.

Our business is subject to audit by the United States government and other potential sources for grant funding, including under our contracts with BARDA, NIAID and DoD, and a negative outcome in an audit could adversely affect our business.

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

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

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

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

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

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

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

These requirements change frequently, such as through appropriations bills or executive orders. Any changes in applicable laws and regulations could restrict our ability to maintain our existing BARDA and other government contracts and obtain new contracts, which could limit our ability to conduct our business and materially adversely affect our results of operations.

Provisions in our United States government contracts, including our contracts with BARDA, may affect our intellectual property rights.

Certain of our activities have been funded, and may in the future be funded, by the United States government, including through our contracts with BARDA. When new technologies are developed with United States government funding, the government obtains certain rights in any resulting patents, including the right to a nonexclusive license authorizing the government to use the invention and rights that may permit the government to disclose our confidential information to third parties and to exercise "march-in" rights. The government can exercise its march-in rights if it determines that action is necessary because we fail to achieve practical application of the United States government-funded technology, because action is necessary to alleviate health or safety needs, to meet requirements of federal regulations or to give preference to United States industry. In addition, United States government-funded inventions must be reported to the government, United States government funding must be disclosed in any resulting patent applications, and our rights in such inventions may be subject to certain requirements to manufacture products in the United States.

Risks Related to Our Intellectual Property

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

Our success depends in large part on our ability to obtain and maintain patent protection in the United States and other countries with respect to our proprietary chemistry technology and product candidates. If we do not adequately protect our intellectual property, competitors may be able to use our technologies and erode or negate any competitive advantage that we may have, which could harm our business and ability to achieve profitability. To protect our proprietary position, we file patent applications in the United States and abroad related to our novel technologies and product candidates that are important to our business. The patent application and approval process is expensive and time-consuming. We may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. We may also fail to identify patentable aspects of our research and development before it is too late to obtain patent protection.

The patent position of biotechnology and pharmaceutical companies generally is highly uncertain. No consistent policy regarding the breadth of claims allowed in biotechnology and pharmaceutical patents has emerged to date in the United States or in many foreign jurisdictions. In addition, the determination of patent rights with respect to pharmaceutical compounds and technologies commonly involves complex legal and factual questions, which has in recent years been the subject of much litigation. As a result, the issuance, scope, validity, enforceability and commercial value of our patent rights are highly uncertain. Furthermore, changes in patent laws in the United States, including those made by the America Invents Act of 2011, may affect the scope, strength and enforceability of our patent rights or the nature of proceedings which may be brought by us related to our patent rights.

Our pending and future patent applications may not result in patents being issued which protect our technology or product candidates, in whole or in part, or which effectively prevent others from commercializing competitive technologies and products. Changes in either the patent laws or interpretation of the patent laws in the United States and other countries may diminish the value of our patents or narrow the scope of our patent protection.

The laws of foreign countries may not protect our rights to the same extent or in the same manner as the laws of the United States. For example, in the US there is an exception for one's own publication of an invention prior to filing a patent application for the invention. Most other countries have no such exception and any publication prior to filing is an absolute bar to patentability. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we were the first to make the inventions claimed in our patents or pending patent applications, or that we were the first to file for patent protection of such inventions. As a result of the America Invents Act of 2011, the United States transitioned to a first-inventor-to-file system in March 2013, under which, assuming the other requirements for patentability are met, the first inventor to file a patent application is entitled to the patent. However, as a result of the lag in the publication of patent applications following filing in the United States, we are still not be able to be certain upon filing that we are the first to file for patent protection for any invention. Moreover, we may be subject to a third-party preissuance submission of prior art to the USPTO or become involved in opposition, derivation, reexamination, *inter partes* review or interference proceedings, in the United States or elsewhere, challenging our patent rights or the patent rights of others. An adverse determination in any such submission, proceeding or litigation could reduce the scope of, or invalidate, our patent rights, allow third parties to commercialize our technology or product candidates and compete directly with us, without payment to us, or result in our inability to manufacture or commercialize products without infringing third-party patent rights.

Due to the war in Ukraine and sanctions between the United States and Russia, patents and patent applications in Russia, the Eurasian Patent Office ("EAPO") and Ukraine currently have an uncertain fate. Unless the conflict with Ukraine ends quickly it is unlikely our Russian and EAPO patent and patent applications will remain in effect. Ukraine is currently under martial law and not processing patent applications. It is expected all patent deadlines in Ukraine will be extended.

Even if our patent applications issue as patents, they may not issue in a form that will provide us with any meaningful protection, prevent competitors from competing with us or otherwise provide us with any competitive advantage. Our competitors may be able to circumvent our owned or licensed patents by developing similar or alternative technologies or products in a non-infringing manner. Our competitors may seek to market generic versions of any approved products by submitting Abbreviated New Drug Applications to the FDA in which they claim that patents owned or licensed by us are invalid, unenforceable and/or not infringed. Alternatively, our competitors may seek approval to market their own products similar to or otherwise competitive with our products. In these circumstances, we may need to defend and/or assert our patents, including by filing lawsuits alleging patent infringement. In any of these types of proceedings, a court or other agency with jurisdiction may find our patents invalid and/or unenforceable. Even if we have valid and enforceable patents, these patents still may not provide protection against competing products or processes sufficient to achieve our business objectives.

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

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

Competitors may infringe our patents, trademarks, copyrights or other intellectual property, or those of our licensors. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time consuming and divert the time and attention of our management and scientific personnel. Any claims we assert against perceived infringers could provoke these parties to assert counterclaims against us alleging that we infringe their patents. In addition, in a patent infringement proceeding, there is a risk that a court will decide that a patent of ours is invalid or unenforceable, in whole or in part, and that we do not have the right to stop the other party from using the invention at issue. There is also a risk that, even if the validity of such patents is upheld, the court will construe the patent's claims narrowly or decide that we do not have the right to stop the other party from using the invention at issue on the grounds that our patents do not cover the invention. An adverse outcome in a litigation or proceeding involving our patents could limit our ability to assert our patents against those parties or other competitors, and may curtail or preclude our ability to exclude third parties from making and selling similar or competitive products. Any of these occurrences could adversely affect our competitive business position, business prospects and financial condition. Similarly, if we assert trademark infringement claims, a court may determine that the marks we have asserted are invalid or unenforceable, or that the party against whom we have asserted trademark infringement has superior rights to the marks in question. In this case, we could ultimately be forced to cease use of such trademarks.

In any infringement litigation, any award of monetary damages we receive may not be commercially valuable. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during litigation. Moreover, there can be no assurance that we will have sufficient financial or other resources to file and pursue such infringement claims, which typically last for years before they are concluded. Even if we ultimately prevail in such claims, the monetary cost of such litigation and the diversion of the attention of our management and scientific personnel could outweigh any benefit we receive as a result of the proceedings.

If we are sued for infringing intellectual property rights of third parties, or otherwise become involved in disputes regarding our intellectual property rights, such litigation could be costly and time consuming and could prevent or delay us from developing or commercializing our product candidates.

Our commercial success depends, in part, on our ability to develop, manufacture, market and sell our product candidates and use our proprietary chemistry technology without infringing the intellectual property and other proprietary rights of third parties. Numerous third-party United States and non-United States issued patents and pending applications exist in the area of antibacterial treatment, including compounds, formulations, treatment methods and synthetic processes that may be applied towards the synthesis of antibiotics. If any of their patents or patent applications cover our product candidates or technologies, we may not be free to manufacture or market our product candidates as planned.

There is a substantial amount of intellectual property litigation in the biotechnology and pharmaceutical industries, and we may become party to, or threatened with, litigation or other adversarial proceedings regarding intellectual property rights with respect to our technology or product candidates, including interference proceedings before the U.S. Patent and Trademark Office. Intellectual property disputes arise in a number of areas including with respect to patents, use of other proprietary rights and the contractual terms of license arrangements. Third parties may assert claims against us based on existing or future intellectual property rights. The outcome of intellectual property litigation is subject to uncertainties that cannot be adequately quantified in advance. With respect to our Meiji License of certain know-how and regulatory documents concerning tebipenem pivoxil, we are neither a party to, nor an express third-party beneficiary of, the letter agreements, which were signed in January 2017 and in February 2022, between Meiji and Global Pharma consenting to Meiji's arrangements with us. As such, if any dispute among the parties were to occur, our direct enforcement rights with respect to the letter agreements may be limited or uncertain.

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

We may be subject to claims that we or our employees, consultants or contractors have misappropriated the intellectual property of a third party, or claims asserting ownership of what we regard as our own intellectual property.

Many of our employees, consultants and contractors are currently, or were previously, employed at universities or other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that these individuals do not use the intellectual property and other proprietary information or know-how of others in their work for us, we may be subject to claims that we or these individuals have used or disclosed such intellectual property or other proprietary information. Litigation may be necessary to defend against these claims.

In addition, while we typically require our employees, consultants and contractors who may be involved in the development of intellectual property to execute agreements assigning such intellectual property to us, we may be unsuccessful in executing such an agreement with each party who in fact develops intellectual property that we regard as our own. To the extent that we fail to obtain such assignments or such assignments are breached, we may be forced to bring claims against third parties, or defend claims they may bring against us, to determine the ownership of what we regard as our intellectual property. If we fail in prosecuting or defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in prosecuting or defending against such claims, litigation could result in substantial costs and be a distraction to our management and scientific personnel.

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

In addition to seeking patents for some of our technology and products, we also rely on trade secrets, including unpatented know-how, technology and other proprietary information, in seeking to develop and maintain a competitive position. We seek to protect these trade secrets, in part, by entering into non-disclosure and confidentiality agreements with parties who have access to them, such as our consultants, independent contractors, advisors, corporate collaborators, outside scientific collaborators, contract manufacturers, suppliers and other third parties. We, as well as our licensors, also enter into confidentiality and invention or patent assignment agreements with employees and certain consultants. Any party with whom we have executed such an agreement may breach that agreement and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret is difficult, expensive and time-consuming, and the outcome is unpredictable. In addition, if any of our trade secrets were to be lawfully obtained or independently developed by a competitor, we would have no right to prevent such third party, or those to whom they communicate such technology or information, from using that technology or information to compete with us. If any of our trade secrets were to be disclosed to or independently developed by a competitor, our business and competitive position could be harmed.

We have registered trademarks and pending trademark applications. Failure to enforce our registered marks or secure registration of our pending trademark applications could adversely affect our business.

We have registered our trademarks for our name and logo in the United States and other countries and have a number of pending trademark applications in the United States and other countries. As of December 31, 2022, we have two registered United States trademarks, 23 registered foreign trademarks, and no pending foreign trademark applications. If our registered trademarks are invalidated, we may be unable to exclusively use our name or logo in certain jurisdictions or may need to change our name or logo in certain jurisdictions, which could affect our business. If we do not secure registrations for our pending trademark applications, we may encounter more difficulty in enforcing them against third parties, which could adversely affect our business.

We have applied to register our product candidate name as a trademark in the United States, where it has been allowed for registration, and have applied to register the mark in three foreign jurisdictions. We have also applied to register additional product candidate names as trademarks in the United States. When we file trademark applications for our product candidates, those applications may not be allowed for registration, and registered trademarks may not be obtained, maintained, or enforced. During trademark registration proceedings in the United States and foreign jurisdictions, we may receive rejections. We are given an opportunity to respond to those rejections, but we may not be able to overcome such rejections. In addition, in the United States Patent and Trademark Office and in comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and to seek to cancel registered trademarks. Opposition or cancellation proceedings may be filed against our trademarks, and our trademarks may not survive such proceedings.

In addition, any proprietary name we propose to use with any product candidate in the United States must be approved by the FDA, regardless of whether we have registered it, or applied to register it, as a trademark. The FDA typically conducts a review of proposed product names, including an evaluation of potential for confusion with other product names. If the FDA objects to any of our proposed proprietary product names, we may be required to expend significant additional resources in an effort to identify a suitable proprietary product name that would qualify under applicable trademark laws, not infringe the existing rights of third parties and be acceptable to the FDA.

Risks Related to Regulatory Approval and Other Legal Compliance Matters

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

Our product candidates and the activities associated with their development and commercialization, including their design, testing, manufacture, safety, efficacy, recordkeeping, labeling, storage, approval, advertising, promotion, sale and distribution, are subject to comprehensive regulation by the FDA and other regulatory agencies in the United States and by comparable foreign regulatory authorities, with regulations differing from country to country. Failure to obtain marketing approval for a product candidate will prevent us from commercializing the product candidate.

We have only limited experience in filing and supporting the applications necessary to gain marketing approvals and have relied on third-party contract research organizations to assist us in this process.

The time required to obtain approval, if any, by the FDA and comparable foreign authorities is unpredictable but typically takes many years following the commencement of 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. We have not obtained regulatory approval for any product candidate and it is possible that none of our product candidates we seek to develop in the future will ever obtain regulatory approval. Neither we nor any future collaborators are permitted to market any of our product candidates in the United States until we or they receive regulatory approval of an NDA from the FDA.

In order to obtain approval to commercialize a product candidate in the United States or abroad, we or our collaborators must demonstrate to the satisfaction of the FDA or foreign regulatory agencies, that such product candidates are safe and effective for their intended uses. Results from nonclinical studies and clinical trials can be interpreted in different ways. Even if we believe that the nonclinical or clinical data for our product candidates are promising, such data may not be sufficient to support approval by the FDA and other regulatory authorities. The FDA may also require us to conduct additional nonclinical studies or clinical trials for our product candidates either prior to or post-approval, and it may otherwise object to elements of our clinical development program.

An NDA must include extensive preclinical and clinical data and supporting information to establish the product candidate's safety and efficacy for each desired indication. The NDA must also include significant information regarding the chemistry, manufacturing and controls for the product candidate. Foreign regulatory authorities have differing requirements for approval of drugs with which we must comply with prior to marketing. Obtaining marketing approval for marketing of a product candidate in one country does not ensure that we will be able to obtain marketing approval in other countries, but the failure to obtain marketing approval in one jurisdiction could negatively affect our ability to obtain marketing approval in other jurisdictions. The FDA or any foreign regulatory bodies can delay, limit or deny approval of our product candidates or require us to conduct additional nonclinical or clinical testing or abandon a program for many reasons, including:

- the FDA or the applicable foreign regulatory agency's disagreement with the design or implementation of our clinical trials;
- negative or ambiguous results from our clinical trials or results that may not meet the level of statistical significance required by the FDA or comparable foreign regulatory agencies for approval;
- serious and unexpected drug-related side effects experienced by participants in our clinical trials or by individuals using drugs similar to our product candidates;
- our inability to demonstrate to the satisfaction of the FDA or the applicable foreign regulatory body that our product candidates are safe and effective for the proposed indication;
- the FDA's or the applicable foreign regulatory agency's disagreement with the interpretation of data from nonclinical studies or clinical trials;
- our inability to demonstrate the clinical and other benefits of our product candidates outweigh any safety or other perceived risks;
- the FDA's or the applicable foreign regulatory agency's requirement for additional nonclinical studies or clinical trials;
- the FDA's or the applicable foreign regulatory agency's disagreement regarding the formulation, labeling and/or the specifications for our product candidates; or
- the potential for approval policies or regulations of the FDA or the applicable foreign regulatory agencies to significantly change in a manner rendering our clinical data insufficient for approval.

Of the large number of drugs in development, only a small percentage complete the FDA or foreign regulatory approval processes and are successfully commercialized. The lengthy review process as well as the unpredictability of future clinical trial results may result in our failing to obtain regulatory approval, which would significantly harm our business, financial condition, results of operations and prospects.

Even if we eventually receive approval of an NDA or foreign marketing application for our product candidates, the FDA or the applicable foreign regulatory agency may grant approval contingent on the performance of costly additional clinical trials, often referred to as Phase 4 clinical trials, and the FDA may require the implementation of a REMS which may be required to ensure safe use of the drug after approval. The FDA or the applicable foreign regulatory agency also may approve a product candidate for a more limited indication or patient population than we originally requested, and the FDA or applicable foreign regulatory agency may not approve the labeling that we believe is necessary or desirable for the successful commercialization of a product candidate. Any delay in obtaining, or inability to obtain, applicable regulatory approval would delay or prevent commercialization of that product candidate and would materially adversely impact our business and prospects.

A fast track designation may not actually lead to a faster development or regulatory review or approval process.

We have received fast track designation for tebipenem HBr for the treatment of cUTIs, including pyelonephritis, in adult patients who have limited oral treatment options, as well as fast track designation for SPR720 for treatment of adult patients with NTM pulmonary disease, and we may seek fast track designation for one or more of our other product candidates in the future. If a drug is intended for the treatment of a serious condition and nonclinical or clinical data demonstrate the potential to address unmet medical need for this condition, a drug sponsor may apply for fast track designation by the FDA for the particular indication under study. If fast track designation is obtained, the FDA may initiate review of sections of an NDA before the application is complete. This "rolling review" is available if the applicant provides and the FDA approves a schedule for the remaining information. If we seek fast track designation for a product candidate, we may not receive it from the FDA. However, even if we receive fast track designation, fast track designation does not ensure that we will receive marketing approval or that approval will be granted within any particular timeframe. We may not experience a faster development or regulatory review or approval process with fast track designation compared to conventional FDA procedures. In addition, the FDA may withdraw fast track designation if it believes that the designation is no longer supported by data from our clinical development program. Fast track designation alone does not guarantee qualification for the FDA's priority review procedures.

Priority review designation by the FDA may not lead to a faster regulatory review or approval process and, in any event, does not assure FDA approval.

If the FDA determines that a product candidate intended to treat a serious disease, if approved, would provide a significant improvement in safety or effectiveness of the treatment of the disease, the FDA may designate the drug application for that product candidate for priority review. A priority review designation means that the goal for the FDA to review the marketing application is six months from the date of NDA acceptance for filing, rather than the standard review period of ten months from the date of NDA acceptance for filing. In January 2022, FDA accepted our NDA for tebipenem HBr and granted it a priority review designation, with a June 27, 2022 target action date. A priority review designation does not necessarily mean a faster regulatory review process or necessarily confer any advantage with respect to approval compared to conventional FDA procedures. Receiving a priority review designation from the FDA does not guarantee approval of the drug application within the six-month review cycle or any time thereafter. For example, in May 2022, we announced that we are suspending current commercialization activities for tebipenem HBr based on feedback from our LCM with the FDA, and during our subsequent Type A meeting, the FDA indicated that positive results from a single additional Phase 3 clinical trial supported by confirmatory nonclinical evidence of efficacy could be sufficient to support the approval of tebipenem HBr for the treatment of cUTI, including pyelonephritis for a limited use indication.

In March 2020, the FDA granted orphan drug designation for SPR720. We may seek orphan drug designation for certain of our other product candidates. We may not be able to obtain or maintain orphan drug designations for any of our other product candidates, and we may be unable to take advantage of the benefits associated with orphan drug designation, including the potential for market exclusivity.

Regulatory authorities in some jurisdictions, including the United States, may designate drugs for relatively small patient populations as orphan drugs. Under the Orphan Drug Act of 1983, the FDA may designate a product as an orphan product if it is intended to treat a rare disease or condition, which is generally defined as a patient population of fewer than 200,000 individuals in the United States, or a patient population of greater than 200,000 individuals in the United States, but for which there is no reasonable expectation that the cost of developing the drug will be recovered from sales in the United States. There can be no assurance that the FDA will grant orphan designation for any indication for which we apply.

In the United States, orphan designation entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages and user-fee waivers. In addition, if a product candidate that has orphan drug designation subsequently receives the first FDA approval for the disease for which it has such designation, it is entitled to orphan drug exclusivity, which means that the FDA may not approve any other applications, including an NDA, to market the same drug for the same indication for seven years, except in limited circumstances, such as a showing of clinical superiority to the product with orphan drug exclusivity or where the manufacturer is unable to assure sufficient product quantity.

Even though we have obtained orphan drug designation for SPR720 and may seek orphan drug designation for other product candidates in the future, there is no assurance that we will be the first to obtain marketing approval for NTM infection or for any particular rare indication. Further, even though we have obtained orphan drug designation for SPR720, or even if we obtain orphan drug designation for other product candidates, such designation may not effectively protect us from competition because different drugs can be approved for the same condition and the same drug can be approved for different conditions and potentially used off-label in the orphan indication. Even after an orphan drug is approved, the FDA can subsequently approve a competing drug for the same condition for several reasons, including, if the FDA concludes that the later drug is safer or more effective or makes a major

contribution to patient care. Orphan drug designation neither shortens the development time or regulatory review time of a drug, nor gives the drug any advantage in the regulatory review or approval process.

If approved for commercial marketing in the United States, our product candidates may face generic competition sooner than anticipated.

Even if we are successful in achieving regulatory approval to commercialize a product candidate, it may face competition from generic products earlier or more aggressively than anticipated, depending upon how well our future products perform in the United States prescription drug market. In addition to creating the 505(b)(2) NDA pathway, the Hatch-Waxman Amendments to the FDCA authorized the FDA to approve generic drugs that are the same as drugs previously approved for marketing under the NDA provisions of the statute pursuant to abbreviated new drug applications ("ANDAs"). An ANDA relies on the preclinical and clinical testing conducted for a previously approved reference listed drug ("RLD"), and must demonstrate to the FDA that the generic drug product is identical to the RLD with respect to the active ingredients, the route of administration, the dosage form, and the strength of the drug and also that it is “bioequivalent” to the RLD. The FDA is prohibited by statute from approving an ANDA when certain marketing or data exclusivity protections apply to the RLD.

If the FDA ultimately approves tebipenem HBr for the treatment of cUTI, including pyelonephritis, caused by certain microorganisms in adult patients who have limited oral treatment options, we expect that it will be designated by the agency as an RLD and that it will be eligible for five-year new chemical entity exclusivity under the Hatch-Waxman provisions of the FDCA. This exclusivity period would block FDA from approving either a subsequent ANDA or 505(b)(2) NDA that references our future NDA, if approved. The QIDP designation granted by FDA to this drug product and indication also make it eligible for a further five-year extension of that Hatch-Waxman exclusivity. We cannot predict the interest of potential generic competitors in the future market for such an approved treatment for cUTI, whether someone will attempt to invalidate our period of exclusivity or otherwise force the FDA to take other actions, or how quickly others may seek to come to market with competing products after the applicable exclusivity period ends. Future product candidates may also receive marketing exclusivity under the FDCA after approval that may similarly be subject to challenge or uncertainty.

If we or our partners are unable to obtain marketing approval in international jurisdictions, we will not be able to market our product candidates abroad.

In order to market and sell our product candidates in the European Union and many other jurisdictions, we or our partners must obtain separate marketing approvals and comply with numerous and varying regulatory requirements. Approval by the FDA does not ensure approval by regulatory authorities in other countries or jurisdictions, and approval by one regulatory authority outside the United States does not ensure approval by regulatory authorities in other countries or jurisdictions or by the FDA. The approval procedure varies among countries and can involve additional testing. In addition, clinical trials conducted in one country may not be accepted by regulatory authorities in other countries. The time required to obtain approval from regulatory authorities in other countries may differ substantially from that required to obtain FDA approval. The regulatory approval process outside the United States generally includes all of the risks associated with obtaining FDA approval. In addition, in many countries outside the United States, it is required that the product be approved for reimbursement before the product can be approved for sale in that country. We or our partners may not obtain approvals from regulatory authorities outside the United States on a timely basis or at all.

If we receive regulatory approval for any of our product candidates, we will be subject to ongoing obligations and continuing regulatory review, which may result in significant additional expense. Our product candidates, if approved, could be subject to restrictions or withdrawal from the market, and we may be subject to penalties if we fail to comply with regulatory requirements or if we experience unanticipated problems with our product candidates, when and if approved.

Any product candidate for which we obtain marketing approval will also be subject to ongoing regulatory requirements for labeling, packaging, storage, distribution, advertising, promotion, record keeping and submission of safety and other post-market information. For example, approved products, manufacturers and manufacturers’ facilities are required to comply with extensive FDA requirements, including ensuring that quality control and manufacturing procedures conform to cGMPs. As such, we and our contract manufacturers will be subject to continual review and periodic inspections to assess compliance with cGMPs. We and others with whom we work must continue to expend time, money and effort in all areas of regulatory compliance, including manufacturing, production and quality control. We will also be required to report certain adverse reactions and production problems, if any, to the FDA and to comply with requirements concerning advertising and promotion for our products.

In addition, even if marketing approval of a product candidate is granted, the approval may be subject to limitations on the indicated uses for which the product may be marketed, may be subject to significant conditions of approval or may impose requirements for costly post-marketing testing and surveillance to monitor the safety or efficacy of the product. The FDA may also require a REMS as a condition of approval of our product candidates, which could include requirements for a medication guide, physician communication plans or additional elements to ensure safe use, such as restricted distribution methods, patient registries and

other risk minimization tools. The FDA closely regulates the post-approval marketing and promotion of drugs to ensure that drugs are marketed only for the approved indications and in accordance with the provisions of the approved labeling and regulatory requirements. The FDA also imposes stringent restrictions on manufacturers' communications regarding off-label use and if we do not restrict the marketing of our products only to their approved indications, we may be subject to enforcement action for off-label marketing.

If a regulatory agency discovers previously unknown problems with a product, such as adverse events of unanticipated severity or frequency, or problems with the facility where the product is manufactured, or disagrees with the promotion, marketing or labeling of a product, it may impose restrictions on that product or us. In addition, if any product fails to comply with applicable regulatory requirements, a regulatory agency may:

- issue warning letters, untitled letters or impose holds on clinical trials if any are still on-going;
- mandate modifications to promotional materials or require provision of corrective information to healthcare practitioners;
- impose restrictions on the product or its manufacturers or manufacturing processes;
- impose restrictions on the labeling or marketing of the product;
- impose restrictions on product distribution or use;
- require post-marketing studies or clinical trials;
- require withdrawal of the product from the market;
- refuse to approve pending applications or supplements to approved applications that we submit;
- require recall of the product;
- require entry into a consent decree, which can include imposition of various fines (including restitution or disgorgement of profits or revenue), reimbursements for inspection costs, required due dates for specific actions and penalties for noncompliance;
- suspend or withdraw marketing approvals;
- refuse to permit the import or export of the product;
- seize or detain supplies of the product; or
- issue injunctions or impose civil or criminal penalties.

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

Our relationships with customers and third-party payors will be subject to applicable anti-kickback, fraud and abuse and other healthcare laws and regulations, which could expose us to criminal sanctions, civil penalties, contractual damages, reputational harm and diminished profits and future earnings.

Healthcare providers, physicians and third-party payors will play a primary role in the recommendation and prescription of any product candidates for which we may obtain marketing approval. Our future arrangements with third-party payors and customers will expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell and distribute any products for which we obtain marketing approval and reimbursement. These laws and regulations include, for example, the false claims and anti-kickback statutes and regulations. At such time as we market, sell and distribute any products for which we obtain marketing approval and reimbursement, it is possible that our business activities could be subject to challenge under one or more of these laws and regulations. Restrictions under applicable federal and state healthcare laws and regulations include the following:

- the federal healthcare Anti-Kickback Statute, among other things, prohibits persons from knowingly and willfully soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward either the referral of an individual for, or the purchase, order or recommendation of, any good or service for which payment may be made under federally funded healthcare programs such as Medicare and Medicaid. A person or entity does not need to have actual knowledge of the statute or specific intent to violate the statute in order to have committed a violation. In addition, the government may assert that a claim that includes items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the False Claims Act;

- the federal False Claims Act imposes criminal and civil penalties, which can be enforced by private citizens through civil whistleblower and qui tam actions, against individuals or entities for knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent or making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government;
- the federal Health Insurance Portability and Accountability Act of 1996 ("HIPAA") imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program or for making any false statements relating to healthcare matters; as in the case of the federal healthcare Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate the statute in order to have committed a violation;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act, also imposes obligations on certain covered entities as well as their business associates that perform services involving the use or disclosure of protected health information, including mandatory contractual terms, with respect to safeguarding the privacy and security of protected health information, and requires notification to affected individuals and regulatory authorities of certain breaches of security of protected health information;
- the federal false statements statute prohibits knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services;
- the federal transparency or “sunshine” requirements under the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Affordability Reconciliation Act (collectively, the "ACA") requires manufacturers of drugs, devices, biologics and medical supplies covered by Medicare or Medicaid to report, on an annual basis, to the United States Department of Health and Human Services ("DHHS"), information related to payments and other transfers of value to physicians (defined to include doctors, dentists, optometrists, podiatrists, chiropractors and certain advanced non-physician health care practitioners), teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members; and
- analogous state laws and regulations, such as state anti-kickback and false claims laws, may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers, and some state laws require pharmaceutical companies to implement compliance programs and to track and report gifts, compensation and other remuneration provided to physicians, in addition to requiring drug manufacturers to report information related to payments to physicians and other healthcare providers or marketing expenditures and pricing information. State laws also govern the privacy and security of health information in some circumstances, and many such state laws differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

We will be required to spend substantial time and money to ensure that our business arrangements with third parties, and our business generally, comply with applicable healthcare laws and regulations. Even then, governmental authorities may conclude that our business practices, including arrangements we may have with physicians and other healthcare providers, do not comply with current or future statutes, regulations or case law involving applicable fraud and abuse or other healthcare laws and regulations. If governmental authorities find that our operations violate any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, imprisonment, fines, exclusion from government funded healthcare programs, such as Medicare and Medicaid, and we may be required to curtail or restructure our operations. Moreover, we expect that there will continue to be federal and state laws and regulations, proposed and implemented, that could affect our operations and business. For example, in November 2020, DHHS finalized significant changes to the regulations implementing the Anti-Kickback Statute, as well as the civil monetary penalty rules regarding beneficiary inducements, with the goal of offering the healthcare industry more flexibility and reducing the regulatory burden associated with those fraud and abuse laws, particularly with respect to value-based arrangements among industry participants. The extent to which future legislation or regulations, if any, relating to healthcare fraud and abuse laws or enforcement, may be enacted or what effect such legislation or regulation would have on our business remains uncertain.

Recently enacted and future policies and legislation may increase the difficulty and cost for us to obtain marketing approval of and commercialize our product candidates and may affect the reimbursement made for any product candidate for which we receive marketing approval.

The pricing and reimbursement environment may become more challenging due to, among other reasons, policies advanced by the presidential administration, federal agencies, new healthcare legislation passed by the United States Congress or fiscal challenges faced by all levels of government health administration authorities. Among policy makers and payors in the United States and foreign countries, there is significant interest in promoting changes in healthcare systems with the stated goals of containing healthcare costs, improving quality and expanding access to healthcare. In the United States, the pharmaceutical industry has been a particular focus of

these efforts and has been significantly affected by major legislative initiatives. We expect to experience pricing pressures in connection with the sale of any products for which we obtain marketing approval, due to the trend toward managed healthcare, the increasing influence of health maintenance organizations and additional legislative proposals. Resulting legislative, administrative, or policy changes from payors may reduce payments for any products for which we obtain marketing approval and could affect future revenues.

The ACA became law in the United States in March 2010 with the goals of broadening access to health insurance, reducing or constraining the growth of healthcare spending, enhancing remedies against fraud and abuse, adding new transparency requirements for the health care and health insurance industries and imposing additional health policy reforms. Provisions of ACA may negatively affect our future revenues. For example, the ACA requires, among other things, that annual fees be paid by manufacturers for certain branded prescription drugs, that manufacturers participate in a discount program for certain outpatient drugs under Medicare Part D, and that manufacturers provide increased rebates under the Medicaid Drug Rebate Program for outpatient drugs dispensed to Medicaid recipients. The ACA also addresses a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for line extensions and expands oversight and support for the federal government's comparative effectiveness research of services and products.

Since its enactment, there have been judicial and Congressional challenges to certain aspects of the ACA, and as a result certain sections of the ACA have not been fully implemented or effectively repealed. However, following several years of litigation in the federal courts, in June 2021, the U.S. Supreme Court upheld the ACA when it dismissed a legal challenge to the ACA's constitutionality. Further legislative and regulatory changes under the ACA remain possible, although the new federal administration under President Biden has signaled that it plans to build on the ACA and expand the number of people who are eligible for health insurance subsidies under it. It is unknown what form any such changes or any law would take, and how or whether it may affect the pharmaceutical industry as a whole or our business in the future. We expect that changes or additions to the ACA, the Medicare and Medicaid programs, such as changes allowing the federal government to directly negotiate drug prices, and changes stemming from other healthcare reform measures, especially with regard to healthcare access, financing or other legislation in individual states, could have a material adverse effect on the healthcare industry in the United States.

Beginning on April 1, 2013, Medicare payments for all items and services under Part A and B, including drugs and biologicals, and most payments to plans under Medicare Part D were reduced by 2%, or automatic spending reductions, required by the Budget Control Act of 2011 ("BCA"), as amended by the American Taxpayer Relief Act of 2012. The BCA requires sequestration for most federal programs, excluding Medicaid, Social Security, and certain other programs. The BCA caps the cuts to Medicare payments for items and services and payments to Part D plans at 2%. As long as these cuts remain in effect, they could adversely affect payment for our product candidates, if approved for commercial marketing. We expect that additional state and federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services, which could result in reduced demand for our product candidates or additional pricing pressures.

Moreover, there has been heightened governmental scrutiny over the manner in which manufacturers set prices for their marketed products. There have been several United States Congressional inquiries and proposed bills designed to, among other things, bring more transparency to drug pricing, reduce the cost of prescription drugs under Medicare, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drugs. Individual states in the United States have also become increasingly active in passing legislation and implementing regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. In December 2020, the U.S. Supreme Court held unanimously that federal law does not preempt the states' ability to regulate pharmaceutical benefit managers ("PBMs") and other members of the health care and pharmaceutical supply chain, an important decision that may lead to further and more aggressive efforts by states in this area.

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 the FDA regulations, guidance or interpretations will be changed, or what the effect of such changes on the marketing approvals of our product candidates, if any, may be. As another example, in 2020, the FDA finalized a rulemaking to establish a system whereby state governmental entities could lawfully import and distribute prescription drugs sourced from Canada. The drug pricing plan released by DHHS in September 2021 in response to the executive order makes clear that the Biden Administration supports aggressive action to address rising drug prices, including allowing DHHS to negotiate the cost of Medicare Part B and D drugs, but such significant changes will require either new legislation to be passed by Congress or time-consuming administrative actions. In addition, increased scrutiny by the United States Congress of the FDA's approval process may significantly delay or prevent marketing approval, as well as subject us to more stringent product labeling and post-marketing testing and other requirements. The Federal Trade Commission in mid-2022 also launched sweeping investigations into the practices of the PBM industry that could lead to additional federal and state legislative or regulatory proposals targeting such entities' operations, pharmacy networks, or financial arrangements. Significant

efforts to change the PBM industry as it currently exists in the U.S. may affect the entire pharmaceutical supply chain and the business of other stakeholders, including biopharmaceutical developers like us.

We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative or executive action, either in the United States or abroad. We expect that additional state and federal health care reform measures will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for health care products and services.

If we successfully commercialize one of our product candidates, failure to comply with our reporting and payment obligations under United States governmental pricing programs could have a material adverse effect on our business, financial condition and results of operations.

If we participate in the Medicaid Drug Rebate Program if and when we successfully commercialize a product candidate, we will be required to report certain pricing information for our product to the Centers for Medicare & Medicaid Services, the federal agency that administers the Medicaid and Medicare programs. We may also be required to report pricing information to the United States Department of Veterans Affairs. If we become subject to these reporting requirements, we will be liable for errors associated with our submission of pricing data, for failure to report pricing data in a timely manner, and for overcharging government payers, which can result in civil monetary penalties under the Medicaid statute, the federal civil False Claims Act, and other laws and regulations.

Additionally, the 2021 Consolidated Appropriations Act signed into law on December 27, 2020 incorporated extensive healthcare provisions and amendments to existing laws, which includes a requirement that all manufacturers of drug products covered under Medicare Part B report the product's average sales price ("ASP") to DHHS beginning on January 1, 2022, subject to enforcement via civil money penalties.

Our employees, independent contractors, principal investigators, contract research organizations, consultants or vendors may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements.

We are exposed to the risk that our employees, independent contractors, principal investigators, contract research organizations, consultants or vendors may engage in fraudulent or other illegal activity. Misconduct by these parties could include intentional, reckless and/or negligent conduct or disclosure of unauthorized activities to us that violates: FDA regulations, including those laws requiring the reporting of true, complete and accurate information to the FDA; manufacturing standards; federal and state healthcare fraud and abuse laws and regulations; or laws that require the true, complete and accurate reporting of financial information or data. Specifically, sales, marketing and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Activities subject to these laws also involve the improper use or misrepresentation of information obtained in the course of clinical trials or creating fraudulent data in our preclinical studies or clinical trials, which could result in regulatory sanctions and serious harm to our reputation. It is not always possible to identify and deter misconduct by our employees and other third parties, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. Additionally, we are subject to the risk that a person could allege such fraud or other misconduct, even if none occurred. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, including the imposition of civil, criminal and administrative penalties, damages, monetary fines, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, contractual damages, reputational harm, diminished potential profits and future earnings, and curtailment of our operations, any of which could adversely affect our business, financial condition, results of operations or prospects.

Inadequate funding for the FDA, the SEC and other government agencies could hinder their ability to hire and retain key leadership and other personnel, prevent our product candidates from being developed or commercialized in a timely manner or otherwise prevent those agencies from performing normal business functions on which the operation of our business relies, which could negatively impact our business.

The ability of the FDA to review and approve new products can be affected by a variety of factors, including government budget and funding levels, ability to hire and retain key personnel and accept the payment of user fees, and statutory, regulatory and policy changes. Average review times at the agency have fluctuated in recent years as a result. In addition, government funding of the SEC and other government agencies on which our operations may rely, including those that fund research and development activities is subject to the political process, which is inherently fluid and unpredictable.

Disruptions at the FDA and other agencies may also slow the time necessary for new drugs to be reviewed and/or approved by necessary government agencies, which would adversely affect our business. For example, over the last several years, the United States

government has shut down several times and certain regulatory agencies, such as the FDA and the SEC, have had to furlough critical FDA, SEC and other government employees and stop critical activities. If a prolonged government shutdown occurs, it could significantly affect the ability of the FDA to timely review and process our regulatory submissions, which could have a material adverse effect on our business. Further, in our operations as a public company, future government shutdowns could impact our ability to access the public markets and obtain necessary capital in order to properly capitalize and continue our operations.

Risks Related to Employee Matters and Managing Growth

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

Our industry has experienced a high rate of turnover of management personnel in recent years. We are highly dependent on the development, regulatory, commercialization and business development expertise of Ankit Mahadevia, M.D., our President and Chief Executive Officer, as well as the other principal members of our management, scientific and clinical team. Although we have formal employment agreements with our executive officers, these agreements do not prevent them from terminating their employment with us at any time.

On May 3, 2022, we implemented a restructuring that reduced our workforce from 146 full-time employees as of December 31, 2021 to 41 full-time employees as of the end of the second quarter of 2022 following the restructuring. Pursuant to the restructuring and effective as of July 2, 2022, Cristina Larkin separated from us as our Chief Operating Officer and David Melnick, M.D. separated from us as our Chief Medical Officer. While we have confidence in our remaining leadership team, including the board of directors, the restructuring may cause concerns from third parties with whom we do business and may increase the likelihood of turnover of other key officers and employees.

If we lose one or more of our other executive officers or key employees, our ability to implement our business strategy successfully could be seriously harmed. 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 develop, gain regulatory approval of and commercialize product candidates successfully. Competition to hire from this limited pool is intense, and we may be unable to hire, train, retain or motivate these additional key personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for similar personnel. We also experience competition for the hiring of scientific and clinical personnel from universities and research institutions. In addition, we rely on consultants and advisors, including scientific and clinical advisors, to assist us in formulating our research and development and commercialization strategy. Our consultants and advisors may be engaged by entities other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us. If we are unable to continue to attract and retain high quality personnel, our ability to develop and commercialize product candidates will be limited.

We have undertaken internal restructuring activities that could result in disruptions to our business or otherwise materially harm our results of operations or financial condition.

There can be no assurance that our restructuring will achieve the cost-savings, operating efficiencies or other benefits that we may initially expect. Restructuring activities may also result in a loss of continuity, accumulated knowledge and inefficiency during transitional periods and thereafter. In addition, internal restructurings can require a significant amount of time and focus from management and other employees, which may divert attention from operations. Further, our restructuring may result in unexpected expenses or liabilities and/or write-offs. If our restructuring fail to achieve some or all of the expected benefits therefrom, our cash resources may not last as long as estimated and our business, results of operations and financial condition could be materially and adversely affected.

If foreign approvals are obtained, we will be subject to additional risks in conducting business in international markets.

Even if we are able to obtain approval for commercialization of a product candidate in a foreign country, we will be subject to additional risks related to international business operations, including:

- potentially reduced protection for intellectual property rights;
- the potential for so-called parallel importing, which is what happens when a local seller, faced with high or higher local prices, opts to import goods from a foreign market (with low or lower prices) rather than buying them locally;
- unexpected changes in tariffs, trade barriers and regulatory requirements;
- economic weakness, including inflation, or political instability in particular foreign economies and markets;
- workforce uncertainty in countries where labor unrest is more common than in the United States;

- production shortages resulting from any events affecting a product candidate and/or finished drug product supply or manufacturing capabilities abroad;
- business interruptions resulting from geo-political actions, including war and terrorism, health epidemics or natural disasters, including earthquakes, hurricanes, typhoons, floods and fires; and
- failure to comply with Office of Foreign Asset Control rules and regulations and the Foreign Corrupt Practices Act.

These and other risks may materially adversely affect our ability to attain or sustain revenue from international markets.

Risks Related to Our Common Stock

The price of our common stock may be volatile and fluctuate substantially, which could result in substantial losses for our stockholders.

Our stock price may be volatile. The stock market in general and the market for smaller pharmaceutical and biotechnology companies in particular have experienced extreme volatility that has often been unrelated to the operating performance of particular companies. As a result of this volatility, our stockholders may not be able to sell their shares at or above the price they paid for their shares. The market price for our common stock may be influenced by many factors, including:

- the success of existing or new competitive products or technologies;
- the timing of clinical trials of our product candidates;
- results of clinical trials of any of our product candidates;
- failure or discontinuation of any of our development programs;
- results of clinical trials of product candidates of our competitors;
- regulatory or legal developments in the United States and other countries;
- the perception of the pharmaceutical and biotechnology industry by the public, legislatures, regulators and the investment community;
- developments or disputes concerning patent applications, issued patents or other proprietary rights;
- the recruitment or departure of key personnel;
- the level of expenses related to any of our product candidates or clinical development programs;
- the results of our efforts to develop, in-license or acquire additional product candidates or products;
- actual or anticipated changes in estimates as to financial results or development timelines;
- announcement or expectation of additional financing efforts;
- sales of our common stock by us, our insiders or other stockholders;
- variations in our financial results or those of companies that are perceived to be similar to us;
- changes in estimates or recommendations by securities analysts, if any, that cover our stock;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors;
- general economic, industry and market conditions; and
- the other factors described in this “Risk Factors” section.

In addition, the stock market has experienced significant volatility, particularly with respect to pharmaceutical, biotechnology and other life sciences company stocks. The volatility of pharmaceutical, biotechnology and other life sciences company stocks often does not relate to the operating performance of the companies represented by the stock. In the past, 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 in the past failed to satisfy certain continued listing requirements of the Nasdaq Global Select Market and could fail to satisfy those requirements again in the future, which could negatively affect the market price of our common stock, our liquidity and our ability to raise capital. Our potential failure to meet the continued listing requirements of Nasdaq Global Select Market in the future could result in a delisting of our common stock.

Our common stock is listed on the Nasdaq Global Select Market ("Nasdaq GS"), which imposes, among other requirements, a minimum $1.00 per share bid price requirement for continued inclusion on the Nasdaq GS pursuant to Nasdaq Listing Rule 5450(a)(1) (the "Bid Price Requirement"). The closing bid price for our common stock must remain at or above $1.00 per share to comply with the Bid Price Requirement for continued listing. On August 8, 2022 we received a deficiency letter (the "Notice") from the Listing Qualifications Department of the Nasdaq Stock Market, LLC ("Nasdaq") notifying us that, for the preceding 30 consecutive trading days, the closing bid price of our common stock was below the Bid Price Requirement. In accordance with Nasdaq Listing Rule 5810(c)(3)(A), we had until February 6, 2023 to regain compliance with the Bid Price Requirement. On October 6, 2022, we received a letter from Nasdaq notifying us that the closing bid price of our common stock was at least $1.00 per share for a minimum of 10 consecutive trading days and that we had regained compliance with the Bid Price Requirement. Our common stock continues to be eligible for listing on the Nasdaq GS.

There can be no assurance that we will be able to keep the closing bid price above $1.00 per share. If we fail to satisfy the continued listing requirements of Nasdaq GS, including the Bid Price Requirement, Nasdaq may provide us with another deficiency letter regarding the continued listing requirement. If we are unable to regain compliance with the Nasdaq Listing Rules in the future, Nasdaq may take steps to delist our common stock. Such a delisting from the Nasdaq GS could make trading our common stock more difficult for investors, potentially leading to declines in our share price and liquidity. If our common stock is delisted by the Nasdaq GS, our common stock may be eligible to trade on the Nasdaq Capital Market or an over-the-counter quotation system, where an investor may find it more difficult to sell our stock or obtain accurate quotations as to the market value of our common stock. We cannot assure you that our common stock, if delisted from the Nasdaq GS, will be listed on another national securities exchange or quoted on an over-the counter quotation system.

We intend to actively monitor the closing bid price of our common stock and may, if appropriate, consider implementing available options to maintain compliance with the minimum bid price requirement under the Nasdaq Listing Rules.

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

The trading market for our common stock relies in part on the research and reports that securities or industry analysts publish about us or our business. If few analysts provide coverage of us, the trading price of our stock would likely decline. If one or more of the analysts covering our business downgrade our stock or change their opinion of our stock, our share price would likely decline. In addition, 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 could cause our share price or trading volume to decline.

We can issue and have issued shares of preferred stock, which may adversely affect the rights of holders of our common stock.

Our amended and restated certificate of incorporation, as amended, authorizes us to issue up to 10,000,000 shares of preferred stock with designations, rights and preferences determined from time-to-time by our board of directors. Accordingly, our board of directors is empowered, without stockholder approval, to issue preferred stock with dividend, liquidation, conversion, voting or other rights superior to those of holders of our common stock. For example, an issuance of shares of preferred stock could:

- adversely affect the voting power of the holders of our common stock;
- make it more difficult for a third party to gain control of us;
- discourage bids for our common stock at a premium;
- limit or eliminate any payments that the holders of our common stock could expect to receive upon our liquidation; or
- otherwise adversely affect the market price or our common stock.

We have in the past issued, and we may at any time in the future issue, shares of preferred stock. In connection with our July 2018 public offering, we issued 2,220 shares of our Series A Convertible Preferred Stock ("Series A Preferred Stock") to certain affiliates of Biotechnology Value Fund, L.P. ("BVF"), each share of which was convertible into 1,000 shares of our common stock, subject to certain ownership restrictions. In November 2018, we entered into an exchange agreement with BVF to exchange 1,000,000 shares of our common stock previously held by BVF for 1,000 shares of our Series B Convertible Preferred Stock ("Series B Preferred Stock"), each share of which was convertible into 1,000 shares of our common stock, subject to certain ownership restrictions. In connection with our rights offering, which we launched in February 2020 and closed in early March 2020, we issued 2,287 shares of

our Series C Convertible Preferred Stock ("Series C Preferred Stock") to BVF, each share of which was convertible into 1,000 shares of our common stock, subject to certain ownership restrictions. In September 2020, in connection with our underwritten public offering, we issued 3,215,000 shares of our Series D Convertible Preferred Stock ("Series D Preferred Stock") to BVF, each share of which was convertible on a one-to-one basis into shares of our common stock, subject to certain ownership restrictions. As of December 31, 2022, all of the Series A Preferred Stock, Series B Preferred Stock, Series C Preferred Stock, and Series D Preferred stock has been converted into shares of our common stock. If any other future holders of our shares of preferred stock convert their shares into common stock, existing holders of our common stock will experience dilution.

We have broad discretion in the use of our cash reserves and may not use them effectively.

Our management has broad discretion in the application of our cash reserves and could spend these funds in ways that do not improve our results of operations or enhance the value of our common stock. The failure by our management to apply these funds effectively could result in financial losses that could have a material adverse effect on our business, cause the price of our common stock to decline and delay the development of our product candidates. Pending their use, we may invest our cash reserves in a manner that does not produce income or that loses value.

We are a smaller reporting company and the reduced disclosure requirements applicable to smaller reporting companies may make our common stock less attractive to investors.

We are subject to Section 404 of The Sarbanes-Oxley Act of 2002 ("Section 404") and the related rules of the SEC, which generally require our management and independent registered public accounting firm to report on the effectiveness of our internal control over financial reporting. However, for so long as we remain a "smaller reporting company" ("SRC") and non-accelerated filer, we intend to take advantage of certain exemptions from various reporting requirements, including, but not limited to, not being required to comply with the auditor attestation requirements of Section 404. Once we do not meet the definition of a SRC and non-accelerated filer or, if prior to such date, we opt to no longer take advantage of the applicable exemption, we will be required to include an opinion from our independent registered public accounting firm on the effectiveness of our internal controls over financial reporting. We could qualify as a SRC if the market value of our common stock held by non-affiliates is below $250.0 million (or $700.0 million if our annual revenue is less than $100.0 million) as of June 30 in any given year.

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

As a public company, we incur significant legal, accounting and other expenses that we did not incur as a private company. Sarbanes-Oxley, the Dodd-Frank Wall Street Reform and Consumer Protection Act, the listing requirements of the Nasdaq GS and other applicable securities rules and regulations impose various requirements on public companies, including establishment and maintenance of effective disclosure and financial controls and corporate governance practices. Our management and other personnel devote a substantial amount of time to these compliance initiatives. Moreover, these rules and regulations have increased our legal and financial compliance costs and have made some activities more time-consuming and costly. For example, these rules and regulations have made it more difficult and more expensive for us to obtain director and officer liability insurance, which could make it more difficult for us to attract and retain qualified members of our board of directors. These rules and regulations are often subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices.

Failure to maintain effective internal controls in accordance with Section 404 of Sarbanes-Oxley in the future could have a material adverse effect on our ability to produce accurate financial statements and on our stock price.

Section 404 of Sarbanes-Oxley requires us, on an annual basis, to review and evaluate our internal controls. To maintain compliance with Section 404, we are required to document and evaluate our internal control over financial reporting, which is both costly and challenging. We will need to continue to dedicate internal resources, continue to engage outside consultants and follow a detailed work plan to continue to assess and document the adequacy of internal control over financial reporting, continue to improve control processes as appropriate, validate through testing that controls are functioning as documented and implement a continuous reporting and improvement process for internal control over financial reporting. If we identify one or more material weaknesses, it could result in an adverse reaction in the financial markets due to a loss of confidence in the reliability of our financial statements.

A significant portion of our total outstanding shares may be sold into the market at any time, which could cause the market price of our common stock to decline significantly, even if our business is doing well.

Sales of a substantial number of shares of our common stock in the public market could occur at any time. These sales, or the perception in the market that the holders of a large number of shares of common stock intend to sell shares, could reduce the market price of our common stock. Our outstanding shares of common stock may be freely sold in the public market at any time to the extent permitted by Rules 144 and 701 under the Securities Act of 1933, or to the extent that such shares have already been registered under the Securities Act and are held by non-affiliates of ours. Moreover, holders of a substantial number of shares of our common stock have rights, subject to conditions, to require us to file registration statements covering their shares or to include their shares in

registration statements that we may file for ourselves or other stockholders. We also have registered all shares of common stock that we may issue under our equity compensation plans or that are issuable upon exercise of outstanding options. These shares can be freely sold in the public market upon issuance and once vested, subject to volume limitations applicable to affiliates. If any of these additional shares are sold, or if it is perceived that they will be sold, in the public market, the market price of our common stock could decline.

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

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all of our future earnings, if any, to finance the operation, development and growth of our business. To the extent that we enter into any future debt agreements, the terms of such agreements may also preclude us from paying dividends. As a result, capital appreciation, if any, of our common stock will be our stockholders' sole source of gain for the foreseeable future.

Provisions in our corporate charter documents and under Delaware law could make an acquisition of us, which may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management.

Provisions in our amended and restated certificate of incorporation, as amended, and amended and restated bylaws may discourage, delay or prevent a merger, acquisition or other change in control of us that our stockholders may consider favorable, including transactions in which our stockholders might otherwise receive a premium for their shares. These provisions could also limit the price that investors might be willing to pay in the future for shares of our common stock, thereby depressing the market price of our common stock. In addition, because our board of directors is responsible for appointing the members of our management team, these provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors. Among other things, these provisions:

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

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

In addition, our amended and restated certificate of incorporation, as amended, to the fullest extent permitted by law, provides that the Court of Chancery of the State of Delaware will be the exclusive forum for: any derivative action or proceeding brought on our behalf; any action asserting a breach of fiduciary duty; any action asserting a claim against us arising pursuant to the DGCL, our amended and restated certificate of incorporation, as amended, or our amended and restated bylaws; or any action asserting a claim against us that is governed by the internal affairs doctrine. This exclusive forum provision does not apply to suits brought to enforce a duty or liability created by the Exchange Act. It could apply, however, to a suit that falls within one or more of the categories enumerated in the exclusive forum provision and asserts claims under the Securities Act, inasmuch as Section 22 of the Securities Act creates concurrent jurisdiction for federal and state courts over all suits brought to enforce any duty or liability created by the Securities Act or the rule and regulations thereunder. There is uncertainty as to whether a court would enforce such provision with respect to claims under the Securities Act, and our stockholders will not be deemed to have waived our compliance with the federal securities laws and the rules and regulations thereunder.

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 any of our directors, officers, or other employees, which may discourage lawsuits with respect to such claims. Alternatively, if a court were to find the choice of forum provisions contained in our amended and restated certificate of incorporation, as amended, to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions, which could harm our business, results of operations and financial condition.

Provisions in our charter and other provisions of Delaware law could limit the price that investors are willing to pay in the future for shares of our common stock.

We may become involved in securities litigation that could divert management's attention and harm the company's business, and insurance coverage may not be sufficient to cover all costs and damages.

In the past, securities litigation has often followed certain significant business transactions, such as the announcement of a strategic restructuring, or the announcement of negative events, such as negative results from clinical trials. We may be exposed to such litigation even if no wrongdoing occurred. Litigation is usually expensive and diverts management's attention and resources, which could adversely affect our business and cash resources and our ability to execute on our partnership with GSK to eventually commercialize tebipenem HBr, or the ultimate value our stockholders receive in such partnership or other opportunity.

Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

Our headquarters are located in Cambridge, Massachusetts, where we lease approximately 23,400 square feet of office space. Our lease extends through July 2027. We believe that our existing facilities will be sufficient to meet our current needs.

Item 3. Legal Proceedings.

Two putative class action lawsuits were filed against us and certain of our officers in the United States District Court for the Eastern District of New York, one captioned Richard S. Germond v. Spero Therapeutics, Inc., Ankit Mahadevia, and Satyavrat Shukla, Case No. 1:22-cv-03125, filed on May 26, 2022, and the other captioned Kashif Memon v. Spero Therapeutics, Inc., Ankit Mahadevia, and Satyavrat Shukla Case No. 1:22-cv-04154, filed on July 15, 2022. The parties moved to consolidate the two complaints on July 22, 2022, which were ordered consolidated on August 5, 2022. Both Mr. Memon and stockholder Nabil Saad filed motions for appointment of lead plaintiff/lead counsel on July 25, 2022. Mr. Saad withdrew his opposition on August 15, 2022, and Mr. Memon was appointed lead plaintiff on September 19, 2022. The complaint purports to be brought on behalf of stockholders who purchased our common stock from May 6, 2021 through May 2, 2022 (Mr. Memon's complaint alleged a six-month longer class period than the complaint originally filed by Mr. Germond). The complaint generally alleges that we and certain of our officers violated Sections 10(b) and/or 20(a) of the Securities Exchange Act of 1934 and Rule 10b-5 promulgated thereunder by making allegedly false and/or misleading statements concerning the New Drug Application for tebipenem HBr in an effort to lead investors to believe that the drug would receive approval from the FDA. The complaint seeks unspecified damages, interest, attorneys' fees, and other costs. Mr. Memon filed an amended complaint on December 5, 2022. The amended complaint generally alleges the same arguments provided in the original complaint. We notified the Court of our intention to file a motion to dismiss the amended complaint in its entirety. The Court held a conference on February 22, 2023 and set a date of March 31, 2023 for us to file a motion to dismiss. We deny any allegations of wrongdoing and intend to vigorously defend against this lawsuit. However, there is no assurance that we will be successful in our defense or that insurance will be available or adequate to fund any settlement or judgment or the litigation costs of this action. Moreover, we are unable to predict the outcomes or reasonably estimate a range of possible loss at this time.

Additional lawsuits against the Company and certain of its officers or director may be filed in the future. If additional similar complaints are filed, absent new or different allegations that are material, the Company will not necessarily announce such additional filings.

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

Our common stock has been publicly traded on The Nasdaq Global Select Market under the symbol "SPRO" since the initial public offering of our common stock on November 2, 2017. Prior to that time, there was no public market for our common stock.

Holders of Record

As of March 1, 2023, we had approximately eight stockholders of record of our common stock. The actual number of stockholders is greater than this number of record holders and includes stockholders who are beneficial owners but whose shares are held in street name by brokers and other nominees.

Dividends

We have never declared or paid cash dividends on our capital stock since our inception. We currently intend to retain all available funds and future earnings, if any, for use in the operation of our business and do not anticipate paying any cash dividends on our common stock in the foreseeable future. Any future determination to declare and pay dividends will be made at the discretion of our board of directors and will depend on various factors, including applicable laws, our results of operations, our financial condition, our capital requirements, general business conditions, our future prospects and other factors that our board of directors may deem relevant. Additionally, our ability to pay dividends on our capital stock could be limited by terms and covenants of any future indebtedness.

Purchases of Equity Securities by the Issuer

None.

Item 6. [Reserved]

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 appearing elsewhere in 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 on Form 10-K, including information with respect to our plans and strategy for our business, includes forward-looking statements that involve risks and uncertainties. As a result of many factors, including those factors set forth in the "Risk Factors" section of this Annual Report on Form 10-K, our actual results could differ materially from the results described in, or implied by, the forward-looking statements contained in the following discussion and analysis.

Overview

We are a multi-asset, clinical-stage biopharmaceutical company focused on identifying, developing and commercializing novel treatments for bacterial infections, including MDR bacterial infections, and rare diseases. Our lead product candidate, SPR720, is an oral antimicrobial agent in development for the treatment of NTM pulmonary disease, a rare orphan disease, where treatment failure is common, and no approved therapies exist. We believe that SPR720, if successfully developed and approved, has the potential to be the first approved oral agent for NTM pulmonary infection. Our partnership-directed programs consist of tebipenem HBr and SPR206, which through our business development efforts, each have partnership relationships supporting their ongoing development. Tebipenem HBr is designed to be the first broad-spectrum oral carbapenem-class antibiotic for use to treat certain bacterial infections that cause cUTIs, including pyelonephritis, caused by certain microorganisms, in adult patients who have limited oral treatment options. SPR206 is an IV-administered agent being developed as an innovative option to treat MDR Gram-negative bacterial infections in the hospital setting.

We believe that our novel product candidates, if successfully developed and approved, would have meaningful patient impacts and significant commercial applications for the treatment of bacterial infections, including MDR infections, in both the community and hospital settings. Since our inception in 2013, we have focused substantially all of our efforts and financial resources on organizing and staffing our company, business planning, raising capital, acquiring and developing product and technology rights, building our intellectual property portfolio and conducting research and development activities for our product candidates. We do not have any products approved for sale and have not generated any revenue from product sales.

We have experienced net losses and significant cash outflows from cash used in operating activities since our inception. Our ability to generate product revenue sufficient to achieve profitability will depend heavily on the successful development and eventual commercialization of one or more of our product candidates. As of December 31, 2022, we had an accumulated deficit of $413.9 million, and cash and cash equivalents of $109.1 million. We expect to continue to incur significant expenses and increasing operating losses for at least the next several years. We believe that our existing cash and cash equivalents will enable us to fund our operating expenses and capital expenditure requirements for at least 12 months from the issuance of the financial statements included in this report. Based on our current operating plans, we believe that our cash runway will be sufficient to fund us beyond 2024. During this period, our strategic refocusing prioritizes advancing SPR720 and SPR206 to key Phase 2 milestones. Beyond this point we will need additional funding, which primarily consist of raising additional capital through some combination of equity or debt financings, potential new collaborations, additional grant funding and/or reducing cash expenditures. If we are not able to secure adequate additional funding, we plan to make reductions in spending. In that event, we may have to delay, scale back, or eliminate some or all of our planned clinical trials and research stage programs.

We will not generate revenue from product sales unless and until we successfully complete clinical development and obtain regulatory approval for our product candidates. If we obtain regulatory approval for any of our product candidates and do not enter into a commercialization partnership, we expect to incur significant expenses related to developing our internal commercialization capability to support product sales, marketing and distribution. Further, we expect to incur additional costs associated with our continued operation as a public company.

As a result, we will need substantial additional funding to support our continuing operations and pursue our growth strategy. Until such time as we can generate significant revenue from product sales, if ever, we expect to finance our operations through a combination of equity offerings, debt financings, government funding arrangements, collaborations, strategic alliances and marketing, distribution or licensing arrangements. We may be unable to raise additional funds or enter into such other agreements or arrangements when needed on favorable terms, or at all. If we fail to raise capital or enter into such agreements as, and when, needed, we may have to significantly delay, scale back or discontinue the development and commercialization of one or more of our product candidates.

Because of the numerous risks and uncertainties associated with pharmaceutical product development, we are unable to accurately predict the timing or amount of increased expenses or when or if we will be able to achieve or maintain profitability. Even if we are able to generate product sales, we may not become profitable. If we fail to become profitable or are unable to sustain profitability on a continuing basis, then we may be unable to continue our operations at planned levels and be forced to reduce or terminate our operations.

Components of Our Results of Operations

Sales Revenue

To date, we have not generated any revenue from product sales. If our development efforts for our product candidates are successful and result in regulatory approval, we may generate revenue in the future from product sales. We cannot predict if, when, or to what extent we will generate revenue from the commercialization and sale of our product candidates. We may never succeed in obtaining regulatory approval for any of our product candidates.

Grant Revenue

We expect that a portion of our revenue for the next few years will continue to be derived from payments under our government awards that we have currently entered into and that we may enter into in the future.

Collaboration Revenue

Collaboration revenue relates to our agreements with Everest, Pfizer and GSK.

Operating Expenses

Research and Development Expenses

Research and development expenses consist primarily of costs incurred for our research activities, including our drug discovery efforts, and the development of our product candidates, which include:

- employee-related expenses, including salaries, related benefits, travel and share-based compensation expense for employees engaged in research and development functions;
- expenses incurred in connection with the preclinical and clinical development of our product candidates, including under agreements with contract research organizations ("CROs");
- costs incurred in connection with our government awards;
- the cost of consultants and contract manufacturing organizations ("CMOs") that manufacture drug products for use in our preclinical studies and clinical trials;
- facilities, depreciation and other expenses, which include direct and allocated expenses for rent and maintenance of facilities, insurance and supplies; and
- payments made under third-party licensing agreements.

We have recorded research and development expenses conducted by our Australian subsidiary net of a 43.5% research and development tax incentive we expect to receive for qualified expenses from the Australian government.

In June 2019, we entered into a collaboration with Gates MRI to develop SPR720 for the treatment of lung infections caused by Mtb. In furtherance of the Gates MRI's charitable purposes, we also granted the Gates MRI a no cost, exclusive license to develop, manufacture and commercialize SPR720 for the treatment of TB in low- and middle- income countries. Gates MRI will conduct and fund preclinical and clinical studies for the development of SPR720 against TB and fund certain agreed upon collaborative research activities performed by us. Due to our assessment that we do not have a vendor/customer relationship with the Gates MRI, we recognize the funding received under the agreement as a reduction to the research and development expenses as the related expenses are incurred.

We expense research and development costs as incurred. Nonrefundable advance payments we make for goods or services to be received in the future for use in research and development activities are recorded as prepaid expenses. The prepaid amounts are expensed as the related goods are delivered or the services are performed.

Our direct research and development expenses are tracked on a program-by-program basis and consist primarily of external costs, such as fees paid to consultants, contractors, CMOs and CROs in connection with our preclinical and clinical development activities. License fees and other costs incurred after a product candidate has been designated and that are directly related to the

product candidate are included in direct research and development expenses for that program. License fees and other costs incurred prior to designating a product candidate are included in early stage research programs. We do not allocate employee costs, costs associated with our preclinical programs or facility expenses, including depreciation or other indirect costs, to specific product development programs because these costs are deployed across multiple product development programs and, as such, are not separately classified.

Product candidates in later stages of clinical development generally have higher development costs than those in earlier stages of clinical development, primarily due to the increased size and duration of later-stage clinical trials.

At this time, we cannot reasonably estimate or know the nature, timing and costs of the efforts that will be necessary to complete the preclinical and clinical development of any of our product candidates. The successful development and commercialization of our product candidates is highly uncertain. This is due to the numerous risks and uncertainties, including the following:

- successful completion of clinical trials with safety, tolerability and efficacy profiles that are satisfactory to the FDA or any comparable foreign regulatory authority, including on account of the disruptive impacts of the COVID-19 pandemic;
- receipt of marketing approvals from applicable regulatory authorities;
- establishment of arrangements with third-party manufacturers to obtain manufacturing supply;
- obtainment and maintenance of patent, trade secret protection and regulatory exclusivity, both in the United States and internationally, including our ability to maintain our license agreement with Meiji with respect to tebipenem HBr;
- protection of our rights in our intellectual property portfolio;
- launch of commercial sales our product candidates, if approved, whether alone or in collaboration with others;
- acceptance of our product candidates, if approved, by patients, the medical community and third-party payors;
- competition with other therapies; and
- a continued acceptable safety profile of tebipenem HBr and our other product candidates, if approved.

A change in the outcome of any of these variables with respect to the development of any of our product candidates would significantly change the costs and timing associated with the development of that product candidate. We may never succeed in obtaining regulatory approval for any of our product candidates.

General and Administrative Expenses

General and administrative expenses consist primarily of salaries and related costs, including share-based compensation, for personnel in executive, finance and administrative functions. General and administrative expenses also include direct and allocated facility-related costs as well as professional fees for legal, patent, consulting, investor and public relations, accounting and audit services. We also anticipate that we will continue to incur accounting, audit, legal, regulatory, compliance, infrastructure and director and officer insurance costs as well as investor and public relations expenses associated with our continued operation as a public company.

Restructuring

In light of our decision to suspend commercialization activities for tebipenem HBr and our strategic restructuring as announced in May 2022, our operating expenses were substantially reduced during the year ended December 31, 2022. We expect to continue to incur research and development and general and administrative expenses in 2023 to support activities under our subsequently announced GSK License Agreement that closed in November 2022. In connection with our restructuring, during the year ended December 31, 2022 we incurred approximately $11.6 million of costs in connection with the reduction in workforce related to severance pay and other restructuring costs. We incurred the majority of the costs associated with our restructuring during the second quarter of 2022.

Other Income (Expense)

Interest Income (Expense)

Interest income (expense) consists of interest expense related to the sale of future royalties and interest earned on our cash equivalents, which are primarily invested in money market accounts, as well as interest earned on our investments in marketable securities that we held during the years ended December 31, 2022 and 2021.

Other Income (Expense), Net

Other income (expense), net, consists of insignificant amounts of miscellaneous income, as well as the loss on extinguishment of liability related to the sale of future royalties, the change in the fair value of our derivative liability, realized and unrealized gains and losses from foreign currency-denominated cash balances, vendor payables and receivables from the Australian research and development tax incentive.

Income Taxes

Since our inception, we have not recorded any income tax benefits for the net losses we have incurred in each year or for our earned research and development tax credits, as we believe, based upon the weight of available evidence, that it is more likely than not that all of our net operating loss carryforwards and tax credits will not be realized. As of December 31, 2022, we had federal and state net operating loss carryforwards of $291.9 million and $282.9 million, respectively, which may be available to offset future income tax liabilities. The federal NOLs of $73.0 million will expire at various dates from 2033 to 2037 and approximately $218.9 million can be carried forward indefinitely. The state NOLs begin to expire in 2033 and will expire at various dates through 2039. In addition, as of December 31, 2022, we had foreign net operating loss carryforwards of $4.6 million, which may be available to offset future income tax liabilities and do not expire. As of December 31, 2022, we also had federal and state research and development tax credit carryforwards of $11.5 million and $2.8 million, respectively, which begin to expire in 2033 and 2028, respectively. We have recorded a full valuation allowance against our net deferred tax assets at each balance sheet date.

Critical Accounting Policies and Significant Judgments and Estimates

Our consolidated financial statements are prepared in accordance with generally accepted accounting principles in the United States ("GAAP"). The preparation of our consolidated financial statements and related disclosures requires us to make estimates, assumptions and judgments that affect the reported amount of assets, liabilities, revenue, costs and expenses, and related disclosures. We base our estimates on historical experience, known trends and events and various other factors that we believe are 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. We evaluate our estimates and assumptions on an ongoing basis. Our actual results may differ from these estimates under different assumptions or conditions.

We believe that the following accounting policies are those most critical to the judgments and estimates used in the preparation of our financial statements.

Funding Received from Government Contracts and Collaborations

Since our inception, we have been able to obtain partial funding for our research and development activities from government contracts, government tax incentives and collaboration arrangements. The classification within our statement of operations and comprehensive loss of the funding received under these arrangements is subject to management judgment based on the nature of the arrangements we enter into, the source of the funding and whether the funding is considered central to our business operations.

Government Contracts

We generate revenue from government contracts that reimburse us for certain allowable costs for funded projects. For contracts with government agencies, when we have concluded that we are the principal in conducting the research and development expenses and where the funding arrangement is considered central to our ongoing operations, we classify the recognized funding received as revenue. Revenue from government grants is recognized as the qualifying expenses related to the contracts are incurred, provided that there is reasonable assurance of recoverability. Revenue recognized upon incurring qualifying expenses in advance of receipt of funding is recorded as unbilled receivables, a component of prepaid expenses and other current assets, in the consolidated balance sheet.

We recognize funding received from BARDA, the DoD and the NIAID of the NIH, as revenue, rather than as a reduction of research and development expenses, because we are the principal in conducting the research and development activities and these contracts are central to our ongoing operations. We recognize revenue only after the qualifying expenses related to the contracts have been incurred, we are reasonably assured that the expenses will be reimbursed and the revenue is collectible. We record revenue recognized upon incurring qualifying expenses in advance of billing as unbilled revenue, which is included in other receivables in our consolidated balance sheet. The related costs incurred by us are included in research and development expense in our consolidated statements of operations and comprehensive loss.

Collaboration Agreements

For collaboration agreements with a third party, to determine the appropriate statement of operations classification of the recognized funding, we first assess whether the collaboration arrangement is within the scope of the accounting guidance for collaboration arrangements. If it is, we evaluate the collaborative arrangement for proper classification in the statement of operations based on the nature of the underlying activity and we assess the payments to and from the collaborative partner. If the payments to and from the collaborative partner are not within the scope of other authoritative accounting guidance, we base the statement of operations classification for the payments received on a reasonable, rational analogy to authoritative accounting guidance, applied in a consistent manner. Conversely, if the collaboration arrangement is not within the scope of accounting guidance for collaboration arrangements, we assess whether the collaboration arrangement represents a vendor/customer relationship. If the collaborative arrangement does not represent a vendor/customer relationship, we then classify the funding payments received in the statement of operations and comprehensive loss as a reduction of the related expense that is incurred.

Revenue Recognition - GSK License Agreement

In determining the accounting treatment for the GSK License Agreement, we developed assumptions to determine the stand-alone selling price for each performance obligation in the contract. We developed the estimated standalone selling price for the license using a discounted cash flow model. To develop this model, we applied significant judgement in the determination of the significant assumptions relating to forecasted future revenues, development time lines, the discount rate, and probabilities of technical and regulatory success. We developed the estimated standalone selling price for the research and development services using a discounted cash flow model. The assumptions to develop the estimated standalone selling price for the related research and development services include estimates of costs to be incurred to fulfill its obligations associated with the performance of the research and development services, plus a reasonable margin.

Accrued Research and Development Expenses

As part of the process of preparing our consolidated financial statements, we are required to estimate our accrued research and development expenses. This process involves reviewing open contracts and purchase orders, communicating with our applicable personnel to identify services that have been performed on our behalf and estimating the level of service performed and the associated cost incurred for the service when we have not yet been invoiced or otherwise notified of actual costs. The majority of our service providers invoice us in arrears for services performed, on a pre-determined schedule or when contractual milestones are met; however, some require advance payments. We make estimates of our accrued expenses as of each balance sheet date in the consolidated financial statements based on facts and circumstances known to us at that time. We periodically confirm the accuracy of the estimates with the service providers and make adjustments if necessary. Examples of estimated accrued research and development expenses include fees paid to:

- vendors in connection with the preclinical development activities;
- CMOs in connection with the production of preclinical and clinical trial materials;
- CROs in connection with preclinical and clinical studies; and
- investigative sites in connection with clinical trials.

We base our expenses related to preclinical studies and clinical trials on our estimates of the services received and efforts expended pursuant to quotes and contracts with multiple research institutions and CROs that conduct and manage preclinical studies and clinical trials on our behalf. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. There may be instances in which payments made to our vendors will exceed the level of services provided and result in a prepayment of the expense. In accruing service fees, we estimate the time period over which services will be performed and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from the estimate, we adjust the accrual or prepaid expense accordingly. Although we do not expect our estimates to be materially different from amounts actually incurred, our understanding of the status and timing of services performed relative to the actual status and timing of services performed may vary and may result in reporting amounts that are too high or too low in any particular period. To date, there have not been any material adjustments to our prior estimates of accrued research and development expenses.

Share-Based Compensation

We issue stock-based awards to employees and directors in the form of stock options and restricted stock units. We measure and recognize compensation expense for our stock-based awards granted to our employees and directors based on the estimated grant date fair value in accordance with Financial Accounting Standards Board ("FASB") Accounting Standards Codification Topic 718 ("ASC 718"), Compensation—Stock Compensation. We determine the fair value of restricted stock units based on the fair value of our common stock. We measure all share-based options granted to employees and directors based on the fair value on the date of grant

using the Black-Scholes option-pricing model, and we recognize compensation expense of those awards over the requisite service period, which is generally the vesting period of the respective award. Generally, we issue awards with only service-based vesting conditions and record the expense for these awards using the straight-line method. The Black-Scholes option-pricing model uses as inputs the fair value of our common stock and assumptions we make for the volatility of our common stock, the expected term of our common stock options and performance-based awards, the risk-free interest rate for a period that approximates the expected term of our common stock options and performance-based awards, and our expected dividend yield. In 2022, the Company granted certain awards with performance-based criteria. Certain performance-based awards are recorded as an accrued liability on the Company's condensed consolidated balance sheet and accrued over time as achievement of performance metrics become probable.

Restructuring

We made estimates and judgments regarding the amount and timing of our restructuring expense and liability, including one-time termination benefits and other exit costs accounted for upon the announcement of our restructuring in May 2022. Restructuring charges are reflected in our consolidated statements of income.

Results of Operations

Comparison of the Years Ended December 31, 2022 and 2021

The following table summarizes our results of operations for the years ended December 31, 2022 and 2021:

	Year Ended December 31,		
	2022	2021	$ Change
Revenues:			
Grant revenue	$ 4,930	$ 15,186	$ (10,256)
Collaboration revenue	48,579	3,070	45,509
Total revenues	53,509	18,256	35,253
Operating expenses:			
Research and development	47,593	64,526	(16,933)
General and administrative	36,483	41,701	(5,218)
Restructuring	11,630	—	11,630
Total operating expenses	95,706	106,227	(10,521)
Loss from operations	(42,197)	(87,971)	45,774
Other income (expense):			
Interest income	1,106	346	760
Other income (expense), net	(55)	(395)	340
Interest expense related to the sale of future royalties	(2,605)	(1,940)	(665)
Loss on extinguishment of liability related to the sale of future royalties	(3,581)	-	(3,581)
Change in fair value of derivative liability	917	204	713
Total other income (expense), net	(4,218)	(1,785)	(2,433)
Net loss	$ (46,415)	$ (89,756)	$ 43,341

Grant Revenue

	Year Ended December 31,		
	2022	2021	$ Change
BARDA Contract (Tebipenem HBr)	$ 2,178	$ 9,909	$ (7,731)
NIAID Contract (SPR206)	1,736	808	928
DoD Agreement (SPR206)	1,016	4,469	(3,453)
Total revenue	$ 4,930	$ 15,186	$ (10,256)

Grant revenue recognized during 2022 and 2021 consisted of the reimbursement of qualifying expenses incurred in connection with our various government awards. The decrease in revenue during 2022 was primarily due to a decrease of $7.7 million in funding under our BARDA contract for tebipenem HBr, a decrease of $3.5 million in funding under our DoD agreement relating to SPR206, partially offset by an increase of $0.9 million in qualified expenses incurred under our NIAID award relating to SPR206.

Collaboration Revenue

During the year ended December 31, 2022 we recognized collaboration revenue of $46.1 million related to our agreement with GSK, $1.8 million related to our agreement with Pfizer, and $0.7 million related to milestones earned under our agreement with Everest. During the year ended December 31, 2021 we recognized collaboration revenue of $1.8 million related to our agreement with Pfizer consisting primarily of the delivery of the license for SPR206 in ex-U.S. and ex-Asia territories and $1.3 million related to milestones earned under our agreement with Everest.

Research and Development Expenses

	Year Ended December 31,		
	2022	2021	$ Change
Direct research and development expenses by program:			
SPR720	$ 2,793	$ 2,156	$ 637
Tebipenem HBr	17,064	28,882	(11,818)
SPR206	4,424	6,249	(1,825)
Unallocated expenses:			
Personnel related (including share-based compensation)	18,918	22,667	(3,749)
Facility related and other	4,394	4,572	(178)
Total research and development expenses	$ 47,593	$ 64,526	$ (16,933)

Direct costs related to our SPR720 program increased by $0.6 million during 2022 compared to 2021, due to increased clinical and preclinical activity during the period related to our Phase 2a clinical trial of SPR720, which we initiated in the fourth quarter of 2022. We expect to continue to incur direct costs related to SPR720 as we progress preclinical and clinical activities. During the year ended December 31, 2022, we did not record a reduction to direct costs related to our SPR720 program related to activities funded by Gates MRI. During the year ended December 31, 2021, direct costs related to our SPR720 program reflected a $1.5 million reduction to expense related to activities funded by Gates MRI.

Direct costs related to our tebipenem HBr program decreased by $11.8 million during 2022 compared to 2021 primarily due to the reduced program activity as a result of our strategic restructuring announced in May 2022 and further described in Note 10 – Restructuring to the Financial Statements. During the year ended December 31, 2022, direct costs related to tebipenem HBr included $6.6 million paid to Meiji, as a percentage of certain amounts received from any sublicensees, out of the $7.5 million we are obligated to pay under the Meiji License.

Direct costs related to our SPR206 program decreased by $1.8 million during the year ended December 31, 2022, primarily due to decreased clinical activity during the period. We expect to continue to incur direct costs related to SPR206 as we progress preclinical and clinical activities.

The decrease in personnel-related costs of $3.7 million was primarily due to decreased research and development headcount costs related to our strategic restructuring. Personnel-related costs for the years ended December 31, 2022 and 2021 included share-based compensation expenses of $3.7 million and $4.2 million, respectively.

Facility-related and other costs primarily reflect costs related to supporting our research and development staff.

General and Administrative Expenses

	Year Ended December 31,		
	2022	2021	$ Change
Personnel related (including share-based compensation)	$ 20,433	$ 22,241	$ (1,808)
Professional and consultant fees	12,140	15,933	(3,793)
Facility related and other	3,910	3,527	383
Total general and administrative expenses	$ 36,483	$ 41,701	$ (5,218)

The decrease in personnel-related costs of $1.8 million was primarily a result of decreased headcount costs in our commercial and general and administrative functions as a result of our strategic restructuring. Personnel-related costs for the years ended December 31, 2022 and 2021 included share-based compensation expense of $5.4 million and $5.3 million, respectively.

The decrease in professional and consultant fees of $3.8 million was primarily due to decreased commercial operation expenses related to our strategic restructuring, partially offset by legal expenses.

Facility-related and other costs primarily reflect costs related to supporting our general and administrative staff.

Restructuring

During the year ended December 31, 2022, we incurred restructuring expenses of $11.6 million related to our strategic restructuring that we announced in May 2022. Restructuring expenses for the period were primarily comprised of $8.6 million of severance and other employee costs and $3.0 million of discontinuation costs such as contract termination fees and lease impairment expenses. For further information, refer to Note 10 – Restructuring to the Financial Statements.

Other Income (Expense), Net

Other income (expense), net was $(4.2) million during 2022, compared to $(1.8) million during 2021. Total other expense for the year ended December 31, 2022 included $2.6 million in interest expense related to the sale of future royalties, $3.6 million in loss on extinguishment of liability related to the sale of future royalties and net immaterial changes primarily due to fluctuations in unrealized foreign currency gains, offset by a $0.9 million net change in derivative liability and $1.1 million in interest income.

Liquidity and Capital Resources

Since our inception, we have incurred significant operating losses. We have recognized revenue to date from funding arrangements with the DoD, NIAID, CARB-X and BARDA and our license agreements with Everest, Pfizer and GSK. We have not yet commercialized any of our product candidates and we may not generate revenue from sales of any product candidates. To date, we have funded our operations with payments received under license and collaboration agreements and funding from government contracts, and mostly from the proceeds of multiple common stock offerings. As of December 31, 2022, we had cash and cash equivalents of $109.1 million.

Below is a summary of some of the items impacting our liquidity and capital resources in 2022:

- On May 3, 2022, we implemented a strategic restructuring initiative and corresponding reduction in workforce. The restructuring initiative and corresponding reduction in workforce was designed to reduce costs and reallocate resources towards the Company's clinical development programs for SPR720 and SPR206, while maintaining key personnel needed to help preserve the value of the tebipenem HBr program.
- On June 7, 2022, we entered into the Termination Agreement with HCR and HCR Collateral Management, LLC, as collateral agent for HCR under the previously disclosed Revenue Interest Agreement, pursuant to which the parties mutually terminated the HCR Agreements, and certain other related ancillary agreements, arrangements or understandings under or contemplated by the HCR Agreements. We were released from all of our obligations and the rights to any future revenues and collateral reverted back to us in return for a cash payment of $54.5 million. We recognized a loss on the extinguishment of $3.6 million, as reported on our condensed consolidated statement of operations and comprehensive loss.
- In September 2022, we entered into the GSK License Agreement with respect to tebipenem HBr. Pursuant to the GSK License Agreement, we received a $66.0 million upfront payment from GSK and are eligible to receive up to $525.0 million in development, sales, and commercial milestones payments, as well as low single-digit to low double-digit tiered royalties on net product sales. In exchange, GSK received an exclusive license to develop and commercialize tebipenem pivoxil and tebipenem pivoxil HBr in all territories, except Japan, and certain other Asian countries, territories which will be retained by our partner Meiji. In connection with the GSK License Agreement, an affiliate of GSK purchased 7,450,000 shares of the Company's common stock at a purchase price of approximately $1.20805 per share for an aggregate purchase price of $9.0 million.
- During the year ended December 31, 2022, we sold 5,963,294 shares of our common stock under the Sales Agreement at an average price of approximately $2.46 per share for aggregate gross proceeds of approximately $14.7 million prior to deducting sales commissions.

In addition, on January 19, 2022, we announced BARDA added and exercised a new option on the contract originally awarded to us in 2018. The new option increases the total amount of committed funding by $12.9 million to $46.9 million, increasing the total potential contract value to $59.7 million. As previously announced, the DTRA is providing up to approximately $10.0 million, in addition to the total potential award from BARDA, to cover the cost of the nonclinical biodefense aspects of the collaboration program for tebipenem HBr. In September 2022, remaining funding from the $12.9 million option was reprogrammed to support clinical trials for patients with cUTIs, including acute pyelonephritis. The period of performance for this new option extends through December 31, 2025 and does not change the total amount of committed funding or potential contract value.

Cash Flows

The following table summarizes our sources and uses of cash for the years ended December 31, 2022 and 2021:

	Year Ended December 31,	
	2022	2021
Cash used in operating activities	$ (7,731)	$ (64,347)
Cash provided by investing activities	33,807	7,672
Cash provided by (used in) financing activities	(29,553)	84,050
Net increase (decrease) in cash and cash equivalents	$ (3,477)	$ 27,375

Operating Activities

Net cash used in operating activities for the year ended December 31, 2022 was $7.7 million, primarily resulting from our net loss of $46.4 million, adjusted for net non-cash items of $16.6 million (primarily stock-based compensation, interest expense associated with the sale of future royalties, loss on extinguishment of liability related to the sale of future royalties, change in the value of derivative liabilities and depreciation and amortization expense). Net cash provided by changes in our operating assets and liabilities was $22.1 million and consisted primarily of a $21.9 million net increase in deferred revenue, a decrease of $5.9 million in accrued expenses and accounts payable, a $5.2 million decrease in prepaid expenses and other current assets and a $1.5 million net decrease in receivables related to our tax incentive receivables and government awards.

Net cash used in operating activities for the year ended December 31, 2021 was $64.3 million, primarily resulting from our net loss of $89.8 million, adjusted for net non-cash items of $12.5 million (primarily stock-based compensation, interest expense associated with the sale of future royalties and depreciation and amortization expense). Net cash provided by changes in our operating assets and liabilities was $12.9 million and consisted primarily of a $10.6 million net increase in deferred revenue, an increase of $2.1 million in accrued expenses and accounts payable, a $2.8 million increase in prepaid expenses and other current assets and a $3.8 million net decrease in receivables related to our tax incentive receivables and government awards and a $0.3 million net increase in other assets.

Changes in accounts payable, accrued expenses and other current liabilities and prepaid expenses and other current assets in all periods were generally due to the advancement of our development programs, the timing of vendor invoicing and payments and write-offs during the second quarter of 2022 related to our strategic restructuring. Changes in deferred revenue are primarily related to our license agreement with GSK.

Investing Activities

Net cash provided by investing activities for the year ended December 31, 2022 was $33.8 million, primarily related to the maturities of marketable securities of $60.8 million, offset by purchases of marketable securities of $27.0 million.

Net cash provided by investing activities for the year ended December 31, 2021 was $7.7 million, primarily related to the maturities of marketable securities of $51.5 million, offset by purchases of marketable securities of $43.9 million.

Financing Activities

Net cash used in financing activities for the year ended December 31, 2022 was $29.6 million, consisting primarily of the $54.5 million repayment of our liability related to the sales of future royalties, partially offset by net proceeds of $14.2 million from the sale of common stock under our “at-the-market” offering program Sales Agreement, proceeds of $9.0 million related to our GSK SPA, and proceeds of $0.4 million from the exercise of employee stock options.

Net cash provided by financing activities for the year ended December 31, 2021 was $84.1 million, consisting primarily of $47.3 million in proceeds from the sale of future royalties, net of transaction costs, $27.5 million in proceeds related to the Pfizer Purchase Agreement, net proceeds of $7.8 million from the sale of common stock under our “at-the-market” offering program Sales Agreement and proceeds of $1.5 million from the exercise of employee stock options, offset by the payment of offering expenses of approximately $0.2 million.

Funding Requirements

We expect our expenses to increase in connection with our ongoing activities, particularly as we advance our clinical programs and prepare for possible commercialization of one or more of our product candidates. In addition, we expect to incur additional costs associated with our continued operation as a public company. The timing and amount of our operating expenditures will depend largely on:

- the timing and costs of our ongoing and planned clinical trials;
- the initiation, progress, timing, costs and results of preclinical studies and clinical trials of our product candidates and potential new product candidates;
- the amount of funding that we receive under government contracts that we have applied for;
- the number and characteristics of product candidates that we pursue;
- the outcome, timing and costs of seeking regulatory approvals;
- the costs of commercialization activities for our product candidates if we receive marketing approval, including the costs and timing of establishing product sales, marketing, distribution and manufacturing capabilities;
- the terms and timing of any future collaborations, licensing or other arrangements that we may establish;
- the amount and timing of any payments we may be required to make, or that we may receive, in connection with the licensing, filing, prosecution, defense and enforcement of any patents or other intellectual property rights, including milestone and royalty payments and patent prosecution fees that we are obligated to pay pursuant to our license agreements;
- the costs of preparing, filing and prosecuting patent applications, maintaining and protecting our intellectual property rights and defending against any intellectual property related claims;
- the costs of operating as a public company; and
- the extent to which we in-license or acquire other products and technologies.

As of December 31, 2022, we had cash and cash equivalents of $109.1 million. In accordance with ASU 2014-15, Disclosure of Uncertainties about an Entity's Ability to Continue as a Going Concern (Subtopic 205-40), we are required to evaluate whether there are conditions and events, considered in the aggregate, that raise substantial doubt about our ability to continue as a going concern from the issuance date of our financial statements. We believe that our existing cash and cash equivalents will enable us to fund our operating expenses and capital expenditure requirements for at least 12 months from the issuance of the financial statements included in this report. Based on our current operating plans, we believe that our cash runway will be sufficient to fund us beyond 2024.

Beyond this point we will need additional funding, which primarily consist of raising additional capital through some combination of equity or debt financings, potential new collaborations, additional grant funding and/or reducing cash expenditures. If we are not able to secure adequate additional funding, we plan to make reductions in spending. In that event, we may have to delay, scale back, or eliminate some or all of our planned clinical trials and research stage programs.

We have based these estimates on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we expect. Because of the numerous risks and uncertainties associated with research, development and commercialization of pharmaceutical product candidates, we are unable to estimate the exact amount of our working capital requirements. Our future funding requirements will depend on and could increase significantly as a result of many factors, including those listed above.

Until such time, if ever, as we can generate substantial product revenue, we expect to finance our operations through a combination of equity offerings, debt financings, government funding, collaborations, strategic alliances and marketing, distribution or licensing arrangements. To the extent that we raise additional capital through the sale of equity or convertible debt securities, our stockholders' ownership interests will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our common stockholders. Debt financing and preferred equity financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making acquisitions or capital expenditures or declaring dividends. If we raise additional funds through collaborations, strategic alliances or marketing, distribution or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or product candidates or grant licenses on terms that may not be favorable to us. The COVID-19 pandemic has resulted in ongoing volatility in financial markets. If our access to capital is restricted or associated borrowing costs increase as a result of developments in financial markets, including relating to the COVID-19 pandemic, our operations and financial condition could be adversely impacted. If we are unable to raise additional funds through equity or debt

financings or other arrangements when needed, we may be required to delay, limit, reduce or terminate our research, product development or future commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

Contractual Obligations and Commitments

The following table summarizes our contractual obligations as of December 31, 2022 and the effects that such obligations are expected to have on our liquidity and cash flows in future periods:

	Payments Due by Period				
	Total	Less Than 1 Year	1 to 3 Years	4 to 5 Years	More than 5 Years
			(in thousands)		
Operating lease commitments (1)	8,266	1,690	5,420	1,156	—
Total	$ 8,266	$ 1,690	$ 5,420	$ 1,156	$ —

(1) Reflects payments due for our lease of office space under an operating lease agreement that expires in 2027.

As further described below, under various licensing and related agreements with third parties, we have agreed to make milestone payments and pay royalties to third parties. We have not included any contingent payment obligations, such as milestones or royalties, in the table above as the amount, timing and likelihood of such payments are not known.

Under our license agreement with Meiji, we are obligated (i) to make future milestone payments of up to $1.0 million upon the achievement of specified clinical and regulatory milestones for tebipenem HBr, (ii) to pay royalties, on a product-by-product and country-by-country basis, of a low single-digit percentage based on net sales of products licensed under the agreement and (iii) to pay to Meiji a low double-digit percentage of any sublicense fees received by us up to $7.5 million, of which we paid $6.6 million in the fourth quarter of 2022.

Under an agreement we entered into with PBB, we are obligated to make milestone payments of up to $5.8 million upon the achievement of specified clinical milestones and a payment of £5.0 million ($6.0 million as of December 31, 2022) upon the achievement of a specified commercial milestone for SPR206. In addition, we have agreed to pay to PBB royalties, on a product-by-product and country-by-country basis, of a low single-digit percentage based on net sales of products licensed under the agreement.

Under our agreement with Vertex, we are obligated to make future milestone payments of up to $80.2 million upon the achievement of specified clinical, regulatory and commercial milestones related to SPR720 and to pay to Vertex tiered royalties, on a product-by-product and country-by-country basis, of a mid single-digit to low double-digit percentage based on net sales of products licensed under the agreement.

We enter into contracts in the normal course of business with CROs, CMOs and other third parties for clinical trials, preclinical research studies and testing, manufacturing and other services. These contracts are cancelable by us upon prior notice. Payments due upon cancellation consist only of payments for services provided or expenses incurred, including non-cancellable obligations of our service providers, up to the date of cancellation. These payments are not included in the table of contractual obligations and commitments above.

Recently Adopted Accounting Pronouncements

Please refer to Note 2 to our consolidated financial statements included in Part II, Item 8, “Financial Statements and Supplementary Data,” of this Annual Report on Form 10-K for a description of recent accounting pronouncements applicable to our business.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk.

As of December 31, 2022, we had cash and cash equivalents of $109.1 million, consisting of cash and money market accounts. The primary objectives of our investment activities are to preserve principal, provide liquidity and maximize income without significantly increasing risk. Our primary exposure to market risk is interest income sensitivity, which is affected by changes in the general level of United States interest rates. We did not have any assets classified as marketable securities as of December 31, 2022. As we incur research expenses in foreign countries, we face exposure to movements in foreign currency exchange rates, primarily the Euro, British Pound and Australian dollar against the United States dollar. Historically, foreign currency fluctuations have not had a material impact on our consolidated financial statements.

Item 8. Financial Statements and Supplementary Data.

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of Spero Therapeutics, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Spero Therapeutics, Inc. and its subsidiaries (the "Company") as of December 31, 2022 and 2021, and the related consolidated statements of operations and comprehensive loss, of convertible preferred shares and stockholders' equity and of cash flows for the years then ended, including the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2022 and 2021, and the results of its operations and its cash flows for the years then ended in conformity with accounting principles generally accepted in the United States of America.

Basis for Opinion

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

We conducted our audits of these consolidated financial statements 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. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

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

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relates to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Revenue Recognition - GSK License Agreement Determination of Standalone Selling Price of the License

As described in Notes 7 and 14 to the consolidated financial statements, on November 7, 2022, the Company closed the GSK plc (GSK) license agreement under which the Company received an upfront payment of $66.0 million in exchange for granting GSK an exclusive royalty-bearing license to develop, manufacture and commercialize tebipenem pivoxil and tebipenem HBr. The Company will be responsible for the execution and costs of the follow-up Phase 3 clinical trial of tebipenem HBr and for providing and paying for the clinical supply of tebipenem HBr. Concurrently with the execution of the GSK license agreement, the Company entered into a stock purchase agreement with Glaxo Group Limited (GGL), an affiliate of GSK, pursuant to which GGL purchased shares of the Company's common stock for an aggregate purchase price of $9.0 million. The fair market value of the Company's common stock issued under the stock purchase agreement was $10.3 million. The Company identified two performance obligations, related to the license and to research and development services. The total transaction price is $64.7 million, which includes the initial payment of $66.0 million and the discount of $1.3 million related to the stock purchase agreement. The total transaction price was allocated to the performance obligations under the agreement in proportion to the standalone selling price of each obligation. Management developed the estimated standalone selling price for the license using a discounted cash flow model. In developing this estimate, management applied significant judgment in the determination of the significant assumptions relating to forecasted future cash flows, the discount

rate, and the probability of success. Of the total transaction price, $45.7 million was allocated to the license performance obligation, which was fully satisfied and recognized as revenue upon delivery of the license, and the additional $19.0 million was allocated to the research and development services obligation and is being recognized over time as the services are delivered.

The principal considerations for our determination that performing procedures relating to revenue recognition and the determination of standalone selling price for the license is a critical audit matter are (i) the significant judgment by management when developing the estimate of standalone selling price for the license; (ii) a high degree of auditor judgment, subjectivity, and effort in performing procedures and evaluating management's significant assumptions related to forecasted future cash flows, the discount rate, and the probability of success; and (iii) the audit effort involved the use of professionals with specialized skill and knowledge.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included, among others (i) reading the contractual terms of the license agreement; (ii) testing management's process for developing the estimate of standalone selling price for the license; (iii) evaluating the appropriateness of the discounted cash flow model; and (iv) evaluating the reasonableness of the significant assumptions related to forecasted future cash flows, the discount rate, and the probability of success. Evaluating management's assumptions related to forecasted future cash flows and the probability of success involved evaluating whether the assumptions used were reasonable considering (i) the consistency with data from internal and external sources including market and industry data and (ii) whether the assumptions were consistent with evidence obtained in other areas of the audit. Professionals with specialized skill and knowledge were used to assist in evaluating (i) the appropriateness of the discounted cash flow model and (ii) the reasonableness of the discount rate.

/s/ PricewaterhouseCoopers LLP
Boston, Massachusetts
March 30, 2023

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

SPERO THERAPEUTICS, INC.

CONSOLIDATED BALANCE SHEETS
(In thousands, except unit, share and per share amounts)

	December 31, 2022	December 31, 2021
Assets		
Current assets:		
Cash and cash equivalents	$ 109,107	$ 112,584
Marketable securities	—	33,818
Other receivables	1,084	2,641
Prepaid expenses and other current assets	3,379	8,829
Total current assets	113,570	157,872
Property and equipment, net	368	1,026
Operating lease right-of-use assets	5,124	6,530
Other assets	5,740	5,644
Total assets	$ 124,802	$ 171,072
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	$ 617	$ 1,101
Accrued expenses and other current liabilities	8,973	14,350
Operating lease liabilities	1,690	1,362
Deferred revenue, current	10,369	1,857
Total current liabilities	21,649	18,670
Liability related to the sale of future royalties	—	48,414
Non-current operating lease liabilities	4,957	5,973
Deferred revenue, non-current	22,166	8,786
Derivative liability	—	802
Other long-term liabilities	96	138
Total liabilities	48,868	82,783
Commitments and contingencies (Note 12)		
Stockholders' equity:		
Preferred stock, $0.001 par value; 10,000,000 shares authorized, no shares issued and outstanding as of December 31, 2022 and 3,218,152 shares issued and outstanding as of December 31, 2021	—	3
Common stock, $0.001 par value; 120,000,000 shares authorized as of December 31, 2022 and December 31, 2021; 52,456,195 shares issued and outstanding as of December 31, 2022 and 32,393,738 shares issued and outstanding as of December 31, 2021	52	32
Additional paid-in capital	489,760	455,719
Accumulated deficit	(413,878)	(367,463)
Accumulated other comprehensive gain (loss)	—	(2)
Total stockholders' equity	75,934	88,289
Total liabilities and stockholders' equity	$ 124,802	$ 171,072

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

SPERO THERAPEUTICS, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS
(In thousands, except share and per share data)

	Year Ended December 31,	
	2022	2021
Revenues:		
Grant revenue	$ 4,930	$ 15,186
Collaboration revenue	48,579	3,070
Total revenues	53,509	18,256
Operating expenses:		
Research and development	47,593	64,526
General and administrative	36,483	41,701
Restructuring	11,630	—
Total operating expenses	95,706	106,227
Loss from operations	(42,197)	(87,971)
Other income (expense):		
Interest income	1,106	346
Other income (expense), net	(55)	(395)
Interest expense related to the sale of future royalties	(2,605)	(1,940)
Loss on extinguishment of liability related to the sale of future royalties	(3,581)	—
Change in fair value of derivative liability	917	204
Total other income (expense), net	(4,218)	(1,785)
Net loss	$ (46,415)	$ (89,756)
Net loss per share attributable to common stockholders, basic and diluted	$ (1.23)	$ (2.91)
Weighted average common shares outstanding, basic and diluted:	37,585,075	30,895,756
Comprehensive loss:		
Net loss	(46,415)	(89,756)
Other comprehensive gain (loss):		
Unrealized gain on marketable securities	2	5
Net unrealized gains (losses) on securities	2	5
Total comprehensive loss	$ (46,413)	$ (89,751)

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

SPERO THERAPEUTICS, INC.
CONSOLIDATED STATEMENTS OF CONVERTIBLE PREFERRED SHARES AND STOCKHOLDERS' EQUITY
(In thousands, except unit and share amounts)

	Series A, B, C and D Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Income (Loss)	Total Stockholders' Equity
	Shares	Par Value	Shares	Par Value				
Balances at December 31, 2020	**3,218,287**	**3**	**29,260,247**	**29**	**409,722**	**(277,707)**	**(7)**	**132,040**
Issuance of common stock upon the exercise of stock options	—	—	160,674	—	1,450	—	—	1,450
Issuance of common stock, net of issuance costs	—	—	475,469	1	7,830	—	—	7,831
Issuance of common stock under Pfizer Purchase Agreement, net of premium of $12.5 million and net of financing costs of $0.2 million	—	—	2,362,348	2	27,287	—	—	27,289
Conversion of convertible preferred stock to common stock	(135)	—	135,000	—	—	—	—	—
Share-based compensation expense	—	—	—	—	9,430	—	—	9,430
Unrealized gain on available-for-sale securities	—	—	—	—	—	—	5	5
Net loss	—	—	—	—	—	(89,756)	—	(89,756)
Balances at December 31, 2021	**3,218,152**	**3**	**32,393,738**	**32**	**455,719**	**(367,463)**	**(2)**	**88,289**
Issuance of common stock upon the exercise of stock options	—	—	56,120	—	420	—	—	420
Issuance of common stock upon the vesting of RSUs	—	—	226,043	—	—	—	—	—
Issuance of common stock, net of issuance costs	—	—	5,963,294	7	14,227	—	—	14,234
Issuance of common stock under GSK Share Purchase Agreement, net of discount of $1.3 million	—	—	7,450,000	7	10,271	—	—	10,278
Conversion of convertible preferred stock to common stock	(3,218,152)	(3)	6,367,000	6	—	—	—	3
Share-based compensation expense	—	—	—	—	9,123	—	—	9,123
Unrealized gain on available-for-sale securities	—	—	—	—	—	—	2	2
Net loss	—	—	—	—	—	(46,415)	—	(46,415)
Balances at December 31, 2022	**—**	**—**	**52,456,195**	**52**	**489,760**	**(413,878)**	**—**	**75,934**

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

SPERO THERAPEUTICS, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Year Ended December 31,	
	2022	2021
Cash flows from operating activities:		
Net loss	$ (46,415)	$ (89,756)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	869	646
Non-cash lease cost	678	471
Impairment of assets	635	—
Share-based compensation	9,123	9,430
Unrealized foreign currency transaction loss	10	13
Accretion of premium (discount) on marketable securities	13	251
Change in fair value of derivative liabilities	(917)	(204)
Non-cash interest expense associated with the sale of future royalties	2,605	1,940
Loss on extinguishment of liability related to the sale of future royalties	3,581	—
Changes in operating assets and liabilities:		
Other receivables	1,196	3,050
Prepaid expenses and other current assets	5,242	(2,808)
Tax incentive receivables	351	782
Other assets	(3)	(319)
Accounts payable	(484)	(53)
Accrued expenses and other current liabilities	(5,377)	2,109
Deferred revenue, current and non-current	21,892	10,643
Other long-term liabilities	(42)	(39)
Operating lease liabilities	(688)	(503)
Net cash used in operating activities	(7,731)	(64,347)
Cash flows from investing activities:		
Purchases of marketable securities	(26,970)	(43,915)
Proceeds from maturities of marketable securities	60,777	51,548
Other	—	39
Net cash provided by investing activities	33,807	7,672
Cash flows from financing activities:		
Repayment of liability related to the sale of future royalties	(54,485)	—
Proceeds from the issuance of common stock, net of issuance costs	14,234	7,831
Proceeds from the issuance of common stock related to the GSK Share Purchase Agreement	10,278	—
Proceeds from the issuance of common stock related to the Pfizer Purchase Agreement	—	27,537
Proceeds from sale of future royalties, net	—	49,750
Transaction costs from sale of future royalties	—	(2,210)
Royalty payments	—	(60)
Payment of offering costs	—	(248)
Proceeds from stock option exercises	420	1,450
Net cash (used in) provided by financing activities	(29,553)	84,050
Net increase (decrease) in cash and cash equivalents	(3,477)	27,375
Cash and cash equivalents at beginning of period	112,584	85,209
Cash and cash equivalents at end of period	$ 109,107	$ 112,584

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

SPERO THERAPEUTICS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Nature of the Business and Basis of Presentation

Spero Therapeutics, Inc., together with its consolidated subsidiaries (the "Company" or "Spero"), is a multi-asset, clinical-stage biopharmaceutical company focused on identifying, developing, and commercializing novel treatments for bacterial infections, including multi-drug resistant ("MDR") bacterial infections, and rare diseases. The Company's lead product candidate, SPR720, is an oral antimicrobial agent in development for the treatment of nontuberculous mycobacterial ("NTM") pulmonary disease, a rare orphan disease. The Company's partnership-directed programs consist of SPR206 and tebipenem HBr. SPR206 is an IV-administered agent being developed as an innovative option to treat MDR Gram-negative bacterial infections in the hospital setting. Tebipenem HBr is designed to be the first broad-spectrum oral carbapenem-class antibiotic for use to treat certain bacterial infections that cause complicated urinary tract infections ("cUTIs") including pyelonephritis, caused by certain microorganisms, in adult patients who have limited oral treatment options.

The Company was formed as Spero Therapeutics, LLC in December 2013 under the laws of the State of Delaware. On June 30, 2017, through a series of transactions, Spero Therapeutics, LLC merged with and into Spero Therapeutics, Inc. (formerly known as Spero OpCo, Inc.), a Delaware corporation.

The Company is subject to risks and uncertainties common to companies in the biotechnology industry, including, but not limited to, development by competitors of new technological innovations, dependence on key personnel, protection of proprietary technology, compliance with government regulations, risks of failure or unsatisfactory results of nonclinical studies and clinical trials, the need to obtain marketing approval for its product candidates, the need to successfully commercialize and gain market acceptance of its product candidates and the ability to secure additional capital to fund operations. The Company's product candidates will require additional preclinical and clinical testing and regulatory approval prior to commercialization. These efforts require significant amounts of additional capital, adequate personnel and infrastructure and extensive compliance-reporting capabilities. Even if the Company's product development efforts are successful, it is uncertain when, if ever, the Company will realize significant revenue from product sales.

The accompanying consolidated financial statements of the Company have been prepared in conformity with accounting principles generally accepted in the United States of America ("GAAP") and include the accounts of the Company and its consolidated subsidiaries. All intercompany accounts and transactions have been eliminated in consolidation.

Since inception, the Company has funded its operations with proceeds from sales of preferred units (including bridge units, which converted into preferred units), payments received in connection with a concluded collaboration agreement, funding from government contracts, licensing agreements and through the sale of the Company's common and preferred stock. The Company has incurred recurring losses since inception, including net losses of $46.4 million and $89.8 million for the years ended December 31, 2022 and 2021, respectively. In addition, as of December 31, 2022, the Company had an accumulated deficit of $413.9 million. The Company expects to continue to generate operating losses for the foreseeable future.

In accordance with Accounting Standards Update ("ASU") 2014-15, Disclosure of Uncertainties about an Entity's Ability to Continue as a Going Concern (Subtopic 205-40), the Company has evaluated whether there are conditions and events, considered in the aggregate, that raise substantial doubt about the Company's ability to continue as a going concern within one year after the date that the consolidated financial statements are issued. As of the issuance date of these annual consolidated financial statements, the Company expects its current operating plan, existing cash and cash equivalents will be sufficient to fund its operating expenses and capital expenditure requirements for at least 12 months from the issuance date of these annual consolidated financial statements. Beyond that point, the Company will require additional funding to fund the development of its product candidates through regulatory approval and commercialization, and to support its continued operations. The Company will seek additional funding through public or private financings, debt financing, collaboration agreements, government grants or other venues. There is no assurance that the Company will be successful in obtaining sufficient funding on acceptable terms, if at all, and it could be forced to delay, reduce or eliminate some or all of its research and development programs, product portfolio expansion or commercialization efforts, which could materially adversely affect its business prospects or its ability to continue operations.

2. Summary of Significant Accounting Policies

Use of Estimates

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of expenses during the reporting periods. Significant estimates and assumptions reflected in these

consolidated financial statements include, but are not limited to, revenue recognition, the accrual for clinical trial costs and other research and development expenses and the valuation of share-based awards. There may be changes to those estimates in future periods. On an ongoing basis, management evaluates its estimates, as there are changes in circumstances, facts and experience. Actual results may differ from those estimates or assumptions.

Segment Information

The Company manages its operations as a single segment for the purposes of assessing performance and making operating decisions. The Company's singular focus is on identifying, developing and commercializing novel treatments for bacterial infections, including MDR bacterial infections, and rare diseases. All of the Company's tangible assets are held in the United States.

Concentrations of Credit Risk and of Significant Suppliers

Financial instruments that potentially expose the Company to concentrations of credit risk consist primarily of cash and cash equivalents. The Company maintains most of its cash and cash equivalents at one accredited financial institution. The Company does not believe that it is subject to unusual credit risk beyond the normal credit risk associated with commercial banking relationships.

The Company is dependent on third-party manufacturers to supply products for research and development activities in its programs. In particular, the Company relies and expects to continue to rely on a small number of manufacturers to supply it with its requirements for the active pharmaceutical ingredients and formulated drugs related to these programs. These programs could be adversely affected by a significant interruption in the supply of active pharmaceutical ingredients and formulated drugs. As of December 31, 2022, and 2021, the Company had no off-balance sheet risk such as foreign exchange contracts, option contracts, or other hedging arrangements.

Cash Equivalents

The Company considers all highly liquid investments with original maturities of three months or less at the date of purchase to be cash equivalents. Cash and cash equivalents include cash held in banks and money market instruments.

Marketable Securities

Marketable securities consist of investments in corporate obligations with original maturities greater than 90 days. The Company considers its portfolio of investments to be available-for-sale. Accordingly, these investments are recorded at fair value, which is based on quoted market prices. Investments with maturities beyond one year are generally classified as short term, based on their highly liquid nature and because such marketable securities represent the investment of cash that is available for current operations. Unrealized gains and losses are reported as a component of accumulated other comprehensive income (loss) in stockholders' equity. Realized gains and losses and declines in value are included as a component of other income (expense), net based on the specific identification method. Any credit impairments are recorded through an allowance account.

Property and Equipment

Property and equipment are stated at cost less accumulated depreciation and amortization. Depreciation and amortization expense are recognized using the straight-line method over the estimated useful life of each asset as follows:

	Estimated Useful Life
Laboratory equipment	5 years
Computer software and equipment	3 years
Office furniture and equipment	7 years
Manufacturing equipment	5 years
Leasehold improvements	Shorter of life of lease or 5 years

Costs for capital assets not yet placed into service are capitalized as construction in progress and are depreciated in accordance with the above guidelines once placed into service. Upon retirement or sale, the cost of assets disposed of and the related accumulated depreciation and amortization are removed from the accounts and any resulting gain or loss is included in loss from operations. Expenditures for repairs and maintenance are charged to expense as incurred. The Company periodically evaluates whether events and circumstances have occurred that may warrant revision of the estimated useful life of property and equipment.

Leases

At the inception of an arrangement, the Company determines whether the arrangement is or contains a lease based on the unique facts and circumstances present in the arrangement. Leases with a term greater than one year are recognized on the balance sheet as right-of-use assets and short-term and long-term lease liabilities, as applicable. The Company has elected not to recognize on the balance sheet leases with terms of one year or less. As of December 31, 2022 and 2021, the Company had no short-term leases with terms of one year or less. Options to renew a lease are not included in the Company's initial lease term assessment unless there is reasonable certainty that the Company will renew. The Company monitors its plans to renew its material leases on a quarterly basis.

Operating lease liabilities and their corresponding right-of-use assets are recorded based on the present value of lease payments over the expected remaining lease term. Certain adjustments to the right-of-use asset may be required for items such as incentives received. The interest rate implicit in lease contracts is typically not readily determinable. As a result, the Company utilizes its incremental borrowing rate ("IBR"), which reflects the fixed rate at which the Company could borrow on a collateralized basis the amount of the lease payments in the same currency, for a similar term, and in a similar economic environment. Since the Company does not have any debt and has not been rated by any major credit rating agency, the Company's IBR was estimated by developing a synthetic credit rating for the Company.

The Company has elected to account for lease and non-lease components together as a single lease component.

Other Assets

Other assets consist of long-term prepayments and deposits.

Impairment of Long-Lived Assets

Long-lived assets consist of property and equipment and operating lease right-of-use assets. Long-lived assets to be held and used are tested for recoverability whenever events or changes in business circumstances indicate that the carrying amount of the assets may not be fully recoverable. Factors that the Company considers in deciding when to perform an impairment review include significant underperformance of the business in relation to expectations, significant negative industry or economic trends and significant changes or planned changes in the use of the assets. If an impairment review is performed to evaluate a long-lived asset group for recoverability, the Company compares forecasts of undiscounted cash flows expected to result from the use and eventual disposition of the long-lived asset group to its carrying value. An impairment loss would be recognized when estimated undiscounted future cash flows expected to result from the use of an asset group are less than its carrying amount. The impairment loss would be based on the excess of the carrying value of the impaired asset group over its fair value, determined based on discounted cash flows.

Fair Value Measurements

Certain assets and liabilities are carried at fair value under GAAP. Fair value is defined as the exchange price that would be received for an asset or paid to transfer a liability (an exit price) in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date. Valuation techniques used to measure fair value must maximize the use of observable inputs and minimize the use of unobservable inputs. Financial assets and liabilities carried at fair value are to be classified and disclosed in one of the following three levels of the fair value hierarchy, of which the first two are considered observable and the last is considered unobservable:

- Level 1—Quoted prices in active markets for identical assets or liabilities.
- Level 2—Observable inputs (other than Level 1 quoted prices), such as quoted prices in active markets for similar assets or liabilities, quoted prices in markets that are not active for identical or similar assets or liabilities, or other inputs that are observable or can be corroborated by observable market data.
- Level 3—Unobservable inputs that are supported by little or no market activity and that are significant to determining the fair value of the assets or liabilities, including pricing models, discounted cash flow methodologies and similar techniques.

The Company's cash equivalents are carried at fair value, determined according to the fair value hierarchy described above (see Note 3). The carrying values of the Company's accounts payable and accrued expenses approximate their fair values due to the short-term nature of these liabilities.

Revenue Recognition - Collaboration Revenue

The Company has entered into licensing agreements that are evaluated under Accounting Standards Codification, Topic 606 ("Topic 606"), Revenue from Contracts with Customers, through which the Company licenses certain of its product candidates' rights to a third party. Terms of these arrangements include various payment types, typically including one or more of the following: upfront license fees; development, regulatory and commercial milestone payments; payments for manufacturing supply services; and/or royalties on net sales of licensed products.

Under Topic 606, an entity recognizes revenue when its customer obtains control of promised goods or services, in an amount that reflects the consideration that the entity expects to receive in exchange for those goods or services. To determine revenue recognition for arrangements that an entity determines are within the scope of Topic 606, the entity performs the following five steps: (i) identify the contract with a customer; (ii) identify the performance obligations under the agreement; (iii) determine the transaction price, including constraint on variable consideration, if any; (iv) allocate the transaction price to the performance obligations in the contract; and (v) determine how the revenue will be recognized for each performance obligation. The Company only applies the five-step model to contracts when it is probable that the Company will collect the consideration to which it is entitled in exchange for the goods or services it transfers to a customer.

Once a contract is determined to be within the scope of Topic 606, the Company assesses the goods or services promised within each contract and determines those that are performance obligations. Arrangements that include rights to additional goods or services that are exercisable at a customer's discretion are generally considered options. The Company assesses if these options provide a material right to the customer and if so, they are considered performance obligations. The exercise of a material right may be accounted for as a contract modification or as a continuation of the contract for accounting purposes.

The Company assesses whether each promised good or service is distinct for the purpose of identifying the performance obligations in the contract. This assessment involves subjective determinations and requires management to make judgments about the individual promised goods or services and whether such are separable from the other aspects of the contractual relationship. Promised goods and services are considered distinct provided that: (i) the customer can benefit from the good or service either on its own or together with other resources that are readily available to the customer (that is, the good or service is capable of being distinct) and (ii) the entity's promise to transfer the good or service to the customer is separately identifiable from other promises in the contract (that is, the promise to transfer the good or service is distinct within the context of the contract). In assessing whether a promised good or service is distinct in the evaluation of a collaboration arrangement subject to Topic 606, the Company considers factors such as the research, manufacturing and commercialization capabilities of the collaboration partner and the availability of the associated expertise in the general marketplace. The Company also considers the intended benefit of the contract in assessing whether a promised good or service is separately identifiable from other promises in the contract. If a promised good or service is not distinct, the Company is required to combine that good or service with other promised goods or services until it identifies a bundle of goods or services that is distinct.

The transaction price is then determined and allocated to the identified performance obligations in proportion to their standalone selling prices ("SSP") on a relative SSP basis. The SSP is determined at contract inception and is not updated to reflect changes between contract inception and when the performance obligations are satisfied. Determining the SSP for performance obligations requires significant judgment. In developing the SSP for a performance obligation, the Company considers applicable market conditions and relevant entity-specific factors, including factors that were contemplated in negotiating the agreement with the customer and estimated costs. In certain circumstances, the Company may apply the residual method to determine the SSP of a good or service if the standalone selling price is considered highly variable or uncertain. The Company validates the SSP for performance obligations by evaluating whether changes in the key assumptions used to determine the SSP will have a significant effect on the allocation of arrangement consideration between multiple performance obligations.

If the consideration promised in a contract includes a variable amount, the Company estimates the amount of consideration to which it will be entitled in exchange for transferring the promised goods or services to a customer. The Company determines the amount of variable consideration by using the expected value method or the most likely amount method. The Company includes the unconstrained amount of estimated variable consideration in the transaction price. The amount included in the transaction price is constrained to the amount for which it is probable that a significant reversal of cumulative revenue recognized will not occur. At the end of each subsequent reporting period, the Company re-evaluates the estimated variable consideration included in the transaction price and any related constraint, and if necessary, adjusts its estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis in the period of adjustment.

If an arrangement includes development and regulatory milestone payments, the Company evaluates whether the milestones are considered probable of being reached and estimates the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within the Company's control or the licensee's control, such as regulatory approvals, are generally not considered probable of being achieved until those approvals are received.

In determining the transaction price, the Company adjusts consideration for the effects of the time value of money if the timing of payments provides the Company with a significant benefit of financing. 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 licensees and the transfer of the promised goods or services to the licensees will be one year or less. The Company assessed its revenue-generating arrangements in order to determine whether a significant financing component exists and concluded that a significant financing component does not exist in the arrangements. For arrangements with licenses of intellectual property that include sales-based royalties, including milestone payments based on the level of sales, and the license is deemed to be the predominant item to which the royalties relate, the Company recognizes royalty revenue and sales-based milestones at the later of (i) when the related sales occur, or (ii) when the performance obligation to which the royalty has been allocated has been satisfied.

The Company then recognizes as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) each performance obligation is satisfied at a point in time or over time, and if over time this is based on the use of an output or input method.

In determining the accounting treatment for these arrangements, the Company develops assumptions to determine the stand-alone selling price for each performance obligation in the contract. The Company develops the estimated standalone selling price for the license using a discounted cash flow model. To develop this model, the Company applies significant judgement in the determination of the significant assumptions relating to forecasted future revenues, development time lines, the discount rate, and probabilities of technical and regulatory success. The Company develops the estimated standalone selling price for the research and development services using a discounted cash flow model. The assumptions to develop the estimated standalone selling price for the related research and development services include estimates of costs to be incurred to fulfill its obligations associated with the performance of the research and development services, plus a reasonable margin.

Government Tax Incentives

For available government tax incentives that the Company may earn without regard to the existence of taxable income and that require the Company to forego tax deductions or the use of future tax credits and net operating loss carryforwards, the Company classifies the funding recognized as a reduction of the related qualifying research and development expenses incurred.

Since the fourth quarter of 2016, the Company's operating subsidiary in Australia has met the eligibility requirements to receive a tax incentive for qualifying research and development activities. The Company recognizes these incentives as a reduction of research and development expenses in the consolidated statements of operations and comprehensive loss in the same period that the related qualifying expenses are incurred. Reductions of research and development expense recognized upon incurring qualifying expenses in advance of receipt of tax incentive payments are recorded in the consolidated balance sheet as tax incentive receivables.

Research and Development Costs

Research and development costs are expensed as incurred. Research and development expenses are comprised of costs incurred in performing research and development activities, including personnel salaries, share-based compensation and benefits, allocated facilities costs, depreciation, manufacturing expenses, costs related to the Company's government contract and grant arrangements, and external costs of outside vendors engaged to conduct preclinical development activities, clinical trials as well as the cost of licensing technology. Upfront payments and milestone payments made for the licensing of technology are expensed as research and development in the period in which they are incurred. Advance payments for goods or services to be received in the future for use in research and development activities are recorded as prepaid expenses. The prepaid amounts are expensed as the related goods are delivered or the services are performed.

In June 2019, the Company entered into a collaboration agreement with the Bill and Melinda Gates Medical Research Institute (the "Gates MRI") and concluded that the agreement is within the scope of the accounting guidance for collaboration arrangements (see Note 14). Due to the cost-funded nature of the payments and the Company's assessment that it does not have a vendor/customer relationship with the Gates MRI, the Company recognizes the funding received under the agreement as a reduction to the research and development expenses incurred, as the related expenses are incurred.

Clinical Trial and other Research Contract Costs and Accruals

The Company has entered into various research and development contracts with clinical research organizations and other companies both inside and outside of the United States. These agreements are generally cancelable, and related payments are recorded as research and development expenses as incurred. There may be instances in which payments made to these vendors exceed the level of service provided and will result in a prepayment of the expense. The Company records accruals for estimated ongoing research and clinical trial costs based on the services received and efforts expended pursuant to multiple contracts with these vendors. When evaluating the adequacy of the accrued liabilities, the Company analyzes the progress of the studies or trials, including the phase or completion of events, invoices received and contracted costs. Significant judgments and estimates are made in determining the accrued balances at the end of any reporting period. Actual results could differ from the Company's estimates. The Company's historical accrual estimates have not been materially different from the actual costs.

Restructuring

The Company made estimates and judgments regarding the amount and timing of its restructuring expense and liability, including one-time termination benefits and other exit costs accounted for upon the announcement of the restructuring in May 2022. Restructuring charges are reflected in the Company's consolidated statements of income.

Patent Costs

All patent-related costs incurred in connection with filing and prosecuting patent applications are expensed as incurred due to the uncertainty about the recovery of the expenditure. Amounts incurred are classified as general and administrative expenses.

Share-Based Compensation

The Company issues stock-based awards to employees and directors in the form of stock options and restricted stock units. The Company measures and recognizes compensation expense for its stock-based awards granted to its employees and directors based on the estimated grant date fair value in accordance with ASC 718 and determines the fair value of restricted stock units based on the fair value of its common stock. The Company measures all share-based options granted to employees and directors based on the fair value on the date of grant using the Black-Scholes option-pricing model. Compensation expense of those awards is recognized over the requisite service period, which is generally the vesting period of the respective award. The Company records the expense for awards with service-based conditions using the straight-line method over the requisite service period, net of any actual forfeitures. The Company has also granted certain awards subject to performance-based vesting eligibility and a subsequent partial time-based vesting schedule. Performance-based awards will be recorded as an accrued liability on the Company's condensed consolidated balance sheet and accrued over time as achievement of performance metrics become probable. The Company classifies share-based compensation expense in its consolidated statements of operations and comprehensive loss in the same manner in which the award recipient's payroll costs are classified or in which the award recipient's service payments are classified.

Comprehensive Loss

Comprehensive loss includes net loss as well as other changes in stockholders' equity that result from transactions and economic events other than those with shareholders. For the years ended December 31, 2022 and 2021, these changes related to unrealized gains and losses on the Company's available-for-sale marketable securities. There were no reclassifications out of comprehensive loss for the years ended December 31, 2022 and 2021.

Net Loss per Share

The Company follows the two-class method when computing net income (loss) per share, as the Company has issued shares that meet the definition of participating securities. The two-class method determines net income (loss) per share for each class of common and participating securities according to dividends declared or accumulated and participation rights in undistributed earnings. The two-class method requires income available to common stockholders for the period to be allocated between common and participating securities based upon their respective rights to receive dividends as if all income for the period had been distributed. Net income (loss) per share attributable to common stockholders is calculated based on net income (loss) attributable to Spero Therapeutics, Inc.

Basic net income (loss) per share attributable to common stockholders is computed by dividing the net income (loss) attributable to common stockholders by the weighted average number of shares of common stock outstanding for the period. Diluted net income (loss) attributable to common stockholders is computed by adjusting net income (loss) attributable to common stockholders to reallocate undistributed earnings based on the potential impact of dilutive securities. Diluted net income (loss) per share attributable to common stockholders is computed by dividing the diluted net income (loss) attributable to common stockholders by the weighted

average number of common shares outstanding for the period, including potential dilutive common shares assuming the dilutive effect of common stock equivalents.

Income Taxes

The Company accounts for income taxes using the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been recognized in the consolidated financial statements or in the Company's tax returns. Deferred tax assets and liabilities are determined on the basis of the differences between the financial statements and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. Changes in deferred tax assets and liabilities are recorded in the provision for income taxes. The Company assesses the likelihood that its deferred tax assets will be recovered from future taxable income and, to the extent it believes, based upon the weight of available evidence, that it is more likely than not that all or a portion of the deferred tax assets will not be realized, a valuation allowance is established through a charge to income tax expense. Potential for recovery of deferred tax assets is evaluated by estimating the future taxable profits expected and considering prudent and feasible tax planning strategies.

The Company accounts for uncertainty in income taxes recognized in the consolidated financial statements by applying a two-step process to determine the amount of tax benefit to be recognized. First, the tax position must be evaluated to determine the likelihood that it will be sustained upon external examination by the taxing authorities. If the tax position is deemed more-likely-than-not to be sustained, the tax position is then assessed to determine the amount of benefit to recognize in the consolidated financial statements. The amount of the benefit that may be recognized is the largest amount that has a greater than 50% likelihood of being realized upon ultimate settlement. The provision for income taxes includes the effects of any resulting tax reserves, or unrecognized tax benefits, that are considered appropriate as well as the related net interest and penalties.

On December 22, 2017, the Tax Cuts and Jobs Act ("TCJA") was signed into law. Under the TCJA provisions, effective with tax years beginning on or after January 1, 2022, taxpayers can no longer immediately expense qualified research and development expenditures, including all direct, indirect, overhead and software development costs. Taxpayers are now required to capitalize and amortize these costs over five years for research conducted within the United States or 15 years for research conducted abroad.

Liability Related to the Sale of Future Royalties

Prior to repayment, as discussed further in Note 9, the Company treated the liability related to the sale of future royalties as a debt instrument, amortized under the effective interest rate method over the estimated life of the revenue streams. The Company recognized interest expense thereon using the effective rate, which was based on its estimates of future revenues over the life of the arrangement. The Company periodically assessed its expected revenues using internal projections, imputed interest on the carrying value of the deferred royalty obligation and recorded interest expense using the imputed effective interest rate. To the extent its estimates of future revenues were greater or less than previous estimates or the estimated timing of such payments was materially different than previous estimates, the Company accounted for any such changes by adjusting the effective interest rate on a prospective basis, with a corresponding impact to the reclassification of the deferred royalty obligation. The assumptions used in determining the expected repayment term of the deferred royalty obligation and amortization period of the issuance costs required that the Company made estimates that could impact the short-term and long-term classification of such costs, as well as the period over which such costs were amortized.

Derivative Liability

In connection with certain transactions, the Company has identified certain embedded derivatives, which are recorded as liabilities on the Company's consolidated balance sheet and are remeasured to fair value at each reporting date until the derivative is settled. Changes in the fair value of the derivative liabilities are recognized as other income (expense) in the consolidated statement of operations and comprehensive loss.

Recently Issued and Adopted Accounting Pronouncements

From time to time, new accounting pronouncements are issued by the FASB or other standard setting bodies and adopted by the Company as of the specified effective date. Unless otherwise noted, the Company believes that the impact of recently issued standards that are not yet effective will not have a material impact on its condensed consolidated financial statements and disclosures.

In June 2022, the FASB issued ASU 2022-03, *Fair Value Measurement of Equity Securities Subject to Contractual Sale Restrictions*. The ASU clarifies that a contractual restriction on the sale of an equity security is not considered part of the unit of account of the equity security and, therefore, is not considered in measuring fair value. The ASU also clarifies that an entity cannot, as a separate unit of account, recognize and measure a contractual sale restriction and requires specific disclosures for equity securities

subject to contractual sale restrictions. These changes will become effective for the Company after December 15, 2023. The Company early adopted this standard during the fourth quarter of 2022 and it did not have a material impact on its consolidated financial statements and related disclosures.

In December 2019, the FASB issued ASU 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*, amended guidance on the accounting and reporting of income taxes. The guidance is intended to simplify the accounting for income taxes by removing exceptions related to certain intraperiod tax allocations and deferred tax liabilities; clarifying guidance primarily related to evaluating the step-up tax basis for goodwill in a business combination; and reflecting enacted changes in tax laws or rates in the annual effective tax rate. The amended guidance is effective for interim and annual periods in 2021. Early adoption is permitted. The application of the amendments in the new guidance are to be applied on a retrospective basis, on a modified retrospective basis through a cumulative-effect adjustment to retained earnings or prospectively, depending on the amendment. This standard became effective for the Company on January 1, 2021, and did not have a material impact on its consolidated financial statements and related disclosures.

3. Fair Value Measurements and Marketable Securities

The following tables present information about the Company's assets and liabilities that are measured at fair value on a recurring basis (in thousands):

	Fair Value Measurements at December 31, 2022 Using:			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents:				
Money market funds	$ —	$ 108,227	$ —	$ 108,227
Total cash equivalents	—	108,227	—	108,227

	Fair Value Measurements at December 31, 2021 Using:			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents:				
Money market funds	$ —	$ 109,316	$ —	$ 109,316
Corporate bonds	$ —	2,701	—	2,701
Total cash equivalents	—	112,017	—	112,017
Marketable securities:				
Corporate bonds	—	11,479	—	11,479
Commercial paper	—	22,339	—	22,339
Total marketable securities	—	33,818	—	33,818
Total cash equivalents and marketable securities	$ —	$ 145,835	$ —	$ 145,835
Liabilities:				
Derivative liability	$ —	$ —	$ 802	$ 802
	$ —	$ —	$ 802	$ 802

Excluded from the tables above is cash of $0.9 million and $0.6 million as of December 31, 2022 and 2021, respectively. During the years ended December 31, 2022 and 2021, there were no transfers between Level 1, Level 2 and Level 3 categories.

Marketable Securities

The Company's marketable securities are classified as Level 2 assets under the fair value hierarchy as these assets were primarily determined from independent pricing sources, which generally derive security prices from recently reported trades for identical or similar securities. The Company evaluated debt securities with unrealized losses for any expected credit losses and determined unrealized losses on these securities were related to non-credit factors. Additionally, the Company currently does not intend to and is not required to sell these investments prior to an anticipated recovery in value.

The Company did not have any assets classified as marketable securities as of December 31, 2022. The following table summarizes the gross unrealized gains and losses of the Company's marketable securities as of December 31, 2021 (in thousands):

	December 31, 2021			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
Assets:				
Corporate bonds	11,481	—	(2)	11,479
Commercial paper	22,339	—	—	22,339
	$ 33,820	$ —	$ (2)	$ 33,818

As of December 31, 2021, all of the Company's marketable securities had remaining contractual maturity dates of one year or less from the respective consolidated balance sheet date.

Embedded Derivative

Liability related to change of control

During the year ended December 31, 2022, in connection with the termination of the Revenue Interest Agreement (as defined below) (see Note 9), the Company classified $0.1 million as a derivative liability on its condensed consolidated balance sheet because of an embedded feature that represented a conditional obligation to pay HCR (as defined below) an additional cash amount upon a change of control. The Company remeasured the derivative liability to fair value at each reporting date until it expired on December 31, 2022, and recognized changes in the fair value of the derivative liability as a component of other income (expense) in the condensed consolidated statement of operations and comprehensive loss. The Company valued the change of control provision under the Revenue Interest Termination Agreement, dated June 7, 2022, by and between the Company and HCR, using a series of Black-Scholes-Merton option pricing models. The assumptions used in the valuation model include (1) the Company's estimates of the probability of a change of control event occurring prior to or as of December 31, 2022, (2) the Company's common stock closing stock price as of June 7, 2022, (3) the Company's fully-diluted number of shares of common stock outstanding as of June 7, 2022, (4) volatility, (5) risk-free rate, and (6) the Company's credit-risk-adjusted discount rate.

The fair value of the derivative liability upon issuance in June 2022 was $0.1 million, and was classified as Level 3 liability under the fair value hierarchy. As of December 31, 2022 the fair value of the derivative liability expired, and as such, was reduced by $0.1 million to zero.

Liability related to the sale of future royalties

During the year ended December 31, 2021, in connection with the liability related to the sale of future royalties, the Company classified a derivative liability on its consolidated balance sheet at inception of its Revenue Interest Financing Agreement because there were embedded instruments that represented a conditional obligation to pay HCR the final payment.

The fair value of the derivative liability upon issuance in October 2021 was $1.0 million, and was classified as Level 3 liability under the fair value hierarchy. As of December 31, 2021 the fair value of the derivative liability decreased by $0.2 million to $0.8 million, primarily due to the passage of time and changes in the market volatility and underlying credit risk inputs. The Revenue Interest Agreement was terminated on June 7, 2022, and as such, the fair value of this derivative liability was reduced to zero.

The fair value for the liability related to the sale of future royalties at the time of the initial transaction was based on the Company's current estimates of future royalties expected to be paid to HCR over the remaining patent life of the product, which were considered Level 3 inputs (see Note 9).

4. Property and Equipment, Net

Property and equipment, net consisted of the following (in thousands):

	December 31,	
	2022	2021
Leasehold improvements	$ 1,636	$ 1,636
Manufacturing equipment	1,338	1,338
Computer software and equipment	437	507
Office furniture and equipment	209	425
	3,620	3,906
Less: Accumulated depreciation and amortization	(3,252)	(2,880)
	$ 368	$ 1,026

Property and equipment decreases during the year ended December 31, 2022 were primarily related to impairments due to our strategic restructuring announced in May 2022. Property and equipment increases during the year ended December 31, 2021 primarily related to office furniture and equipment and construction-in-progress related to the expansion of Company's leased office space (see Note 5). Depreciation and amortization expense related to property and equipment was $0.7 million and $0.6 million for the years ended December 31, 2022 and 2021, respectively.

5. Leases

Operating Leases

The Company has entered into, and subsequently amended, an operating lease agreement with U.S. REIF Central Plaza Massachusetts, LLC with respect to its corporate headquarters located at 675 Massachusetts Avenue, Cambridge, Massachusetts where the Company leases approximately 23,400 square feet of office space. The Company's lease extends through July 2027.

For the years ended December 31, 2022 and 2021, the components of operating lease expense were as follows (in thousands):

Operating lease expense	Statement of Operations Location	December 31, 2022	December 31, 2021
Fixed operating lease expense	Research and development expense	$ 824	$ 869
	General and administrative expense	772	681
Variable operating lease expense	Research and development expense	56	76
	General and administrative expense	59	143
Total operating lease expense		$ 1,711	$ 1,769

Supplemental cash flow information related to the Company's operating leases for the years ended December 31, 2022 and 2021, was as follows (in thousands):

	December 31, 2022	December 31, 2021
Cash paid for amounts included in the measurement of lease liabilities:		
Operating cash flows from operating leases	$ 1,514	$ 1,525

The following table presents the lease balances within the consolidated balance sheet, weighted average remaining lease term, and the weighted average discount rates related to the Company's operating and finance leases as of December 31, 2022 and 2021 (in thousands, except for the weighted average remaining lease term and the weighted average discount rate):

Lease Assets and Liabilities	Classification	December 31, 2022	December 31, 2021
Assets			
Operating	Operating lease right-of-use assets	$ 5,124	$ 6,530
Financing	Property and equipment, net	201	468
Total leased assets		$ 5,325	$ 6,998
Liabilities			
Current			
Operating	Operating lease liabilities	$ 1,690	$ 1,362
Non-Current			
Operating	Non-current operating lease liabilities	4,957	5,973
Total lease liabilities		$ 6,647	$ 7,335
Weighted average remaining lease term (in years)		4.6	5.6
Weighted average discount rate		9.8%	9.8%

The following table presents the maturity of the Company's operating lease liabilities as of December 31, 2022 (in thousands):

Years Ending December 31,	
2023	1,690
2024	1,718
2025	1,746
2026	1,956
2027	1,156
Total future minimum lease payments	8,266
Less imputed interest	(1,619)
Total operating lease liabilities	$ 6,647

6. Accrued Expenses and Other Current Liabilities

Accrued expenses and other current liabilities consisted of the following (in thousands):

	December 31, 2022	December 31, 2021
Accrued external research and development expenses	$ 1,823	$ 6,315
Accrued payroll and related expenses	5,797	5,884
Accrued professional fees	696	909
Accrued restructuring expenses	448	-
Accrued other	209	1,242
Total Accrued expenses and other current liabilities	$ 8,973	$ 14,350

7. Equity

Convertible Preferred Shares

Series A Convertible Preferred Shares

The Company has designated 2,220 of the 10,000,000 authorized shares of preferred stock as Series A Preferred Stock.

Each share of Series A Preferred Stock is convertible into 1,000 shares of common stock at any time at the option of the holder, provided that the holder will be prohibited from converting the Series A Preferred Stock into shares of common stock if, as a result of such conversion, the holder, together with its affiliates, would own more than 9.99% of the total number of shares of common stock then issued and outstanding, subject to certain exceptions. In the event of the Company's liquidation, dissolution, or winding up, holders of Series A Preferred Stock will receive a payment equal to $0.001 per share of Series A Preferred Stock before any proceeds are distributed to the holders of common stock. Shares of Series A Preferred Stock will generally have no voting rights, except as required by law and except that the consent of holders of a majority of the then outstanding Series A Preferred Stock will be required to amend the terms of the Series A Preferred Stock. As such, the Company classified the Series A Preferred Stock within permanent equity in its consolidated balance sheet.

Series B Convertible Preferred Shares

The Company has designated 1,000 of the 10,000,000 authorized shares of preferred stock as Series B Preferred Stock.

Each share of Series B Preferred Stock is convertible into 1,000 shares of common stock at any time at the option of the holder, provided that the holder will be prohibited from converting the Series B Preferred Stock into shares of common stock if, as a result of such conversion, the holder, together with its affiliates, would own more than 9.99% of the total number of shares of common stock then issued and outstanding, subject to certain exceptions. In the event of the Company's liquidation, dissolution, or winding up, holders of Series B Preferred Stock will receive a payment equal to $0.001 per share of Series B Preferred Stock before any proceeds are distributed to the holders of common stock and equal to any distributions to the holders of Series A Preferred Stock. Shares of Series B Preferred Stock will generally have no voting rights, except as required by law and except that the consent of holders of a majority of the then outstanding Series B Preferred Stock will be required to amend the terms of the Series B Preferred Stock. As such, the Company has classified the Series B Preferred Stock within permanent equity in its consolidated balance sheet.

Series C Convertible Preferred Shares

The Company has designated 3,333 of the 10,000,000 authorized shares of preferred stock as Series C Preferred Stock.

Each share of Series C Preferred Stock is convertible into 1,000 shares of common stock at any time at the option of the holder, provided that the holder will be prohibited from converting the Series C Preferred Stock into shares of common stock if, as a result of such conversion, the holder, together with its affiliates, would own more than 9.99% of the total number of shares of common stock then issued and outstanding, subject to certain exceptions. In the event of the Company's liquidation, dissolution, or winding up, holders of Series C Preferred Stock will receive a payment equal to $0.001 per share of Series C Preferred Stock before any proceeds are distributed to the holders of common stock and equal to any distributions to the holders of Series A Preferred Stock and Series B Preferred Stock. Shares of Series C Preferred Stock will generally have no voting rights, except as required by law and except that the consent of holders of a majority of the then outstanding Series C Preferred Stock will be required to amend the terms of the Series C Preferred Stock. As such, the Company has classified the Series C Preferred Stock within permanent equity in its consolidated balance sheet.

Series D Convertible Preferred Shares

The Company has designated 3,215,000 of the 10,000,000 authorized shares of preferred stock as Series D Preferred Stock.

The shares of Series D Preferred Stock are convertible on a one-to-one basis into shares of common stock at any time at the option of the holder, provided that the holder will be prohibited from converting the Series D Preferred Stock into shares of common stock if, as a result of such conversion, the holder, together with its affiliates, would own more than 9.99% of the total number of shares of common stock then issued and outstanding, subject to certain exceptions. In the event of the Company's liquidation, dissolution, or winding up, holders of Series D Preferred Stock will receive a payment equal to $0.001 per share of Series D Preferred Stock before any proceeds are distributed to the holders of common stock and equal to any distributions to the holders of Series A Preferred Stock, Series B Preferred Stock and Series C Preferred Stock. Shares of Series D Preferred Stock will generally have no voting rights, except as required by law and except that the consent of holders of a majority of the then outstanding Series D Preferred Stock will be required to amend the terms of the Series D Preferred Stock. As such, the Company has classified the Series D Preferred Stock within permanent equity in its consolidated balance sheet.

Conversions

In February 2021, a holder of the Company's Series B Preferred Stock elected to convert 62 shares of Series B Preferred Stock into 62,000 shares of the Company's common stock, pursuant to such holder's rights under the certificate of designation for such Series B Preferred Stock. In addition, a holder of the Company's Series C Preferred Stock elected to convert 73 shares of Series C Preferred Stock into 73,000 shares of the Company's common stock, pursuant to such holder's rights under the certificate of designation for such Series C Preferred Stock.

In June 2022, a holder of the Company's Series B Preferred Stock elected to convert 938 shares of Series B Preferred Stock into 938,000 shares of the Company's common stock, pursuant to such holder's rights under the certificate of designation for such Series B Preferred Stock. In addition, a holder of the Company's Series D Preferred Stock elected to convert 942,000 shares of Series D Preferred Stock into 942,000 shares of the Company's common stock, pursuant to such holder's rights under the certificate of designation for such Series D Preferred Stock.

In September 2022, a holder of the Company's Series C Preferred Stock elected to convert the remaining 2,214 shares of Series C Preferred Stock into 2,214,000 shares of the Company's common stock, pursuant to such holder's rights under the certificate of designation for such Series C Preferred Stock. In addition, a holder of the Company's Series D Preferred Stock elected to convert the remaining 2,273,000 shares of Series D Preferred Stock into 2,273,000 shares of the Company's common stock, pursuant to such holder's rights under the certificate of designation for such Series D Preferred Stock.

As of December 31, 2022, all of the Company's shares of preferred stock have been converted to common stock.

Common Stock

"At-the-Market" Offering

On March 11, 2021, the Company entered into a sales agreement (the "Sales Agreement") with Cantor Fitzgerald & Co. ("Cantor") and filed a universal shelf registration statement on Form S-3 (Registration No. 333-254170), and pursuant to which the Company registered for sale up to $300.0 million of any combination of its common stock, preferred stock, debt securities, warrants, rights and/or units from time to time and at prices and on terms that the Company may determine, including up to $75.0 million of its common stock available for issuance pursuant to the "at-the-market" offering program Sales Agreement. Under the Sales Agreement, Cantor may sell shares of the Company's common stock by any method permitted by law deemed to be an "at the market" offering as defined in Rule 415 of the Securities Act, subject to the terms of the Sales Agreement. The Company's universal shelf registration statement on Form S-3 (Registration No. 333-254170) became effective on March 29, 2021.

During year ended December 31, 2022 the Company sold 5,963,294 shares of its common stock under the Sales Agreement at an average price of approximately $2.46 per share for aggregate gross proceeds of approximately $14.7 million prior to deducting sales commissions. Subsequent to December 31, 2022, the Company did not sell any shares of its common stock under the Sales Agreement.

GSK License and Share Purchase Agreements

Concurrently with the execution of the GSK License Agreement, on September 21, 2022 (the "GSK Effective Date"), the Company entered into a stock purchase agreement (the "GSK SPA") with Glaxo Group Limited ("GGL"), an affiliate of GSK, which closed on November 7, 2022 (the "GSK Closing Date"), and pursuant to which GGL purchased on the GSK Closing Date 7,450,000 shares (the "GSK Shares") of the Company's common stock at a purchase price of approximately $1.20805 per share, which represented a discount on the closing price on November 4, 2022, for an aggregate purchase price of $9.0 million. The GSK SPA contains certain standstill, lock-up and registration rights provisions. Upon closing, the Company recorded the fair market value of the shares issued in stockholders' equity in its condensed consolidated balance sheet.

The fair market value of 7,450,000 shares of the Company's common stock issued under the GSK SPA was $10.3 million. The common stock issued under the GSK SPA were valued using an option pricing valuation model as the shares are subject to certain holding period restrictions. The Company accounted for the associated discount of $1.3 million as a freestanding equity-linked instrument under ASC 815. The discount was allocated as consideration for the GSK License Agreement and evaluated under ASC 606. The discount was determined not to be constrained and was included in the calculation of the total transaction price related to the GSK License Agreement as of the effective date of the transaction. Refer to Note 14 for further discussion.

The GSK Shares were issued and sold without registration under the Securities Act in reliance on the exemptions provided by Section 4(a)(2) of the Securities Act and/or Regulation D promulgated thereunder and in reliance on similar exemptions under applicable state laws. Refer to Note 14 for further discussion.

Pfizer License and Share Purchase Agreements

On June 30, 2021, the Company agreed to sell 2,362,348 shares of common stock to Pfizer Inc. ("Pfizer") pursuant to a Share Purchase Agreement (the "Pfizer Purchase Agreement"), at a price of $16.93 per share, which represented a premium over the most recent closing price on June 30, 2021, for an aggregate purchase price of $40.0 million.

No shareholder approval was required for the sale of the shares. Pfizer is an accredited investor as defined in the Securities Act, and the shares were sold pursuant to exemptions from registration under Regulation D of the Securities Act. The Company has not filed a registration statement with the SEC covering the resale of the shares and such securities may not be offered or sold in the United States absent registration or an exemption from registration under the Securities Act and any applicable state securities laws.

The fair market value of 2,362,348 shares of the Company's common stock issued to Pfizer under the Pfizer Purchase Agreement was $27.5 million. The common stock issued under the Pfizer Purchase Agreement were valued using an option pricing valuation model as the shares are subject to certain holding period restrictions. The Company accounted for the associated premium of $12.5 million as a freestanding equity-linked instrument under ASC 815. The premium was allocated as consideration for the Company's license agreement with Pfizer (the "Pfizer License Agreement") and evaluated under ASC 606. The premium was determined not to be constrained and was included in the calculation of the total transaction price related to the Pfizer License Agreement as of June 30, 2021. Refer to Note 14 for further discussion.

The closing of the sale of the shares pursuant to the Pfizer Purchase Agreement occurred on July 1, 2021. Upon closing, the Company recorded the fair market value of the shares issued in stockholders' equity in its condensed consolidated balance sheet.

Charter Amendment

On August 17, 2021, the Company filed a Certificate of Amendment to its Amended and Restated Certificate of Incorporation with the Secretary of State of the State of Delaware to increase the number of shares of the Company's common stock authorized for issuance from 60,000,000 shares to 120,000,000 shares (the "Charter Amendment"). The Charter Amendment was approved by the Company's stockholders at the annual meeting of stockholders held on August 17, 2021.

8. Share-Based Compensation

2017 Stock Incentive Plan

On June 28, 2017, the Company's shareholders approved the 2017 Stock Incentive Plan (the "2017 Plan"). The 2017 Plan provides for the grant of incentive stock options, nonstatutory stock options, stock grants and stock-based awards. The 2017 Plan is administered by the board of directors, or at the discretion of the board of directors, by a committee of the board. The exercise prices, vesting and other restrictions are determined at the discretion of the board of directors, or their committee if so delegated, except that the exercise price per share of stock options may not be less than 100% of the fair market value of the share of common stock on the date of grant and the term of stock option may not be greater than ten years. The number of shares initially reserved for issuance under the 2017 Plan was 1,785,416 shares of common stock. The shares of common stock underlying any awards that are forfeited, cancelled, repurchased or are otherwise terminated by the Company under the 2017 Plan will be added back to the shares of common stock available for issuance under the 2017 Plan.

On October 18, 2017, the Company's shareholders approved an amendment to the 2017 Plan, which became effective upon the completion of the Company's initial public offering, to increase the total number of shares reserved for issuance under the 2017 Plan from 1,785,416 to 2,696,401. Additionally, the number of shares of common stock that may be issued under the 2017 Plan would be automatically increased on each January 1, beginning with the fiscal year ending December 31, 2019 and continuing for each fiscal year until, and including, the fiscal year ending December 31, 2027, equal to the lowest of (i) 607,324 shares of common stock, (ii) 4% of the outstanding shares of common stock on such date and (iii) an amount determined by the Company's board of directors or compensation committee.

On August 17, 2021, the Company's shareholders approved amendments to the 2017 Plan. The amendments provided for the following: (i) increased the number of shares of the Company's common stock authorized for issuance under the 2017 Plan by

3,170,254 shares, (ii) removed the "evergreen" provision historically included in the 2017 Plan, and (iii) made certain other amendments.

In September 2022, the Company's shareholders approved an amendment to the 2017 Plan to increase the number of shares of the Company's common stock authorized for issuance under the 2017 Plan by 2,000,000 shares.

As of December 31, 2022, there were 4,382,875 shares remaining available to be issued under the 2017 Plan, as amended.

2019 Equity Incentive Plan

On March 11, 2019, the Company adopted the 2019 Inducement Equity Incentive Plan (the "2019 Inducement Plan") to reserve 331,500 shares of its common stock to be used exclusively for grants of awards to individuals that were not previously employees or directors of the Company as a material inducement to such individuals' entry into employment with Spero within the meaning of Rule 5635(c)(4) of the Nasdaq Listing Rules. The terms and conditions of the 2019 Inducement Plan are substantially similar to those of the 2017 Plan.

In June 2020, the board of directors approved an amendment to the 2019 Inducement Plan to increase the number of shares of common stock authorized for issuance under the 2019 Inducement Plan by 700,000 shares. In December 2022, the board of directors approved an amendment to the 2019 Inducement Plan to increase the number of shares of common stock authorized for issuance under the 2019 Inducement Plan by 875,000 shares.

As of December 31, 2022, there were 1,030,096 shares remaining available to be issued under the 2019 Inducement Plan, as amended.

The following table summarizes stock option activity for all of our plans during 2022:

	2017 Plan	2019 Inducement Plan	Total Number of Stock Options
Outstanding as of December 31, 2021	3,893,605	997,111	4,890,716
Granted	956,604	—	956,604
Exercised	(56,120)	—	(56,120)
Forfeited or cancelled	(1,161,257)	(650,844)	(1,812,101)
Outstanding as of December 31, 2022	3,632,832	346,267	3,979,099

As of December 31, 2022, a total of 11,595,127 shares have been authorized and reserved for issuance under all equity plans and 5,412,971 shares were available for future issuance under such plans.

Stock Option Valuation

The fair value of stock options is estimated using the Black-Scholes option-pricing model. The Company does not have sufficient company-specific historical and implied volatility information and it therefore estimates its expected share volatility based on the historical volatility of a set of publicly traded peer companies. The Company expects to continue to do so until such time as it has adequate historical data regarding the volatility of its own traded share price. The Company has estimated the expected term of the Company's stock option awards utilizing the "simplified" method for awards that qualify as "plain-vanilla." The risk-free interest rate is determined by reference to the U.S. Treasury yield curve in effect at the time of grant of the award for time periods approximately equal to the expected term of the award. Expected dividend yield is based on the fact that the Company has never paid cash dividends and does not expect to pay any cash dividends in the foreseeable future.

The assumptions that the Company used in the Black-Scholes option-pricing model to determine the fair value of stock option awards granted to employees and directors were as follows, presented on a weighted average basis:

	Year Ended December 31,	
	2022	2021
Risk-free interest rate	1.7%	0.8%
Expected term (in years)	6.2	6.2
Expected volatility	82.7%	92.6%
Expected dividend yield	0.0%	0.0%

The following table summarizes details regarding stock options granted under our equity incentive plans for the year ended December 31, 2022:

	Number of Shares	Weighted Average Exercise Price	Weighted Average Contractual Term (in years)	Aggregate Intrinsic Value (in thousands)
Outstanding as of December 31, 2021	4,890,716	$ 11.75	7.62	$ 24,263
Granted	956,604	11.12		
Exercised	(56,120)	7.48		
Forfeited or cancelled	(1,812,101)	13.21		
Outstanding as of December 31, 2022	3,979,099	$ 10.99	5.27	$ 1
Outstanding as of December 31, 2022 - vested and expected to vest	3,979,099	$ 10.99	5.27	$ 1
Exercisable at December 31, 2022	2,688,861	$ 9.76	4.58	$ —

The weighted average grant-date fair value of stock options granted during the year ended December 31, 2022 was $7.94 per share. The weighted average grant-date fair value of awards granted during the year ended December 31, 2021 was $13.37 per share. The aggregate intrinsic value of stock options exercised during the years ended December 31, 2022 and 2021 was approximately $0.1 million and $1.2 million, respectively. The Company satisfies stock option exercises with newly issued shares of its common stock.

As of December 31, 2022, total unrecognized compensation cost related to unvested stock option grants was approximately $11.4 million. This amount is expected to be recognized over a weighted average period of approximately 2.42 years.

Restricted Stock Units

The Company granted 1,420,750 restricted stock units (“RSUs”) to employees during the year ended December 31, 2022.

The following table summarizes RSU activity under all equity plans (excluding performance-based RSUs) during the year months ended December 31, 2022:

	Number of RSU Shares	Weighted Average Grant Date Fair Value
Outstanding as of December 31, 2021	513,690	$ 17.08
Granted	1,420,750	5.88
Vested and released	(226,043)	7.00
Forfeited or cancelled	(408,000)	14.16
Outstanding as of December 31, 2022	1,300,397	$ 7.51

As of December 31, 2022, there was approximately $8.1 million of total unrecognized compensation expense related to RSUs, which is expected to be recognized over a weighted-average period of approximately 2.83 years.

The fair value of the RSUs is determined on the date of grant based on the market price of the Company’s common stock on that date. Each RSU represents the right to receive one share of the Company’s common stock, $0.001 par value per share, upon vesting. Other than RSUs granted as retention awards, the RSUs vest in four equal annual installments, subject to the individual’s continued service to the Company through the applicable vesting date, and are subject to the terms and conditions of the Company’s form of RSU agreement under the 2017 Plan and 2019 Plan.

Performance-Based awards

In July 2022, as part of the retention awards referenced in Footnote 10, the Company issued awards containing performance-based vesting criteria ("performance-based awards") to be issued on May 31, 2023, with a value of $1.7 million based on the common stock price at such time, subject to the discretion of the Company's Board or Compensation Committee to pay in cash or a combination of cash and stock. Performance-based awards will be recorded as an accrued liability on the Company's condensed consolidated balance sheet and accrued over time as achievement of performance metrics become probable. The performance-based

awards are eligible for vesting based on the achievement of certain performance criteria by May 31, 2023 relating to pipeline execution, business development, and financial stewardship. Performance-based awards for which the performance criteria have not been achieved as specified by May 31, 2023 will lapse and be forfeited. The performance-based awards will be subject to acceleration of vesting in the event of termination of employment without cause by the Company or by the executive for good reason (each as defined in the executive's employment agreement).

In September 2022, the Company approved an award of 140,000 performance-based stock units as part of an executive inducement grant ("Inducement PSUs"). The Inducement PSUs are eligible for vesting based on the same performance criteria, above. To the extent these performance criteria are met by May 31, 2023, 50% of the Inducement PSUs will vest on September 12, 2023 and 50% will vest on September 12, 2024.

The Company recognized $1.0 million of compensation expense associated with performance-based awards and an insignificant amount of expense associated with the Inducement PSUs during the year ended December 31, 2022, as the performance conditions were considered probable of achievement.

Share-Based Compensation Expense

The Company recorded share-based compensation expense, for both RSUs and stock options in the following expense categories of its consolidated statements of operations and comprehensive loss (in thousands):

	Year Ended December 31,	
	2022	2021
Research and development expenses	$ 3,678	$ 4,163
General and administrative expenses	5,445	5,267
Total	$ 9,123	$ 9,430

9. Liability Related to the Sale of Future Royalties

On September 29, 2021, the Company entered into a Revenue Interest Financing Agreement ("Revenue Interest Agreement") with certain entities managed by HealthCare Royalty Management, LLC ("HCR"), pursuant to which the Company sold to HCR the right to receive certain royalty payments from the Company for a purchase price of up to $125.0 million. The Company evaluated the terms of the Revenue Interest Agreement and concluded that the features of the investment amount were similar to those of a debt instrument. The Company received gross proceeds of $50.0 million from HCR at an initial funding on October 19, 2021. As such, the Company accounted for this transaction as long-term debt as of December 31, 2021. The Company was entitled to receive an additional $50.0 million upon FDA approval of tebipenem HBr on or before December 31, 2022, and an additional $25.0 million subject to the mutual agreement of the Company and HCR and if the Company met certain minimum tebipenem HBr product sales thresholds in the United States within 12 months from commercial launch.

On June 7, 2022, the Company entered into a Revenue Interest Termination Agreement (the "Termination Agreement") with HCR and HCR Collateral Management, LLC, as collateral agent for HCR under the Revenue Interest Agreement, pursuant to which the parties mutually agreed to terminate the Revenue Interest Agreement between the parties, and certain other related ancillary agreements, arrangements or understandings under or contemplated by the Revenue Interest Agreement and Security Agreement between the Company and HCR. The Company was released from all of its obligations and the rights to any future revenues and collateral reverted back to the Company in return for a cash payment of $54.5 million and a potential additional cash amount contingent upon the occurrence of a change of control event.

If a change of control event had occurred on or prior to December 31, 2022, the Company would have been obligated to pay to HCR an additional amount within 15 days following the consummation of such change of control transaction, calculated based on the fully-diluted equity value of the Company. If the change of control value was less than $100 million, the change of control payment would be $4 million, if $100 million to $200 million, the change of control payment would be $4 million plus 6% of the change of control value in excess of $100 million and if above $200 million, the change of control payment would be $10 million plus 3% of the change of control value in excess of $200 million. The change of control payment is not cumulative, such that only the highest applicable change of control value would apply in calculating the change of control payment.

The rights to this contingent payment expired on December 31, 2022. The Company recognized a loss on the extinguishment of $3.6 million, as reported on the associated condensed consolidated statement of operations and comprehensive loss.

The following table presents the changes in the liability related to the sale of future royalties under the Revenue Interest Agreement with HCR as of December 31, 2022 (in thousands):

	December 31, 2022
Liability related to sale of future royalties, as of December 31, 2021	$ 48,414
Repayment of liability	(54,485)
Loss on extinguishment of liability	3,581
Establish change of control derivative liability	(115)
Interest expense recognized	2,605
Liability related to sale of future royalties, as of December 31, 2022	$ —

10. Restructuring

On May 3, 2022, the Company implemented a strategic restructuring initiative and corresponding reduction in workforce. The restructuring initiative and corresponding reduction in workforce was designed to reduce costs and reallocate resources towards the Company's clinical development programs for SPR720 and SPR206, while maintaining key personnel needed to help preserve the value of the Company's tebipenem HBr program. The restructuring reduced the Company's workforce from 146 full-time employees as of December 31, 2021 to 41 full-time employees as of the end of the second quarter of 2022 following the restructuring.

During the year ended December 31, 2022, the Company recognized a restructuring charge of $11.6 million, the majority of which was incurred in the second quarter of 2022. Restructuring charges included approximately $8.6 million of employee related termination costs and $3.0 million of other discontinuation costs such as contract termination fees and lease impairment expense. The following tables summarize the restructuring related charges by line item within the Company's consolidated statements of operations where they were recorded during the year ended December 31, 2022:

	Year Ended December 31, 2022		
	Research and development	General and administrative	Total
Severance and other employee costs	$ 3,872	$ 4,680	$ 8,552
Other	488	2,590	3,078
Total restructuring charges	$ 4,360	$ 7,270	$ 11,630

The restructuring charge was included in accrued expenses and other current liabilities in the Company's condensed consolidated balance sheet. Activity for the quarter is summarized as follows (amounts in thousands):

	As of December 31, 2022
Balance as of December 31, 2021	$ —
Charge to expense	11,630
Payments made	(7,702)
Write-offs and impairments	(3,480)
Balance as of December 31, 2022	$ 448

As of December 31, 2022, the Company had $0.4 million remaining in accrued expenses related to restructuring costs on its condensed consolidated balance sheet, of which the majority will be paid by the end of the first quarter of 2023.

Retention Awards

In June 2022, upon recommendation of the Company's Compensation Committee, the Board of Directors approved retention awards for employees of the Company. Subject to remaining actively employed with the Company through May 31, 2023, the aggregate retention awards include (i) a cash bonus of $1.1 million, which was paid on November 30, 2022 and $0.2 million as fully vested RSU grants of the same value issued on November 30, 2022 and (ii) a cash bonus of $3.2 million payable on May 31, 2023 and $0.7 million to be paid in cash or as a fully vested RSU grant of the same value. These amounts are accrued as services are performed through May 31, 2023.

On July 1, 2022, upon recommendation of the Company's Compensation Committee, the Board of Directors approved a cash and RSU retention award to certain members of the Company's executive leadership team consisting of the following:

- Subject to the certain members of the Company's executive leadership team remaining actively employed with the Company through May 31, 2023, they shall receive an aggregate of: (i) a cash bonus equal to $0.9 million, which was paid on November 30, 2022 and (ii) if certain performance criteria are achieved, a number of shares of common stock to be issued to them on May 31, 2023 having a value of $1.7 million based on the common stock price at such time, subject to the discretion of the Board or the Compensation Committee to pay in cash or a combination of cash and stock.

The RSUs are eligible for vesting based on the achievement of certain performance criteria by May 31, 2023 relating to pipeline execution, business development, and financial stewardship. RSUs for which the performance criteria have not been achieved as specified by May 31, 2023 will lapse and be forfeited. The RSUs will be subject to acceleration of vesting in the event of termination of employment without cause by the Company or by the executive for good reason (each as defined in the executive's employment agreement).

These awards will be accrued as services are incurred through May 31, 2023. Awards with performance criteria will be accrued as performance metrics are met. During the year ended December 31, 2022, the Company recognized $1.0 million of compensation expense associated with these awards (see Note 8).

11. Income Taxes

During the years ended December 31, 2022 and 2021, the Company recorded no income tax benefits for the net operating losses incurred in each year or interim period due to its uncertainty of realizing a benefit from those items.

The domestic and foreign components of loss before income taxes were as follows (in thousands):

	Year Ended December 31,	
	2022	2021
Domestic	$ (46,249)	$ (89,565)
Foreign	(166)	(191)
Loss before income taxes	$ (46,415)	$ (89,756)

A reconciliation of the U.S. federal statutory income tax rate to the Company's effective income tax rate is as follows:

	Year Ended December 31,	
	2022	2021
Federal statutory income tax rate	(21.0)	(21.0)
Federal and state research and development tax credit	(4.3)	(3.1)
State taxes, net of federal benefit	(2.3)	(7.0)
Nondeductible items	1.0	0.6
Increase in deferred tax asset valuation allowance	26.6	30.5
Effective income tax rate	—	—

Net deferred tax assets as of December 31, 2022 and 2021 consisted of the following (in thousands):

	December 31,	
	2022	2021
Net operating loss carryforwards	$ 78,619	$ 83,849
Research and development tax credit carryforwards	14,294	12,375
Capitalized research and development expenses, net	11,613	—
Other	10,264	6,220
Total deferred tax assets	114,790	102,444
Valuation allowance	(114,790)	(102,444)
Net deferred tax assets	$ —	$ —

As of December 31, 2022, the Company had U.S. federal and state net operating loss carryforwards of $291.9 million and $282.9 million, respectively, which may be available to offset future income tax liabilities. The federal NOLs of $73.0 million will expire at various dates from 2033 to 2037 and approximately $218.9 million can be carried forward indefinitely. The state NOLs begin

to expire in 2033 and will expire at various dates through 2039. In addition, as of December 31, 2022, the Company had foreign net operating loss carryforwards of $4.6 million, which may be available to offset future income tax liabilities and do not expire. As of December 31, 2022, the Company also had federal and state research and development tax credit carryforwards of $11.5 million and $2.8 million, respectively, which may be available to offset future income tax liabilities and begin to expire in 2033 and 2028, respectively.

Utilization of the U.S. net operating loss carryforwards and research and development tax credit carryforwards may be subject to a substantial annual limitation under Section 382 of the Internal Revenue Code of 1986, and corresponding provisions of state law, due to ownership changes that have occurred previously or that could occur in the future. These ownership changes may limit the amount of carryforwards that can be utilized annually to offset future taxable income. In general, an ownership change, as defined by Section 382, results from transactions increasing the ownership of certain stockholders or public groups in the stock of a corporation by more than 50% over a three-year period. If the Company experiences a change of control, as defined by Section 382, at any time since inception, utilization of the net operating loss carryforwards or research and development tax credit carryforwards would be subject to an annual limitation under Section 382, which is determined by first multiplying the value of the Company's stock at the time of the ownership change by the applicable long-term tax-exempt rate, and then could be subject to additional adjustments, as required. Any limitation may result in expiration of a portion of the net operating loss carryforwards or research and development tax credit carryforwards before utilization. The Company completed an analysis under Section 382 through December 31, 2022 and concluded it had experienced ownership changes in the past. However, the ownership changes did not result in a limitation that at this time would materially reduce the total amount of net operating loss carryforwards and credits that can be utilized.

The Company has evaluated the positive and negative evidence bearing upon its ability to realize the deferred tax assets. Management has considered the Company's history of cumulative net losses incurred since inception and its lack of commercialization of any products or generation of any revenue from product sales since inception and has concluded that it is more likely than not that the Company will not realize the benefits of the deferred tax assets. Accordingly, a full valuation allowance has been established against the deferred tax assets as of December 31, 2022 and 2021. Management reevaluates the positive and negative evidence at each reporting period.

Changes in the valuation allowance for deferred tax assets during the years ended December 31, 2022 and 2021 related primarily to the increase in net operating loss carryforwards and research and development tax credit carryforwards, and were as follows (in thousands):

	December 31,	
	2022	2021
Valuation allowance as of beginning of year	$ (102,444)	$ (75,039)
Increases recorded to income tax provision	(12,346)	(27,405)
Valuation allowance as of end of year	$ (114,790)	$ (102,444)

The Company has not recorded any amounts for unrecognized tax benefits as of December 31, 2022 or 2021. The Company's policy is to record interest and penalties related to income taxes as part of its income tax provision. As of December 31, 2022 or 2021, the Company had no accrued interest or penalties related to uncertain tax positions and no amounts had been recognized in the Company's statement of operations and comprehensive loss.

The Company has not, as yet, conducted a study of its research and development credit carryforwards. This study may result in an adjustment to the Company's research and development credit carryforwards; however, until a study is completed and any adjustment is known, no amounts are being presented as an uncertain tax position. A full valuation allowance has been provided against the Company's research and development credits and, if an adjustment is required, this adjustment would be offset by an adjustment to the valuation allowance.

The Company had filed separate U.S. income tax returns return for each of its subsidiaries prior to its reorganization in 2015. The Company now files U.S. income tax returns as a U.S. consolidated group. In Massachusetts, the Company files income tax returns as a combined group except for its Massachusetts Securities Corporation subsidiary, which is a separate income tax filing. The statute of limitations for assessment by the Internal Revenue Service and Massachusetts tax authorities remains open for all years since 2019. To the extent the Company has tax attribute carryforwards, the tax years in which the attribute was generated may still be adjusted upon examination by the Internal Revenue Service or state authorities to the extent utilized in a future period. No federal or state tax audits are currently in process.

In response to the COVID-19 pandemic, the Coronavirus Aid, Relief and Economic Security Act (“CARES Act”), was signed into law in the United States in March 2020. The CARES Act adjusted a number of provisions of the tax code, including the calculation and eligibility of certain deductions and the treatment of net operating losses and tax credits. The enactment of the CARES Act did not result in any material adjustments to the Company’s income tax provision for the year ended December 31, 2022, or to the Company’s net deferred tax assets as of December 31, 2022.

On December 22, 2017, the Tax Cuts and Jobs Act ("TCJA") was signed into law. Under the TCJA provisions, effective with tax years beginning on or after January 1, 2022, taxpayers can no longer immediately expense qualified research and development expenditures, including all direct, indirect, overhead and software development costs. Taxpayers are now required to capitalize and amortize these costs over five years for research conducted within the United States or 15 years for research conducted abroad. As a result, the Company capitalized $47.6 million of research and development expenses for the year ended December 31, 2022.

12. Commitments and Contingencies

License Agreements

The Company has entered into license agreements with various parties under which it is obligated to make contingent and non-contingent payments (see Note 14).

Operating Leases

The Company has entered into an operating lease agreement with U.S. REIF Central Plaza Massachusetts, LLC with respect to its corporate headquarters located at 675 Massachusetts Avenue, Cambridge, Massachusetts (see Note 5).

Indemnification Agreements

In the ordinary course of business, the Company may provide indemnification 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 or from intellectual property infringement claims made by third parties. In addition, the Company has entered into indemnification agreements with members of its board of directors that will require the Company, among other things, to indemnify them against certain liabilities that may arise by reason of their status or service as directors or officers. The maximum potential amount of future payments the Company could be required to make under these indemnification agreements is, in many cases, unlimited. To date, the Company has not incurred any material costs as a result of such indemnifications. The Company is not aware of any claims under indemnification arrangements that will have a material effect on its financial position, results of operations or cash flows, and it has not accrued any liabilities related to such obligations in its consolidated financial statements as of December 31, 2022 or 2021.

Legal Proceedings

Two putative class action lawsuits were filed against the Company and certain of its officers in the United States District Court for the Eastern District of New York, one captioned Richard S. Germond v. Spero Therapeutics, Inc., Ankit Mahadevia, and Satyavrat Shukla, Case No. 1:22-cv-03125, filed on May 26, 2022, and the other captioned Kashif Memon v. Spero Therapeutics, Inc., Ankit Mahadevia, and Satyavrat Shukla Case No. 1:22-cv-04154, filed on July 15, 2022. The parties moved to consolidate the two complaints on July 22, 2022, which were ordered consolidated on August 5, 2022. Both Mr. Memon and stockholder Nabil Saad filed motions for appointment of lead plaintiff/lead counsel on July 25, 2022. Mr. Saad withdrew his opposition on August 15, 2022, and Mr. Memon was appointed lead plaintiff on September 19, 2022. The complaint purports to be brought on behalf of stockholders who purchased the Company’s common stock from May 6, 2021 through May 2, 2022 (Mr. Memon’s complaint alleged a six-month longer class period than the complaint originally filed by Mr. Germond). The complaint generally alleges that the Company and certain of its officers violated Sections 10(b) and/or 20(a) of the Securities Exchange Act of 1934 and Rule 10b-5 promulgated thereunder by making allegedly false and/or misleading statements concerning the New Drug Application for tebipenem HBr in an effort to lead investors to believe that the drug would receive approval from the FDA. The complaint seeks unspecified damages, interest, attorneys’ fees, and other costs. Mr. Memon filed an amended complaint on December 5, 2022. The amended complaint generally alleges the same arguments provided in the original complaint. The Company notified the Court of its intention to file a motion to dismiss the amended complaint in its entirety. The Court held a conference on February 22, 2023 and set a date of March 31, 2023 for the Company to file a motion to dismiss. The Company denies any allegations of wrongdoing and intends to vigorously defend against this lawsuit. However, there is no assurance that the Company will be successful in its defense or that insurance will be

available or adequate to fund any settlement or judgment or the litigation costs of this action. Moreover, the Company is unable to predict the outcomes or reasonably estimate a range of possible loss at this time.

Additional lawsuits against the Company and certain of its officers or directors may be filed in the future. If additional similar complaints are filed, absent new or different allegations that are material, the Company will not necessarily announce such additional filings.

13. Government Contracts

BARDA

In July 2018, the Company was awarded a contract from Biomedical Advanced Research and Development Authority ("BARDA") of up to $44.2 million to develop tebipenem HBr for the treatment of complicated urinary tract infections ("cUTI") caused by antibiotic resistant Gram-negative bacteria and for assessment against biodefense pathogens. The award committed initial funding of $15.7 million over a three-year base period from July 1, 2018 to June 30, 2021 for cUTI development activities. In May 2019, the contract was modified to include additional funding of approximately $2.5 million for the development of tebipenem HBr, increasing the amount of the initial committed funding from $15.7 million to approximately $18.2 million and increasing the overall potential award to $46.8 million. In January 2020, BARDA exercised its first contract option for additional committed funding of $15.9 million, increasing the total committed funding to $34.0 million and extended the period of performance through November 1, 2021. In October 2022, BARDA extended the period of performance for the first contract option through December 15, 2023. As of December 31, 2022, the balance of the award was subject to BARDA exercising a second option which would entail funding of $12.7 million and is exercisable by BARDA subject to, among other things, satisfactory progress and results from the biodefense studies described below. On January 19, 2022, the Company announced that BARDA exercised a new option under the contract. The new option increases the total amount of committed funding by $12.9 million to approximately $46.9 million, increasing the total potential contract value to $59.7 million. In September 2022, remaining funding from the $12.9 million option was reprogrammed to support clinical trials for patients with cUTIs, including acute pyelonephritis. The period of performance for this new option extends through December 31, 2025 and does not change the total amount of committed funding or potential contract value.

As part of an inter-agency collaboration between BARDA and the DTRA, a series of studies to assess the efficacy of tebipenem HBr in the treatment of infections caused by biodefense threats such as anthrax, plague and melioidosis will be conducted under the direction of Spero. DTRA provides up to $10.0 million, in addition to the total potential award from BARDA, to cover the cost of the nonclinical biodefense aspects of the collaborative program for tebipenem HBr. Together, BARDA and DTRA will provide up to $69.7 million in total funding for the clinical development and biodefense assessment of tebipenem HBr, of which $12.7 million is subject to the exercise of options by BARDA and Spero's achievement of specified milestones.

During the years ended December 31, 2022 and 2021, the Company recognized $2.2 million and $9.9 million of revenue under this agreement, respectively.

U.S. Department of Defense

On July 1, 2019, the Company received a $5.9 million award from the DoD Congressionally Directed Medical Research Programs ("CDMRP") Joint Warfighter Medical Research Program. The funding supported the further clinical development of SPR206. The award committed non-dilutive funding of $5.9 million over a four-year period to cover the costs of select Phase 1 pharmacology studies, a 28-day GLP NHP toxicology study, and microbiological surveillance studies that would be required for a potential NDA submission with the FDA for SPR206. During the years ended December 31, 2022 and 2021, the Company recognized $1.0 million and $4.5 million in revenue under this agreement, respectively. As of December 31, 2022, all activities under this award were completed and this award was closed out.

NIAID

In May 2021, the Company was awarded a five-year contract from the U.S. National Institute of Allergy and Infectious Diseases ("NIAID") under the Agency's Omnibus Broad Agency Announcement No. HHS-NIH-NIAID-BAA2020-1 award mechanism to support further development of SPR206. Funding will be used to offset certain expenses related to manufacturing, clinical, non-clinical and regulatory activities. The Company can receive up to $23.4 million over a base period and five option periods. As of December 31, 2022, funding for the base period totaling $6.2 million has been committed. In December 2022, the contract was modified to include additional funding of approximately $0.1 million increasing the amount of base period committed funding from $2.1 million to $2.2 million. This increased the total potential contract value to $23.5 million. In October 2022, NIAID exercised its first option under the contract, committing $4.0 million for SPR206 through April 2025. The Company recognized $1.7 million and $0.4 million under this agreement during the years ended December 31, 2022 and 2021, respectively.

In June 2016, the Company entered into agreements with Pro Bono Bio PLC ("PBB"), a corporation organized under the laws of England, and certain of its affiliates, including PBB Distributions Limited and Cantab Anti-Infectives Limited ("CAI"), in order to acquire certain intellectual property and government funding arrangements relating to SPR206. Under these agreements, CAI agreed to submit a request to NIAID to novate the then CAI-held NIAID contract to Spero, which was finalized in December 2017. The NIAID contract provided development funding of up to $6.5 million over a base period and three option periods. In March 2021, a contract modification was executed and the performance period for this award was extended through June 15, 2021. As of December 31, 2021, funding for the base period and the first two option periods totaling $5.9 million had been committed. The Company did not recognize revenue under this agreement during the year ended December 31, 2022 and recognized $0.4 million in revenue under this agreement, during the year ended December 31, 2021.

14. License, Collaboration and Service Agreements

The Company has certain obligations under license agreements with third parties that include annual maintenance fees and payments that are contingent upon achieving various development, regulatory and commercial milestones. Pursuant to these license agreements, the Company is required to make milestone payments if certain development, regulatory and commercial milestones are achieved, and may have certain additional research funding obligations. Also, pursuant to the terms of each of these license agreements, when and if commercial sales of a product commence, the Company will pay royalties to its licensors on net sales of the respective products.

SPR720 Agreements

Gates MRI

In June 2019, the Company entered into a collaboration with Gates MRI to develop SPR720 for the treatment of lung infections caused by Mycobacterium tuberculosis. In furtherance of the Gates MRI's charitable purposes, the Company also granted to Gates MRI a no-cost, exclusive license to develop, manufacture and commercialize SPR720 for the treatment of tuberculosis ("TB") in low- and middle- income countries. The Gates MRI is responsible for formulating and funding its own research plan for the development of SPR720 for TB. As such, Gates MRI will conduct and fund preclinical and clinical studies for the development of SPR720 against TB. In addition, Gates MRI and the Company will jointly design and manage certain collaborative research activities, which the Company will perform and which will be funded by the Gates MRI. Due to the cost-funded nature of the payments and the Company's assessment that it does not have a vendor/customer relationship with the Gates MRI, the Company will recognize the funding received under the agreement as a reduction to the research and development expenses incurred, as the related expenses are incurred. The Company did not record a reduction to research and development expense as no activities were funded by Gates MRI during the year ended December 31, 2022. The Company did not record a reduction to research and development expense related to activities funded by Gates MRI during the year ended December 31, 2022 and recorded a $1.5 million reduction to research and development expense related to activities funded by Gates MRI during the year ended December 31, 2021.

Vertex License Agreement

In May 2016, the Company entered into an agreement with Vertex Pharmaceuticals Incorporated ("Vertex") whereby Vertex granted the Company certain know-how and a sublicense to research, develop, manufacture and sell products for a proprietary compound, as well as a transfer of materials. In exchange for the know-how, sublicense and materials, Spero paid Vertex an upfront, one-time, nonrefundable, non-creditable fee of $0.5 million, which was recognized as research and development expense. As part of the agreement, the Company is obligated to make future milestone payments of up to $80.2 million upon the achievement of specified clinical, regulatory and commercial milestones and to pay Vertex tiered royalties, on a product-by-product and country-by-country basis, of a mid-single-digit to low double-digit percentage based on net sales of products licensed under the agreement. During the years ended December 31, 2022 and 2021, the Company did not record any research and development expense under this agreement and the next milestone under this agreement is not accrued because it is not yet probable.

The agreement continues in effect until the expiration of all payment obligations thereunder, with royalty payment obligations continuing on a product-by-product and country-by-country basis until the later of ten years after the first commercial sale of such product in such country or the date of expiration in such country of the last to expire applicable patent. Further, Vertex has the right to terminate the agreement if provided with notification from the Company of intent to cease all development or if no material development or commercialization efforts occur for one year.

Tebipenem HBr Agreements

GSK License and Share Purchase Agreement

On November 7, 2022, the Company closed the transactions contemplated by the GSK License Agreement, which was entered into on September 21, 2022. Pursuant to the terms of the GSK License Agreement, the Company granted GSK an exclusive royalty-bearing license, with the right to grant sublicenses, under the Company's intellectual property and regulatory documents and a sublicense under certain intellectual property of Meiji Seika Pharma Co. Ltd. ("Meiji") and Meiji's regulatory documents to develop, manufacture and commercialize tebipenem pivoxil and tebipenem HBr and products that contain tebipenem pivoxil and tebipenem HBr (the "GSK Licensed Products") in all territories, except certain Asian countries previously licensed to Meiji (Japan, Bangladesh, Brunei, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, South Korea, Taiwan, Thailand and Vietnam (the "Meiji Territory")) (the "GSK Territory"). If the Company's license with Meiji is terminated, or if Meiji forfeits or loses its rights to develop, manufacture and commercialize tebipenem HBr and products that contain tebipenem HBr in any countries in the Meiji Territory, then GSK will have an exclusive first right to negotiate with Spero to add any such countries to the GSK Territory.

Under the terms of the GSK License Agreement, the Company received an upfront payment of $66.0 million for GSK to secure rights to the medicine. Remaining potential payments are milestone and royalty based, and are as follows (in millions):

Event	Milestone payments (up to)
From FDA acceptance of clinical protocol, commencement of Phase 3 study through NDA submission	$150.0 (in tranched milestones)
Total commercial milestone payments based on first sale (US/EU)	$150.0
Total potential sales milestone payments	$225.0
Royalties	Low-single digit to low-double digit (if sales exceed $1.0 billion) tiered royalties on net product sales

Royalties are subject to reduction in the event of third-party licenses, entry of a generic product or expiration of patent and regulatory exclusivity prior to the tenth anniversary of the first commercial sale of a GSK Licensed Product in a particular country.

The Company will be responsible for the execution and costs of the follow-up Phase 3 clinical trial of tebipenem HBr. GSK will be responsible for the execution and costs of any additional further development, including additional Phase 3 regulatory filing and commercialization activities for tebipenem HBr in the GSK Territory. The Company will also be responsible for providing and paying for the clinical supply of tebipenem HBr while GSK will be responsible for the costs of the commercial supply of tebipenem HBr. A joint development committee has been established between GSK and the Company to coordinate and review development activities for tebipenem HBr in the United States.

Unless earlier terminated due to certain material breaches of the GSK License Agreement or by GSK for convenience, or otherwise, the GSK License Agreement will expire on a jurisdiction-by-jurisdiction and GSK Licensed Product-by-GSK Licensed

Product basis on the latest to occur of (i) loss of patent exclusivity, (ii) loss of regulatory exclusivity or (iii) the Royalty Term. During the Royalty Term, the Company has agreed not to develop, manufacture or commercialize any oral carbapenem for any indication or any oral antibiotic for cUTI; this restriction does not apply to any third party which acquires control of Spero after the date of the GSK License Agreement if certain conditions are met.

The Company has the right to terminate the GSK License Agreement upon a material breach by, or bankruptcy of, GSK. GSK has the right to terminate the GSK License Agreement at any time upon a specified number of days' notice or upon a material breach by, or bankruptcy of, the Company. In addition, in the event that GSK has the right to terminate the GSK License Agreement due to a breach by the Company, GSK may elect not to terminate the GSK License Agreement and in lieu thereof may assume the responsibility and expense of development of tebipenem HBr in the United States, in which event GSK's obligation to make further development payments to the Company would cease, and/or to reduce all subsequent commercial and sales milestone payments and royalty payments otherwise due by GSK to the Company under the GSK License Agreement by 50%.

The GSK License Agreement contains representations and warranties, other covenants, indemnification provisions and other terms and conditions customary for transactions of the type contemplated by the GSK License Agreement. In support of certain of its rights to indemnification, GSK also has certain rights to suspend payments otherwise owed to the Company, as well as the right to offset payments otherwise owed to the Company against certain indemnifiable claims.

Accounting Analysis and Revenue Recognition

The Company determined that GSK is a customer and that the GSK License Agreement is within the scope of ASC 606 as licensing intellectual property and performing ongoing research and development services are ordinary activities that are ongoing and central to the Company's operations. Accordingly, in determining the appropriate amount of revenue to be recognized, the Company performed the following steps: (i) identified the promised goods or services in the contract; (ii) determined whether the promised goods or services are performance obligations including whether they are distinct in the context of the contract; (iii) measured the transaction price, including the constraint on variable consideration; (iv) allocated the transaction price to the identified performance obligations in proportion to their SSP; and (v) recognized revenue when each performance obligation was deemed to be satisfied.

Based on that evaluation, the Company identified two performance obligations, related to the license and to research and development services.

The Company developed the estimated SSP for the license using a discounted cash flow model. In developing this estimate, the Company applied significant judgment in the determination of the significant assumptions relating to forecasted future cash flows, the discount rate, and the probability of success. The SSP for the research and development services was estimated based on the Company's estimate of costs to be incurred to fulfill its obligations associated with the performance of the research and development services, plus a reasonable margin.

The total transaction price is $64.7 million, which includes the initial payment of $66.0 million and the discount of $1.3 million related to the GSK SPA (see Note 7). At contract inception, $45.7 million of the initial $64.7 million was allocated to the license transfer performance obligation, which was fully satisfied and recognized as revenue upon delivery of the license. The additional $19.0 million was allocated to the research and development services obligation and is being recognized over time as services are delivered, estimated to be over a three year period.

The potential development milestone payments from the GSK License Agreement will be accounted for as variable consideration under ASC 606. Given the uncertain nature of these payments, the Company determined they were fully constrained as of December 31, 2022 and not included in the transaction price. The Company can also earn sales-based royalties.

The Company recognizes revenue for the license performance obligation at a point in time, that is upon transfer of the license to GSK. Control of the license was transferred on the GSK Effective Date and GSK could begin to use and benefit from the license at the GSK Effective Date.

In total, the Company recognized $46.1 million during the year ended December 31, 2022 related to the GSK License Agreement, which included $45.7 million recognized upfront upon the license and know-how transfer and $0.4 million related to the research and development service obligation.

The remaining transaction price balance of approximately $18.6 million from the GSK License Agreement allocated to the research and development services performance obligation has been recorded as deferred revenue in the condensed consolidated balance sheet. As of December 31, 2022, the research and development services related to the second performance obligation were expected to be recognized as costs are incurred over the project development timeframe.

Meiji License Agreement

In June 2017, the Company entered into agreements with Meiji, whereby Meiji granted to the Company a license under certain patents, know-how and regulatory documentation to research, develop, manufacture and sell products containing a proprietary compound in the licensed territory. In exchange for the license, the Company paid Meiji an upfront, one-time, nonrefundable, non-creditable fee of $0.6 million, which was recognized as research and development expense. In October 2017, the Company paid a $1.0 million milestone payment to Meiji upon the enrollment of the first patient in the Company's Phase 1 clinical trial of tebipenem HBr. The payment was recorded as research and development expense in the statement of operations and comprehensive loss for the year ended December 31, 2017. The Company paid Meiji approximately $1.6 million during the fourth quarter of 2018 related to fixed assets which will be used in manufacturing related activities at Meiji. This equipment has been capitalized as property and equipment in the consolidated balance sheet as of December 31, 2022. In October 2021, the Company paid a $1.0 million milestone payment to Meiji upon submission of a NDA to the FDA for tebipenem HBr. As part of the agreement, the Company is obligated to make future milestone payments of up to $1.0 million as of December 31, 2022 upon the achievement of specified regulatory milestones, to pay royalties, on a product-by-product and country-by-country basis, of a low single-digit percentage based on net sales of products licensed under the agreement and to pay Meiji a low double-digit percentage of any sublicense fees received by the Company up to a maximum amount of $7.5 million, of which the Company paid $6.6 million as of December 31, 2022 and was recorded as research and development expense in the Company's consolidated statement of operations.

The agreement continues in effect until the expiration of all payment obligations thereunder (including royalty payments and licensee revenue) on a product-by-product and country-by-country basis, unless earlier terminated by the parties. Pursuant to the terms of the agreement, in addition to each party's right to terminate the agreement upon the other party's material breach (if not cured within a specified period after receipt of notice) or insolvency, the Company also has unilateral termination rights (i) in the event that the Company abandons the development and commercialization of tebipenem HBr for efficacy, safety, legal or business reasons, and (ii) under certain circumstances arising out of the head license with a global pharmaceutical company.

Savior Service Agreement

In November 2018, the Company entered into a service agreement with Savior Lifetec Corporation ("Savior") to perform technology transfer, process development, analytical method development and testing and formulation development for tebipenem HBr. Per the terms of the agreement, the Company paid Savior a non-refundable supervision fee of approximately $2.0 million to manage the buildout of a commercial manufacturing facility. The supervision fee was classified as a prepaid asset on the Company's balance sheet and was fully amortized as of December 31, 2021. The Company has paid Savior an additional $5.3 million for facility build out costs, which is classified as a long-term asset on the Company's balance sheet as of December 31, 2022.

SPR206 Agreements

Cantab License Agreements

Under the Cantab Agreements, the Company is obligated to make future milestone payments of up to $5.8 million upon the achievement of specified clinical and regulatory milestones and a payment of £5.0 million ($6.0 million as of December 31, 2022) upon the achievement of a specified commercial milestone. In addition, the Company agreed to pay to PBB royalties, on a product-by-product and country-by-country basis, of a low single-digit percentage based on net sales of products licensed under the agreement. During both the years ended December 31, 2022 and 2021, the Company did not record any research and development expense related to the achievement of regulatory milestones for SPR206.

The Cantab Agreements continue indefinitely, with royalty payment obligations thereunder continuing on a product-by-product and country-by-country basis until the later of ten years after the first commercial sale of such product in such country or the expiration in such country of the last to expire valid claim of any of the applicable patents.

Everest Medicines License Agreement

On January 4, 2019, the Company, through its wholly owned subsidiary New Pharma License Holdings Limited ("NPLH"), entered into a license agreement (the "Original Everest License Agreement"), with Everest. Under the terms of the Original Everest License Agreement, the Company granted Everest an exclusive license to develop, manufacture and commercialize SPR206 or products that contain SPR206 (the "Licensed Products"), in Greater China (which includes Mainland China, Hong Kong and Macau), South Korea and certain Southeast Asian countries (the "Territory"). The Company retained development, manufacturing and commercialization rights with respect to SPR206 and Licensed Products in the rest of the world and also retained the right to develop or manufacture SPR206 and Licensed Products in the Territory for use outside the Territory. In addition to the license grant with respect to SPR206, the Company, through its wholly owned subsidiary, Spero Potentiator, Inc., a Delaware corporation, granted Everest a 12-month exclusive option to negotiate with it for an exclusive license to develop, manufacture and commercialize SPR741 in the Territory.

Under the terms of the Original Everest License Agreement, the Company received an upfront payment of $3.0 million that was recognized in the first quarter of 2019, comprised of a $2.0 million payment to license SPR206 and $1.0 million for the exclusive option to negotiate a license to develop SPR741. The Company also received a milestone payment of $2.0 million in the fourth quarter of 2020 upon completion and delivery of the results of a clinical study.

On January 15, 2021, the Company entered into an amended and restated license agreement ("the Amended Everest License Agreement") with Everest and Spero Potentiator, Inc., which amended and restated in its entirety the Original Everest License Agreement. The Amended Everest License Agreement modifies the dates and values of certain milestone events related to development and commercialization of SPR206. Everest will now be making more significant investments in the development of SPR206 beyond what was contemplated at the time of the Original Everest License Agreement. The Original Everest License Agreement provided that the Company could receive up to $59.5 million upon achievement of certain milestones. The Amended Everest License Agreement provides that the Company may receive up to $38.0 million upon achievement of certain milestones, of which $2.0 million has been received to date. The Company received milestones of $1.5 million related to a clinical study for SPR206, of which the Company received approximately $0.8 million upon the initiation of the BAL clinical trial of SPR206 in June 2021 and received the remaining $0.7 million upon the delivery of the clinical study report in the second quarter of 2022. In addition, under the Amended Everest License Agreement, the Company assigned patents in the Territory to Everest, rather than licensing such patents to Everest, and the option related to SPR741 and the related provisions have been removed. Under the terms of the Amended Everest License Agreement, the Company is also entitled to receive high single-digit to low double-digit royalties on net sales, if any, of Licensed Products in the Territory following regulatory approval of SPR206. Everest has the right to sublicense to affiliates and third parties in the Territory.

Everest is responsible for all costs related to developing, obtaining regulatory approval of and commercializing SPR206 and Licensed Products in the Territory, and is obligated to use commercially reasonable efforts to develop, manufacture and commercialize Licensed Products, including to achieve certain specified diligence milestones within agreed-upon periods. A joint development committee has been established between the Company and Everest to coordinate and review the development, manufacturing and commercialization plans with respect to Licensed Products in the Territory.

Unless earlier terminated due to certain material breaches of the contract, or otherwise, the Amended Everest License Agreement will expire on a jurisdiction-by-jurisdiction and Licensed Product-by-Licensed Product basis upon the latest to occur of expiration of the last valid claim under a licensed patent in such jurisdiction, the expiration of regulatory exclusivity in such jurisdiction or ten years after the first commercial sale of such Licensed Product in such jurisdiction. The Amended Everest License Agreement may be terminated in its entirety by Everest upon 90 or 180 days' prior written notice, depending on the stage of development of the initial Licensed Product.

To date, all performance obligations under the contract were fully satisfied.

As of December 31, 2022 remaining future milestone payments of $34.0 are fully constrained, and will be recognized when and if achievement of those milestones becomes probable.

During the year ended December 31, 2022, the Company recognized approximately $0.7 million of revenue under this agreement related to certain milestone achievements. During the year ended December 31, 2021, the Company recognized $1.3 million of revenue related to this agreement.

Pfizer License and Share Purchase Agreements

On June 30, 2021, the Company and Pfizer entered into the Pfizer License Agreement and the Pfizer Purchase Agreement. Under the terms of the Pfizer License Agreement, the Company granted Pfizer an exclusive royalty-bearing license to develop, manufacture and commercialize SPR206 or products that contain SPR206 (the "Licensed Products") globally with some territorial exceptions (the "Pfizer Territory"). The Pfizer Territory excludes the United States and the Asian markets previously licensed to Everest, those being the People's Republic of China, including Hainan Island, the Hong Kong Special Administrative Region of the People's Republic of China, and the Macau Special Administrative Region of the People's Republic of China, Taiwan, the Republic of Korea (South Korea), the Republic of Singapore, Malaysian Federation, Kingdom of Thailand, the Republic of Indonesia, Socialist Republic of Vietnam and the Republic of the Philippines).

Under the terms of the Pfizer Purchase Agreement, Pfizer purchased 2,362,348 shares of the Company's common stock at a price of $16.93 per share for a total investment of $40.0 million. Under the terms of the Pfizer License Agreement, the Company received no other upfront payments but is eligible to receive up to $80.0 million in development and sales milestones, and may also receive high single-digit to low double-digit royalties on net sales of SPR206 in the Pfizer Territory. Achievement of these payments cannot be guaranteed. The Company and Pfizer agree that upon Pfizer's request, the parties will negotiate in good faith regarding procuring a clinical or commercial supply of the compound.

The fair market value of 2,362,348 shares of the Company's common stock issued to Pfizer under the Pfizer Purchase Agreement was determined to be $27.5 million. The common stock issued under the Pfizer Purchase Agreement were valued using an option pricing valuation model as the shares are subject to certain holding period restrictions. The Company accounted for the associated premium of $12.5 million as a freestanding equity-linked instrument under ASC 815. The premium was allocated as consideration for the Pfizer License Agreement and evaluated under ASC 606. The premium was determined not to be constrained and was included in the calculation of the total transaction price related to the Pfizer License Agreement as of June 30, 2021.

The Company is responsible for all costs related to developing and obtaining regulatory approval of SPR206 and Licensed Products in the Pfizer Territory, with a focus on the European market, and is obligated to use commercially reasonable efforts, including to achieve certain specified diligence milestones within agreed-upon periods. A joint development committee was established between the Company and Pfizer to coordinate and review the development, manufacturing and commercialization plans with respect to Licensed Products in the Pfizer Territory. Pfizer is responsible for commercializing SPR206 and the Licensed Products in the Pfizer Territory.

Unless earlier terminated due to certain material breaches of the contract or by Pfizer's convenience, or otherwise, the Pfizer License Agreement will expire on a jurisdiction-by-jurisdiction and licensed product-by-licensed product basis after ten years from the effective date. The Pfizer License Agreement will automatically renew for an additional ten-year term unless terminated.

Accounting Analysis and Revenue Recognition

The Company determined that Pfizer is a customer and that the Pfizer License Agreement is within the scope of ASC 606 as licensing intellectual property and performing ongoing research and development services are ordinary activities that are ongoing and central to the Company's operations. Accordingly, in determining the appropriate amount of revenue to be recognized, the Company performed the following steps: (i) identified the promised goods or services in the contract; (ii) determined whether the promised goods or services are performance obligations including whether they are distinct in the context of the contract; (iii) measured the transaction price, including the constraint on variable consideration; (iv) allocated the transaction price to the identified performance obligations in proportion to their SSP; and (v) recognized revenue when each performance obligation was deemed to be satisfied.

Based on that evaluation, the Company identified two performance obligations, license and know-how transfer and research and development services related to upcoming milestones. The Company determined that the supply agreement is a customer option and not a material right, as the pricing to Pfizer is not at a significant discount. Furthermore, Pfizer has the right to use third parties to manufacture the compound, or to manufacture the compound itself.

At contract inception, $1.4 million of the then transaction price of $12.5 million was allocated to the license and know-how transfer performance obligations, which was fully satisfied and recognized as revenue upon delivery of the license. The additional $11.1 million was allocated to the research and development services obligation and is being recognized over time as services are delivered.

In the third quarter of 2022, upon the completion of a milestone related to regulatory engagement for SPR206, Pfizer communicated its approval that the milestone was achieved, and the Company received $5.0 million under the Pfizer License Agreement, which the Company accounted for as variable consideration under ASC 606 and was added to the transaction price in the third quarter of 2022. Of this $5.0 million milestone, $0.9 million was recognized during the third quarter of 2022 and the remaining $4.1 million was allocated to the research and development services performance obligation and will be recognized over time as the services are delivered.

The potential license maintenance fees and development milestone payments from the Pfizer License Agreement will be accounted for as variable consideration under ASC 606. Given the uncertain nature of these payments, the Company determined they were fully constrained as of December 31, 2022 and not included in the transaction price. The Company can also earn sales-based royalties.

The Company recognizes revenue for the license performance obligation at a point in time, that is upon transfer of the license to Pfizer. Control of the license was transferred on the Effective Date and Pfizer could begin to use and benefit from the license at the Effective Date.

In total, and inclusive of the above, the Company recognized $1.8 million during both the twelve months ended December 31, 2022 and 2021, respectively.

The remaining transaction price balance of approximately $13.9 million from the Pfizer Purchase Agreement allocated to the research and development services performance obligation has been recorded as deferred revenue in the condensed consolidated balance sheet. As of December 31, 2022, the research and development services related to the second performance obligation were expected to be recognized as costs are incurred over the project development timeframe.

15. Net Loss per Share

Basic and diluted net loss per share attributable to common stockholders of Spero Therapeutics, Inc. was calculated as follows (in thousands, except share and per share amounts):

	Year Ended December 31,	
	2022	2021
Numerator:		
Net loss	$ (46,415)	$ (89,756)
Net loss attributable to common stockholders	$ (46,415)	$ (89,756)
Denominator:		
Weighted average common shares outstanding, basic and diluted	37,585,075	30,895,756
Net loss per share, basic and diluted	$ (1.23)	$ (2.91)

The Company excluded potentially dilutive securities from the computation of diluted net loss per share as the effect would be to reduce the net loss per share. Therefore, the weighted average number of common shares outstanding used to calculate both basic and diluted net loss per share attributable to common stockholders of Spero Therapeutics, Inc. is the same. The Company excluded the following potential common shares, presented based on amounts outstanding at each period end, from the computation of diluted net

loss per share attributable to common stockholders for the periods indicated because including them would have had an anti-dilutive effect:

	Year Ended December 31,	
	2022	2021
Options to purchase common stock	3,979,099	4,890,716
Unvested restricted stock units	1,300,397	513,690
Series A convertible preferred stock (as converted to common shares)	—	—
Series B convertible preferred stock (as converted to common shares)	—	938,000
Series C convertible preferred stock (as converted to common shares)	—	2,214,000
Series D convertible preferred stock (as converted to common shares)	—	3,215,000
Total	5,279,496	11,771,406

16. Retirement Plan

The Company has a defined-contribution plan under Section 401(k) of the Internal Revenue Code (the "401(k) Plan"). The 401(k) Plan covers all employees who meet defined minimum age and service requirements, and allows participants to defer a portion of their annual compensation on a pre-tax basis. As currently established, the Company is not required to make any contributions to the 401(k) Plan. The Company made matching contributions to the 401(k) Plan of $0.4 million and $0.5 million during the years ended December 31, 2022 and 2021, respectively.

17. Subsequent Events

The Company has evaluated, for potential recognition and disclosure, events that occurred prior to the date at which the consolidated financial statements were available to be issued. There were no material subsequent events.

Subsequent to December 31, 2022, the Company did not sell any shares of its common stock under the Sales Agreement.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure.

None.

Item 9A. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer (our principal executive officer and principal financial officer, respectively), evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2022. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of December 31, 2022, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level.

Management's Annual Report on Internal Controls Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act. Our 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 general accepted accounting principles. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. 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.

Under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the *Internal Control – Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on our evaluation under that framework, our management concluded that our internal control over financial reporting was effective as of December 31, 2022.

Changes in Internal Control Over Financial Reporting

No change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) occurred during the three months ended December 31, 2022 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information.

None.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections.

Not applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

Set forth below are the names of our directors, their ages, their offices, if any, their principal occupations or employment for at least the past five years, the length of their tenure as directors and the names of other public companies in which such persons hold or have held directorships during the past five years. Additionally, information about the specific experience, qualifications, attributes or skills that led to our Board of Directors' conclusion that each person listed below should serve as a director is set forth below:

Name	Age	Position with the Company
Milind Deshpande, Ph.D.	66	Chairman of the Board of Directors
Scott Jackson	58	Director
Ankit Mahadevia, M.D.	42	Chief Executive Officer, President and Director
John C. Pottage, Jr., M.D.	70	Director
Cynthia Smith	54	Director
Frank E. Thomas	53	Director
Kathleen Tregoning	52	Director
Patrick Vink, M.D.	59	Director

Our Board of Directors has reviewed the materiality of any relationship that each of our directors has with Spero Therapeutics, Inc., either directly or indirectly. Based upon this review, our Board of Directors has determined that the following members of the Board of Directors are "independent directors" as defined by The Nasdaq Stock Market: Milind Deshpande, Ph.D., Scott Jackson, John C. Pottage, Jr., M.D., Cynthia Smith, Frank E. Thomas, Kathleen Tregoning and Patrick Vink, M.D. See "Item 13. Certain Relationships and Related Transactions, and Director Independence."

Milind Deshpande, Ph.D. has served on our Board of Directors since January 2014 and currently serves as chairman of our Board of Directors. Dr. Deshpande is the President and Chief Executive Officer at Nayan Therapeutics since February 2019, and previously served as President and Chief Executive Officer of Avilar Therapeutics from January 2020 to June 2021. He is also a Venture Partner at RA Capital, where he has served since October 2018. Dr. Deshpande served as President and Chief Executive Officer of Achillion Pharmaceuticals, Inc. and served on the board of directors from May 2013 until May 2018. He joined Achillion in September 2001 as Vice President of Chemistry, was named Head of Drug Discovery in April 2002, Senior Vice President of Drug Discovery in December 2002, Senior Vice President and Chief Scientific Officer in December 2004, Executive Vice President of Research and Chief Scientific Officer in June 2007 and President of Research and Development in October 2010. Prior to joining Achillion, Dr. Deshpande was Associate Director of Lead Discovery and Early Discovery Chemistry at the Pharmaceutical Research Institute at Bristol-Myers Squibb Co. from 1991 to 2001, where he managed the identification of new clinical candidates to treat infectious and neurological diseases. From 1988 to 1991, he held a faculty position at Boston University Medical School. Dr. Deshpande currently serves as the chairman of the board of directors of Avilar Therapeutics and as a member of the board of directors of Triana Biomedicines and Clear Creek Bio. Dr. Deshpande received his Ph.D. in Organic Chemistry from Ohio University, following his undergraduate education in India. We believe that Dr. Deshpande is qualified to serve on our Board of Directors due to his extensive experience in the life sciences industry.

Scott Jackson has served on our Board of Directors since April 2020. Mr. Jackson served as Chief Executive Officer and as a member of the board of directors of Celator Pharmaceuticals, Inc. from April 2008 until July 2016, when the company was acquired by Jazz Pharmaceuticals plc. Mr. Jackson has more than thirty years of corporate leadership experience in the pharmaceutical and biotechnology industry and has held positions of increasing responsibility in sales, marketing and commercial development at Eli Lilly & Company, SmithKline Beecham plc, ImClone Systems Incorporated, Centocor Inc., a division of Johnson & Johnson, Eximias Pharmaceutical Corporation and YM BioSciences Inc. Mr. Jackson presently serves on the boards of Philabundance Food Bank, MacroGenics, Inc. and GlycoMimetics, Inc. Mr. Jackson holds a B.S. in pharmacy from the Philadelphia College of Pharmacy and Science and an M.B.A. from the University of Notre Dame. We believe that Mr. Jackson's extensive executive leadership experience in the pharmaceutical industry and his experience as a member of the board of directors of other publicly traded biotechnology companies, as well as his broad life sciences industry knowledge qualifies him to serve on our Board of Directors.

Ankit Mahadevia, M.D. has served as our Chief Executive Officer and President since March 2015 and has been a member of our Board of Directors since September 2013. He was formerly a Venture Partner in the life sciences group at Atlas Venture, located in Cambridge, Massachusetts. In that capacity, he supported the formation of eight companies focused on novel drug discovery platforms and therapeutic products, including Nimbus Therapeutics, Arteaus Therapeutics (acquired by Lilly), and Translate Bio (Nasdaq: TBIO). He led three of these companies as acting CEO, including Synlogic (Nasdaq: SYBX). Prior to joining Atlas Venture in 2008, Dr. Mahadevia worked on product and business development with the founding team at Arcion Therapeutics, Inc. He has also held positions in business development both at Genentech, Inc. and at Vanda Pharmaceuticals Inc. Previously, he worked in the health

care groups of McKinsey & Company and Monitor Group. Dr. Mahadevia began his career in health care policy, with roles in the U.S. Senate Health, Education, Labor, and Pensions committees, the U.S. Government Accountability Office and the Mexican Institute of Social Security. He has spoken widely on entrepreneurship, including at Harvard University, Columbia University, Northwestern University, and the Berkeley Forum. Dr. Mahadevia has also been active in the policy of life science innovation, including service on the Advisory Council at the NIH National Center for Advancing Translational Sciences. Dr. Mahadevia holds an M.D. from the Johns Hopkins School of Medicine, an M.B.A. from the Wharton School at the University of Pennsylvania and a B.A. in Economics and Biology from Northwestern University. We believe that Dr. Mahadevia is qualified to serve on our Board of Directors due to his experience serving as our Chief Executive Officer and President and his extensive experience in the life sciences industry.

John C. Pottage, Jr., M.D. has served on our Board of Directors since September 2018. Dr. Pottage served as Senior Vice President and Chief Scientific and Medical Officer of ViiV Healthcare from November 2009 to October 2019. From September 2008 to November 2009, Dr. Pottage served as Senior Vice President, Head of Infectious Disease Medicine Development Center and, from June 2007 to September 2008, as the Vice President, Global Clinical Development of Antivirals, at GlaxoSmithKline. Prior to joining GlaxoSmithKline, Dr. Pottage served as Chief Medical Officer and Senior Vice President of Drug Development of Achillion Pharmaceuticals from May 2002 to May 2007. From July 1998 to May 2002, Dr. Pottage served as Medical Director of Vertex Pharmaceuticals (Nasdaq: VRTX) ("Vertex"). Dr. Pottage currently serves on the board of directors of Pardes Biosciences. We believe that Dr. Pottage's extensive industry and executive experience, his broad experience within the biopharmaceutical sector and his knowledge of the life sciences industry qualifies him to serve on our Board of Directors.

Cynthia Smith has served on our Board of Directors since March 2019. Ms. Smith was Chief Commercial Officer of ZS Pharma, from June 2013 to December 2016. ZS Pharma became a subsidiary of AstraZeneca after its acquisition in December 2015. Prior to joining ZS Pharma, Ms. Smith was Vice President, Market Access & Commercial Development at Affymax, Inc., a biotechnology company focused on the development and commercialization of novel renal therapies, including a new anemia drug for chronic kidney disease patients. Ms. Smith was employed at Affymax from October 2008 to March 2013. Prior to Affymax, Ms. Smith was Executive Director of Healthcare Systems and Medicare Strategy at Merck. During her tenure at Merck from June 2000 to October 2008, she also held various leadership positions in corporate strategy, public policy, and external affairs, including global crisis management for the Vioxx recall. Before joining the pharmaceutical industry, she served in the White House Office of Management and Budget (OMB) in the Clinton Administration. Ms. Smith earned an M.B.A. from the Wharton School of the University of Pennsylvania, an MS in public policy from the Eagleton Institute of Politics at Rutgers University, and a BA from the University of North Carolina at Chapel Hill. Ms. Smith also serves on the boards of directors of Agios Pharmaceuticals, Akebia Therapeutics and Protara Therapeutics, Inc. We believe that Ms. Smith's extensive management experience in the healthcare industry and her experience as a member of the board of directors of other publicly traded biotechnology companies, as well as her broad life sciences industry knowledge, qualifies her to serve on our Board of Directors.

Frank E. Thomas has served on our Board of Directors since July 2017. Mr. Thomas is currently President and Chief Operating Officer of Orchard Therapeutics, a development-stage biotechnology company based in the United Kingdom, where he served as Chief Financial Officer and Chief Business Officer from January 2018 to March 2020. Prior to Orchard, Mr. Thomas served as the President and Chief Operating Officer of AMAG Pharmaceuticals, Inc., a commercial-stage pharmaceutical company, which was a publicly traded company that was subsequently acquired by Covis Pharma, from April 2015 to April 2017, as AMAG's Executive Vice President and Chief Operating Officer from May 2012 through April 2015 and as Executive Vice President, Chief Financial Officer and Treasurer from August 2011 through May 2012. Prior to AMAG, he served as Senior Vice President, Chief Operating Officer and Chief Financial Officer for Molecular Biometrics, Inc., a commercial-stage medical diagnostics company, from October 2008 to July 2011. Prior to Molecular Biometrics, Mr. Thomas spent four years at Critical Therapeutics, Inc., which was a publicly traded company that subsequently merged with Cornerstone Therapeutics Inc., from April 2004 to March 2008, where he was promoted to President in June 2006 and Chief Executive Officer in December 2006 from the position of Senior Vice President and Chief Financial Officer. He also served on the board of directors of Critical Therapeutics from 2006 to 2008. Prior to 2004, Mr. Thomas served as the Chief Financial Officer and Vice President of Finance and Investor Relations at Esperion Therapeutics, Inc., a public biopharmaceutical company (Nasdaq: ESPR). Mr. Thomas was a member of the board of directors of the Massachusetts Biotechnology Council from 2007 to 2015. Mr. Thomas currently serves as a member of the board of directors of Larimar Therapeutics Inc (Nasdaq: LRMR). Mr. Thomas holds a B.B.A. from the University of Michigan, Ann Arbor. We believe that Mr. Thomas' extensive commercial and operational management experience at biopharmaceutical companies and with financial matters qualifies him to serve on our Board of Directors.

Kathleen Tregoning has served on our Board of Directors since October 2021. Ms. Tregoning has served as Chief Corporate Affairs Officer of Cerevel Therapeutics Holdings, Inc. since July 2020. Previously, from February 2017 to March 2020, Ms. Tregoning served as Executive Vice President for External Affairs at Sanofi S.A., a French multinational pharmaceutical company, where she was responsible for leading an integrated organization that brought together market access, communications, public policy, government affairs, patient advocacy and corporate social responsibility. Prior to joining Sanofi, Ms. Tregoning spent more than a decade at Biogen Inc., a multinational biotechnology company, first as Vice President, Public Policy & Government Affairs, from

2006 to 2015, and then as Senior Vice President, Corporate Affairs, from December 2015 to February 2017. Previously, Ms. Tregoning served as a professional staff member in the United States Congress, where she held health policy roles with the Senate Budget Committee, the House Energy & Commerce Committee, and the House Ways & Means Committee. Ms. Tregoning began her career with Andersen Consulting, where she developed business strategies and processes for clients in a range of industries, and later served as an Assistant Deputy Mayor for Policy & Budget in the office of the Mayor of Los Angeles. Ms. Tregoning graduated from Stanford University with a B.A. in International Relations and holds an M.A. in Public Policy from the Kennedy School of Government at Harvard University. We believe that Ms. Tregoning is qualified to serve on our Board of Directors because of her senior and executive leadership experience in several biopharmaceutical companies.

Patrick Vink, M.D. has served on our Board of Directors since September 2015. Dr. Vink has been an advisor to the pharmaceutical industry since 2015 and board member of several companies. Previously, Dr. Vink was employed at Cubist Pharmaceuticals, Inc ("Cubist"). Most recently, he served as Executive Vice-President and Chief Operating Officer, overseeing all worldwide commercial and technical operations as well as global alliance management and managing the company's profit and loss. He joined Cubist in 2012 as Senior Vice President and Head of all International Business Operations. In this role, he was responsible for the business activities in International markets outside USA. Prior to joining Cubist, Dr. Vink served as Senior Vice President, Global Head of Hospital Business and Global Head of Biologics for Mylan Inc. In this role, Dr. Vink managed the global hospital business of the company. He joined Mylan in 2008 and established a number of global functions for the company in Switzerland. Before joining Mylan, Dr. Vink held several leadership positions across the industry, including Head of Global Business Franchise Biopharmaceuticals for Novartis Sandoz; Vice President International Business for Biogen, Inc.; and Head of Worldwide Marketing, Cardiovascular and Thrombosis for Sanofi-Synthélabo SA. Dr. Vink served as a member of the Executive Committee of the European Federation of Pharmaceutical Industries and Associations (EFPIA) between 2013 and 2015. Dr. Vink graduated as a medical doctor from the University of Leiden, Netherlands in 1988 and obtained his M.B.A. in 1992 from the University of Rochester. Dr. Vink serves on the boards of directors of Santhera Pharmaceuticals AG, Amryt Pharma PLC., and is Chairman of the board of directors of two privately held companies. We believe that Dr. Vink is qualified to serve on our Board of Directors because of his extensive operational business experience, significant knowledge of the activities of our company, and diverse background serving on the board of directors of various public and private life science companies.

Term of Office of Directors

Our amended and restated By-Laws provide that our business is to be managed by or under the direction of our Board of Directors. Our Board of Directors is divided into three classes for purposes of election. One class is elected at each annual meeting of stockholders to serve for a three-year term. Our Board of Directors currently consists of eight members, classified into three classes as follows:

(1) Milind Deshpande, Ph.D., Ankit Mahadevia, M.D. and Kathleen Tregoning constitute our Class III directors with a term ending at the 2023 annual meeting;

(2) Cynthia Smith, John C. Pottage, Jr., M.D. and Scott Jackson constitute our Class I directors with a term ending at the 2024 annual meeting; and

(3) Patrick Vink, M.D. and Frank E. Thomas constitute our Class II directors with a term ending at the 2025 annual meeting.

Committees of the Board of Directors and Meetings

Meeting Attendance. During the fiscal year ended December 31, 2022, there were 11 meetings of our Board of Directors, and the various committees of the Board of Directors met a total of 15 times. No director attended fewer than 75% of the total number of meetings of the Board of Directors and of committees of the Board of Directors on which such director served during the fiscal year ended December 31, 2022. The Board of Directors has adopted a policy under which each member of the Board of Directors makes every effort to but is not required to attend each annual meeting of our stockholders.

Audit Committee. Our Audit Committee met four times during the fiscal year ended December 31, 2022. This committee currently has four members, Frank E. Thomas (Chairman), Scott Jackson, John C. Pottage, Jr., M.D., and Patrick Vink, M.D. Our Audit Committee's role and responsibilities are set forth in the Audit Committee's written charter and include the authority to retain and terminate the services of our independent registered public accounting firm. In addition, the Audit Committee reviews annual financial statements, considers matters relating to accounting policy and internal controls and reviews the scope of annual audits. All members of the Audit Committee satisfy the current independence standards promulgated by the SEC and by The Nasdaq Stock Market, as such standards apply specifically to members of audit committees. The Board of Directors has determined that Mr. Thomas is an "audit committee financial expert," as the SEC has defined that term in Item 407 of Regulation S-K. Please also see the report of the Audit Committee set forth elsewhere in this proxy statement.

A copy of the Audit Committee's written charter is publicly available on our website at www.sperotherapeutics.com.

Compensation Committee. Our Compensation Committee (formerly, our Human Capital Management Committee) met five times during the fiscal year ended December 31, 2022. This committee currently has four members, Patrick Vink, M.D. (Chairman), Milind Deshpande, Ph.D., Cynthia Smith and Kathleen Tregoning. Our Compensation Committee's role and responsibilities are set forth in the Compensation Committee's written charter and include reviewing, approving and making recommendations regarding our compensation policies, practices and procedures to ensure that legal and fiduciary responsibilities of the Board of Directors are carried out and that such policies, practices and procedures contribute to our success. Our Compensation Committee also administers the Spero Therapeutics, Inc. 2017 Stock Incentive Plan, as amended (the "2017 Plan"), and our 2019 Inducement Equity Incentive Plan, as amended (the "2019 Inducement Plan"). The Compensation Committee is responsible for the determination of the compensation of our chief executive officer and shall conduct its decision-making process with respect to that issue without the chief executive officer present. All members of the Compensation Committee qualify as independent under the definition promulgated by The Nasdaq Stock Market.

The Compensation Committee retains Meridian Compensation Partners, LLC ("Meridian") as an independent advisor to the Compensation Committee to provide executive compensation consulting services. Meridian did not provide any services to us other than executive compensation consulting services during the fiscal year ended December 31, 2022. In compliance with the SEC and the corporate governance rules of The Nasdaq Stock Market, Meridian provided the Compensation Committee with a letter addressing each of the six independence factors. Their responses affirm the independence of Meridian and the partners, consultants, and employees who service the Compensation Committee on executive compensation matters and governance issues.

A copy of the Compensation Committee's written charter is publicly available on our website at www.sperotherapeutics.com.

Nominating and Corporate Governance Committee. Our Nominating and Corporate Governance Committee ("Nominating Committee") met three times during the fiscal year ended December 31, 2022 and has three members, Milind Deshpande, Ph.D. (Chairman), Scott Jackson and Frank E. Thomas. Our Board of Directors has determined that all members of the Nominating Committee qualify as independent under the definition promulgated by The Nasdaq Stock Market. The Nominating Committee's responsibilities are set forth in the Nominating Committee's written charter and include:

- identifying and recommending candidates for membership on our Board of Directors;
- recommending directors to serve on board committees;
- reviewing and recommending our corporate governance guidelines and policies;
- reviewing proposed waivers of the code of conduct for directors and executive officers;
- evaluating, and overseeing the process of evaluating, the performance of our Board of Directors and individual directors; and
- assisting our Board of Directors on corporate governance matters.

Generally, our Nominating Committee considers candidates recommended by stockholders as well as from other sources such as other directors or officers, third party search firms or other appropriate sources. Once identified, the Nominating Committee will evaluate a candidate's qualifications in accordance with the criteria set forth in our Corporate Governance Guidelines. Our Nominating Committee has not adopted a formal diversity policy in connection with the consideration of director nominations or the selection of nominees. However, the Nominating Committee will consider issues of diversity among its members in identifying and considering nominees for director, and strive where appropriate to achieve a diverse balance of backgrounds, perspectives, experience, age, gender, ethnicity and country of citizenship on the Board of Directors and its committees.

If a stockholder wishes to propose a candidate for consideration as a nominee for election to the Board of Directors, it must follow the procedures described in our amended and restated By-Laws and in "Stockholder Proposals and Nominations For Director" at the end of this proxy statement. Any such recommendation should be made in writing to the Nominating and Governance Committee, care of our Secretary at our principal office and should be accompanied by the following information concerning each recommending stockholder and the beneficial owner, if any, on whose behalf the nomination is made:

- all information relating to such person that would be required to be disclosed in a proxy statement;
- certain biographical and share ownership information about the stockholder and any other proponent, including a description of any derivative transactions in our securities;
- a description of certain arrangements and understandings between the proposing stockholder and any beneficial owner and any other person in connection with such stockholder nomination; and

- a statement whether or not either such stockholder or beneficial owner intends to deliver a proxy statement and form of proxy to holders of voting shares sufficient to carry the proposal.

The recommendation must also be accompanied by the following information concerning the proposed nominee:

- certain biographical information concerning the proposed nominee;
- all information concerning the proposed nominee required to be disclosed in solicitations of proxies for election of directors;
- certain information about any other security holder who supports the proposed nominee;
- a description of all relationships between the proposed nominee and the recommending stockholder or any beneficial owner, including any agreements or understandings regarding the nomination; and
- additional disclosures relating to stockholder nominees for directors, including completed questionnaires and disclosures required by our amended and restated By-Laws.

Corporate Governance Guidelines. Our Board of Directors has adopted corporate governance guidelines, which apply to our principal executive officer, our principal financial and accounting officer and all of our other employees, to assist in the exercise of its duties and responsibilities and to serve the best interests of us and our stockholders. The guidelines provide that:

- our Board of Directors' principal responsibility is to oversee our management;
- except as required by Nasdaq rules, a majority of the members of our Board of Directors must be independent directors;
- the independent directors meet in executive session at least twice a year;
- directors have full and free access to management and, as necessary, independent advisors; and
- our nominating and corporate governance committee will oversee periodic self-evaluations of the Board of Directors to determine whether it and its committees are functioning effectively.

We have no formal policy regarding diversity of our board members, but our Corporate Governance Guidelines provide that the background and qualifications of the members of our Board of Directors considered as a group should provide a significant breadth of experience, knowledge, and ability to assist our Board of Directors in fulfilling its responsibilities. Our priority in selection of board members is identification of members who will further the interests of our stockholders through their established records of professional accomplishment, the ability to contribute positively to the collaborative culture among our board members, knowledge of our business, understanding of the competitive landscape in which we operate and adherence to high ethical standards.

Copies of the Nominating Committee's written charter and our Corporate Governance Guidelines are publicly available on our website at www.sperotherapeutics.com.

Code of Business Conduct and Ethics. We have adopted a Code of Business Conduct and Ethics that applies to all of our employees, including our chief executive officer and chief financial and accounting officers. The text of the Code of Business Conduct and Ethics is posted on our website at www.sperotherapeutics.com and will be made available to stockholders without charge, upon request, in writing to our Secretary at Spero Therapeutics, Inc., 675 Massachusetts Avenue, 14th Floor, Cambridge, Massachusetts 02139. Disclosure regarding any amendments to, or waivers from, provisions of the Code of Business Conduct and Ethics that apply to our directors, principal executive and financial officers will be included in a Current Report on Form 8-K within four business days following the date of the amendment or waiver, unless website posting or the issuance of a press release of such amendments or waivers is then permitted by the rules of The Nasdaq Stock Market.

Compensation Committee Interlocks and Insider Participation. None of the members of our Compensation Committee has at any time during the prior three years been one of our officers or employees. None of our executive officers currently serves, or in the past fiscal year has served, as a member of our Board of Directors or Compensation Committee of any entity that has one or more executive officers serving on our Board of Directors or Compensation Committee. For a description of transactions between us and members of our Compensation Committee and affiliates of such members, see "Certain Relationships and Related Person Transactions."

Board Leadership Structure and Role in Risk Oversight

Our Board of Directors is currently chaired by Milind Deshpande, Ph.D. As a general policy, our Board of Directors believes that separation of the positions of chairman and chief executive officer reinforces the independence of our Board of Directors from management, creates an environment that encourages objective oversight of management's performance and enhances the

effectiveness of our Board of Directors as a whole. As such, Dr. Mahadevia serves as our Chief Executive Officer while Dr. Deshpande serves as the chairman of our Board of Directors but is not an officer.

Our Board of Directors oversees the management of risks inherent in the operation of our business and the implementation of our business strategies. Our Board of Directors performs this oversight role by using several different levels of review. In connection with its reviews of our operations and corporate functions, our Board of Directors addresses the primary risks associated with those operations and corporate functions. In addition, our Board of Directors reviews the risks associated with our business strategies periodically throughout the year as part of its consideration of undertaking any such business strategies.

Each of our board committees also oversees the management of our risk that falls within the committee's areas of responsibility. In performing this function, each committee has full access to management, as well as the ability to engage advisors. Our Chief Executive Officer reports to the Audit Committee and is responsible for identifying, evaluating and implementing risk management controls and methodologies to address any identified risks. In connection with its risk management role, our Audit Committee meets privately with representatives from our independent registered public accounting firm and our Chief Executive Officer. The Audit Committee oversees the operation of our risk management program, including the identification of the primary risks associated with our business and periodic updates to such risks, and reports to our Board of Directors regarding these activities.

Stockholder Communications to the Board of Directors

Generally, stockholders who have questions or concerns should contact our Investor Relations department at 857-242-1547 or ir@sperotherapeutics.com. However, any stockholders who wish to address questions regarding our business directly with the Board of Directors, or any individual director, should direct his or her questions in writing to the Chairman of the Board of Directors at Spero Therapeutics, Inc., 675 Massachusetts Avenue, 14th Floor, Cambridge, Massachusetts 02139. Communications will be distributed to the Board of Directors, or to any individual director or directors as appropriate, depending on the facts and circumstances outlined in the communications. Items that are unrelated to the duties and responsibilities of the Board of Directors may be excluded, such as: junk mail and mass mailings; resumes and other forms of job inquiries; surveys; and solicitations or advertisements. In addition, any material that is unduly hostile, threatening, or illegal in nature may be excluded, provided that any communication that is filtered out will be made available to any outside director upon request.

Executive Officers

The following table sets forth certain information regarding our executive officers who are not also directors. We have employment agreements or consulting agreements with each of our executive officers.

Name	Age	Position
Kamal Hamed	62	Chief Medical Officer
Tamara Joseph	60	Chief Legal Officer
Timothy Keutzer	55	Chief Operating Officer
Satyavrat Shukla	50	Chief Financial Officer

Kamal Hamed has served as our Chief Medical Officer since September 2022. Dr. Hamed has over 20 years of experience leading various anti-infective clinical development programs in antibacterials, antivirals, antimalarials, and antifungals. Before joining us, he was the CMO at Lysovant Sciences, a subsidiary of Roivant Sciences. Prior to his time at Lysovant, Dr. Hamed was Head of Clinical Development & Medical Affairs at Basilea Pharmaceutica. Earlier in his career, he held senior positions in clinical development and medical affairs at Novartis (including Therapeutic Area Head for Anti-infectives), Bristol-Myers Squibb, and Bayer, spearheading the successful global development, approval, and post-marketing medical affairs support of multiple anti-infective products. Prior to joining the pharmaceutical industry, Dr. Hamed worked as an academic physician for 14 years. He holds an M.D. degree from the American University of Beirut, an M.P.H. degree from Johns Hopkins University, and an M.B.A. degree from the University of South Florida. Dr. Hamed completed a residency in Internal Medicine at UMDNJ–Robert Wood Johnson Medical School and a fellowship in Infectious Diseases at Stanford University School of Medicine. He is a fellow of both the American College of Physicians and the Infectious Diseases Society of America and has published over 110 manuscripts in peer-reviewed journals.

Tamara Joseph has served as our Chief Legal Officer since December 2020. She has over 20 years of leadership roles in the biotechnology sector, overseeing legal, public and government affairs, compliance and risk management. Ms. Joseph most recently served as General Counsel at Millendo Therapeutics, Inc. and previously served as General Counsel at Enzyvant Therapeutics Ltd., InVivo Therapeutics Holdings Corp., Cubist Pharmaceuticals, Inc., Mayne Pharma Ltd., and Transkaryotic Therapies, Inc. Her experience also includes establishing and leading the international legal and public affairs departments of Biogen Idec Inc. Ms. Joseph

received her B.A. in economics from Duke University, her J.D. from the University of Michigan Law School and her L.L.M. degrees from the College of Europe in Belgium and the University of Paris.

Timothy Keutzer has served as our Chief Operating Officer since February 2023 and previously served as our Chief Development Officer from June 2019 until February 2023 and as our Senior Vice President, Development from September 2015 to June 2019. He has over 20 years' experience in the pharmaceutical industry, spanning multiple functional and therapeutic areas. Prior to joining Spero, Mr. Keutzer served in various roles at Cubist Pharmaceuticals, including Vice President of Program and Portfolio Management from May 2014 to July 2015. At Cubist Mr. Keutzer was the program leader for ceftolozane/tazobactam, which progressed rapidly from Phase 1 to Phase 3, and was approved in the FDA in December of 2014. Prior to that role, he also led several of Cubist's inlicensed development programs, and also led the commercial supply chain for Cubicin. His experience before Cubist spans multiple drug classes and includes preclinical PK/PD and clinical operations at Genetics Institute, as well as global strategic marketing and program management at Wyeth. Tim began his career in contract toxicology labs. Mr. Keutzer earned his bachelor's degree from the University of Kentucky.

Satyavrat Shukla has served as our Chief Financial Officer since January 2021. He has over 20 years of strategic and financial leadership experience. He was most recently Chief Financial Officer at Ziopharm Oncology, Inc. from July 2019 to December 2020, where he directed all of Ziopharm's financial aspects, including financial planning, analysis and reporting, treasury and tax functions, capital strategy and investor relations. Prior to Ziopharm, Mr. Shukla was Vice President and Global Head of Corporate Finance for Vertex Pharmaceuticals, Inc. from July 2012 to July 2019, where he managed financial planning, analysis and budgeting, and led the annual long-range planning process encompassing Vertex's entire portfolio and operations across more than 30 countries. Previously, Mr. Shukla was a Principal at Cornerstone Research, where he led teams providing consulting services for life science clients ranging from start-ups to multi-billion-dollar corporations. Prior to Cornerstone, he worked for finance consulting firms LECG Corporation and Putnam, Hayes & Bartlett, Inc. Mr. Shukla earned a B.A. in Economics from Harvard University and an M.B.A. in Finance and Strategy from Yale University. He also holds the Chartered Financial Analyst designation.

Director or Officer Involvement in Certain Legal Proceedings

Our directors and executive officers have not been involved in any legal proceedings as described in Item 401(f) of Regulation S-K in the past ten years.

Item 11. Executive Compensation.

The following table shows the total compensation paid or accrued during the last two fiscal years ended December 31, 2022 and 2021 to our President and Chief Executive Officer and our two next most highly compensated executive officers who earned more than $100,000 during the fiscal year ended December 31, 2022 and were serving as executive officers as of such date.

Name and Principal Position	Year	Salary ($)	Bonus ($)(1)	Stock Awards ($)(2)	Option Awards ($)(3)	Non-Equity Incentive Plan Compensation ($)(4)	All other Compensation ($)(5)(6)	Total ($)
Ankit Mahadevia, M.D.	2022	633,750	254,000	1,499,998	1,499,324	342,900	9,733	4,239,705
Chief Executive Officer	2021	590,417	—	1,300,000	2,650,765	327,618	6,245	4,875,045
Satyavrat Shukla	2022	478,333	168,000	424,997	424,807	172,800	4,133	1,673,070
Chief Financial Officer	2021	440,889	164,000	399,994	1,039,433	175,660	8,295	2,228,271
Tamara Joseph	2022	448,740	157,500	424,997	424,807	162,000	7,314	1,625,358
Chief Legal Officer	2021	410,000	—	399,994	—	164,082	5,999	980,075

(1) Consists of retention bonuses paid to Dr. Mahadevia, Mr. Shukla and Ms. Joseph during the year ended December 31, 2022 and a sign-on bonus to Mr. Shukla in connection with his commencement of employment during the year ended December 31, 2021.

(2) These amounts represent the aggregate grant date fair value for RSU awards computed in accordance with ASC 718. A discussion of the assumptions used in determining grant date fair value may be found in Note 8 to our consolidated financial statements for the year ended December 31, 2022.

(3) These amounts represent the aggregate grant date fair value for option awards computed in accordance with ASC 718. A discussion of the assumptions used in determining grant date fair value may be found in Note 8 to our consolidated financial statements for the year ended December 31, 2022.

(4) Amounts represent annual cash bonuses earned for the applicable fiscal year. The annual cash bonuses are paid in the first quarter of the calendar year following the year to which the cash bonus relates.

(5) Amounts in this column include for the year ended December 31, 2022 (i) in the case of Dr. Mahadevia, $583 consists of the dollar value of life insurance premiums we paid with respect to term life insurance and $9,150 in a matching contribution under our 401(k) plan, (ii) in the case of Mr. Shukla, $583 consists of the dollar value of life insurance premiums we paid with respect to term life insurance and $3,550 in a matching contribution under our 401(k) plan and (iii) in the case of Ms. Joseph, $583 consists of the dollar value of life insurance premiums we paid with respect to term life insurance and $6,731 in a matching contribution under our 401(k) plan.

(6) Amounts in this column include for the year ended December 31, 2021 (i) in the case of Dr. Mahadevia, $740 consists of the dollar value of life insurance premiums we paid with respect to term life insurance and $5,505 in a matching contribution under our 401(k) plan, (ii) in the case of Mr. Shukla, $740 consists of the dollar value of life insurance premiums we paid with respect to term life insurance and $7,555 in a matching contribution under our 401(k) plan and (iii) in the case of Ms. Joseph, $740 consists of the dollar value of life insurance premiums we paid with respect to term life insurance and $5,259 in a matching contribution under our 401(k) plan.

Narrative Disclosure to Summary Compensation Table

Our employment arrangements with our named executive officers are described below.

Ankit Mahadevia, M.D.

On October 20, 2017, we entered into an employment agreement with Dr. Mahadeiva with respect to his employment as our Chief Executive Officer, as amended on November 10, 2022. The terms of Dr. Mahadeiva's agreement provide for an annual base salary of $400,000, and eligibility for an annual incentive bonus, with a target bonus opportunity of 30% of his then-current base salary, subject to adjustment by the Board of Directors or Compensation Committee. Dr. Mahadeiva's annual base salary and target bonus opportunity have been subsequently increased over time. In December 2020, Dr. Mahadevia's base salary was increased, effective February 1, 2021, to $565,000, with a target bonus opportunity of 50% of his base salary. As of July 1, 2021, Dr. Mahadevia's base salary was increased to $620,000, with a target bonus opportunity of 60% of his base salary. In December 2021, Dr. Mahadevia's base salary was increased, effective February 1, 2022, to $635,000, with a target bonus opportunity of 60% of his base salary. In January 2023, Dr. Mahadevia's base salary was increased, effective February 1, 2023, to $647,700, with a target bonus opportunity of 60% of his base salary.

This agreement provides for the following increased severance payments upon termination by us without Cause (as defined below) or by Dr. Mahadevia for Good Reason (as defined below): (i) payment of his then current base salary for a period of 12 months following termination; (ii) a pro-rated target bonus for the period during which Dr. Mahadevia was employed in the year of termination; and (iii) continued coverage under our group health insurance plan until the earlier of 12 months from termination or the date Dr. Mahadevia becomes eligible for medical benefits with another employer. Further, the agreement provides that upon termination by us without Cause or by Dr. Mahadevia for Good Reason within 90 days prior to the earlier to occur of a Change of Control (as defined below) or the execution of a definitive agreement the consummation of which would result in a Change of Control or one year following a Change of Control (a "Change of Control Termination"), Dr. Mahadevia will be entitled to receive (i) a lump sum payment equal to 18 months of his then-current base salary plus the amount of his then-current target performance bonus; (ii) acceleration of all unvested equity awards as of the date of termination; and (iii) continued coverage under our group health insurance plan until the earlier of 12 months from termination or the date Dr. Mahadevia becomes eligible for medical benefits with another employer. Payment in each case is subject to Dr. Mahadevia's execution of a release satisfactory to us following such termination. In addition, if Dr. Mahadevia's employment terminates as a result of disability or death, he shall be entitled to receive a pro-rated target bonus for the period during which Dr. Mahadevia was employed in the year of termination. The agreement also provides that Dr. Mahadevia shall serve as a member of our Board of Directors during his employment with us until the term of his directorship expires and he is not re-elected or his earlier resignation or removal from our Board of Directors.

Satyavrat Shukla

On December 9, 2020, we entered into an employment agreement with Mr. Shukla with respect to his employment as our Chief Financial Officer, as amended on November 10, 2022. The terms of Mr. Shukla's agreement provide for an annual base salary of $425,000 prorated for fiscal year 2021, and eligibility for an annual incentive bonus, with a target bonus opportunity of 40% of his then-current base salary, subject to adjustment by the Board of Directors or Compensation Committee. Mr. Shukla's annual base salary has been subsequently increased over time. As of July 1, 2021, Mr. Shukla's base salary was increased to $460,000, with a target bonus opportunity of 40% of his base salary. In December 2021, Mr. Shukla's base salary was increased, effective February 1, 2022, to $480,000 with a target bonus opportunity of 40% of his base salary. In January 2023, Mr. Shukla's base salary was increased, effective February 1, 2023, to $489,600 with a target bonus opportunity of 40% of his base salary.

The agreement also provides for the following severance payments upon termination by us without Cause or by Mr. Shukla for Good Reason: (i) payment of his then-current base salary for a period of nine months following termination; (ii) a pro-rated target bonus for the period during which Mr. Shukla was employed in the year of termination; and (iii) continued coverage under our group health insurance plan until the earlier of 12 months from termination or the date Mr. Shukla becomes eligible for medical benefits with another employer. Further, the agreement provides that upon termination by us without Cause or by Mr. Shukla for Good Reason within 90 days prior to the earlier to occur of a Change of Control or a Change of Control Termination, Mr. Shukla will be entitled to receive: (i) a lump sum payment equal to 12 months of his then-current base salary plus the amount of his then-current target performance bonus; (ii) acceleration of all unvested equity awards as of the date of termination; and (iii) continued coverage under our group health insurance plan until the earlier of 12 months from termination or the date Mr. Shukla becomes eligible for medical benefits with another employer. Payment in each case is subject to Mr. Shukla's execution of a release satisfactory to us following such termination. In addition, if Mr. Shukla's employment terminates as a result of disability or death, he shall be entitled to receive a pro-rated target bonus for the period during which Mr. Shukla was employed in the year of termination.

Tamara Joseph

On November 6, 2020, we entered into an employment agreement with Ms. Joseph with respect to her employment as our Chief Legal Officer, as amended on November 10, 2022. The terms of Ms. Joseph's agreement provide for an annual base salary of $385,000 prorated for fiscal year 2020, and eligibility for an annual incentive bonus, with a target bonus opportunity of 40% of her then-current base salary, subject to adjustment by the Board of Directors or Compensation Committee. Ms. Joseph's annual base salary has been subsequently increased over time. As of July 1, 2021, Ms. Joseph's base salary was increased to $435,000, with a target bonus opportunity of 40% of her base salary. In December 2021, Ms. Joseph's base salary was increased, effective February 1, 2022, to $450,000 with a target bonus opportunity of 40% of her base salary. In January 2023, Ms. Joseph's base salary was increased, effective February 1, 2023, to $459,000 with a target bonus opportunity of 40% of her base salary.

The agreement also provides for the following severance payments upon termination by us without Cause or by Ms. Joseph for Good Reason: (i) payment of her then-current base salary for a period of nine months following termination; (ii) a pro-rated target bonus for the period during which Ms. Joseph was employed in the year of termination; and (iii) continued coverage under our group health insurance plan until the earlier of 12 months from termination or the date Ms. Joseph becomes eligible for medical benefits with another employer. Further, the agreement provides that upon termination by us without Cause or by Ms. Joseph for Good Reason within 90 days prior to the earlier to occur of a Change of Control or a Change of Control Termination, Ms. Joseph will be entitled to receive: (i) a lump sum payment equal to 12 months of her then-current base salary plus the amount of her then-current target performance bonus; (ii) acceleration of all unvested equity awards as of the date of termination; and (iii) continued coverage under our group health insurance plan until the earlier of 12 months from termination or the date Ms. Joseph becomes eligible for medical benefits with another employer. Payment in each case is subject to Ms. Joseph's execution of a release satisfactory to us following such termination. In addition, if Ms. Joseph's employment terminates as a result of disability or death, she shall be entitled to receive a pro-rated target bonus for the period during which Ms. Joseph was employed in the year of termination.

Under each of the employment agreements, Cause means (i) the executive's conviction of (A) a felony or (B) any misdemeanor involving moral turpitude, deceit, dishonesty or fraud; (ii) the executive's willful failure or refusal to comply with lawful directions of our Board of Directors (or, for Mr. Shukla and Ms. Joseph, the lawful directions of Dr. Mahadevia), which failure or refusal continues for more than thirty days after written notice is given to the executive by our Board of Directors (or, for Mr. Shukla and Ms. Joseph, by Dr. Mahadevia), which notice sets forth in reasonable detail the nature of such failure or refusal; (iii) willful and material breach by the executive of a written company policy applicable to the executive or the executive's covenants and/or obligations under his or her employment agreement or the material breach of the executive's proprietary information and inventions assignment agreement; and/or (iv) material misconduct by the executive that seriously discredits or damages us or any of our affiliates.

Under each of the employment agreements, Good Reason means (i) relocation of the executive's principal business location to a location more than thirty (30) miles from the executive's then-current business location; (ii) a material diminution in the executive's duties, authority or responsibilities; (iii) a material reduction in the executive's base salary; (iv) willful and material breach by us of our covenants and/or obligations under the executive's employment agreement; or (v) within one year following a Change of Control, the executive is not an executive of the parent company, provided that the executive's roles responsibilities and scope of authority within the subsidiary is not comparable to the executive's roles, responsibilities and scope of authority with us prior to the Change of Control.

Under each of the employment agreements, Change of Control means (i) any person (as such term is used in Sections 13(d) and 14(d) of the Exchange Act) becomes the beneficial owner, directly or indirectly, of securities of the Company representing fifty percent (50%) or more of the total voting power represented by the Company's then outstanding voting securities (excluding for this purpose any such voting securities held by the Company, or any affiliate, parent or subsidiary of the Company, or by any employee benefit plan of the Company) pursuant to a transaction or a series of related transactions; (ii) a merger or consolidation of the Company other than a merger or consolidation which would result in the voting securities of the Company outstanding immediately

prior thereto continuing to represent (either by remaining outstanding or by being converted into voting securities of the surviving entity or the parent of such corporation) at least fifty percent (50%) of the total voting power represented by the voting securities of the Company or such surviving entity or parent of such corporation, as the case may be, outstanding immediately after such merger or consolidation; (iii) our stockholders approve an agreement for the sale or disposition by the Company of all or substantially all of our assets; or (iv) a change in the composition of our Board of Directors, as a result of which fewer than a majority of the directors are incumbent directors.

All of our executive officers have entered into our standard proprietary information and inventions assignment agreement.

Outstanding Equity Awards at 2022 Fiscal Year-End

The following table shows grants of stock options and awards outstanding on the last day of the fiscal year ended December 31, 2022 to each of the executive officers named in the Summary Compensation Table.

	Option Awards					Stock Awards	
Name	Number of Securities Underlying Unexercised Options (#) Exercisable	Number of Securities Underlying Unexercised Options (#) Unexercisable	Option Exercise Price ($)	Option Expiration Date	Number of Shares or Units of Stock That Have not Vested (#)	Market Value of Shares or Units of Stock that Have not Vested ($) (1)
Ankit Mahadevia, M.D.	22,213 (2)	—	$ 5.90	7/5/2027	—	—
	101,488 (3)	—	$ 5.90	7/5/2027	—	—
	118,888 (4)	—	$ 5.90	7/5/2027	—	—
	244,220 (5)	—	$ 5.90	7/5/2027	—	—
	125,079 (6)	—	$ 11.63	12/12/2027	—	—
	176,250 (7)	3,750 (7)	$ 6.26	1/1/2029	—	—
	127,500 (8)	52,500 (8)	$ 9.34	2/2/2030	—	—
	82,187 (9)	97,132 (9)	$ 19.18	1/31/2031	—	—
	—	187,730 (10)	$ 11.18	1/31/2032	—	—
	—	—	—	—	58,664 (11)	101,489
	—	—	—	—	134,168 (12)	232,111
Satyavrat Shukla	35,938 (13)	39,062 (13)	$ 17.93	1/4/2031	—	—
	—	53,190 (10)	$ 11.18	1/31/2032	—	—
	—	—	—	—	18,050 (11)	31,227
	—	—	—	—	38,014 (12)	65,764
Tamara Joseph	37,500 (14)	37,500 (14)	$ 17.28	12/2/2030	—	—
	—	53,190 (10)	$ 11.18	1/31/2032	—	—
	—	—	—	—	18,050 (11)	31,227
	—	—	—	—	38,014 (12)	65,764

(1) The market value of the stock awards is based on the closing price of our common stock of $1.73 per share on December 31, 2022.

(2) 100% of these options vested on August 24, 2019.

(3) These options vested on April 28, 2020.

(4) 100% of these options vested on July 6, 2017.

(5) 100% of these options vested on July 6, 2021.

(6) 100% of these options vested on December 13, 2021.

(7) 25% of the options vested on January 2, 2020 and an additional 1/36th of the remaining shares vest monthly until the option is fully vested. In addition, in the event of a Change of Control Termination, the vesting of these options will accelerate in accordance with the terms of the option and his or her employment agreement.

(8) 25% of the options vested on February 3, 2021 and an additional 1/36th of the remaining shares vest monthly until the option is fully vested. In addition, in the event of a Change of Control Termination, the vesting of these options will accelerate in accordance with the terms of the option and his or her employment agreement.

(9) 25% of the options vested on February 1, 2022 and an additional 1/36th of the remaining shares vest monthly until the option is fully vested. In addition, in the event of a Change of Control Termination, the vesting of these options will accelerate in accordance with the terms of the option and his or her employment agreement.

(10) 25% of the options vested on February 1, 2023 and an additional 1/36th of the remaining shares vest monthly until the option is fully vested. In addition, in the event of a Change of Control Termination, the vesting of these options will accelerate in accordance with the terms of the option and his or her employment agreement.

(11) Consists of RSUs. Each RSU represents the right to receive one share of common stock upon vesting. The RSUs vest in four equal annual installments beginning on August 26, 2022, subject to the individual's continued service through the applicable vesting date.

(12) Consists of RSUs. Each RSU represents the right to receive one share of common stock upon vesting. The RSUs vest in four equal annual installments beginning on February 2, 2023, subject to the individual's continued service through the applicable vesting date.

(13) 25% of the options vested on February 4, 2022 and an additional 1/36th of the remaining shares vest monthly until the option is fully vested. In addition, in the event of a Change of Control Termination, the vesting of these options will accelerate in accordance with the terms of the option and his or her employment agreement.

(14) 25% of the options vested on December 2, 2021 and an additional 1/36th of the remaining shares vest monthly until the option is fully vested. In addition, in the event of a Change of Control Termination, the vesting of these options will accelerate in accordance with the terms of the option and his or her employment agreement.

During the year ended December 31, 2022, the executive officers named in the Summary Compensation Table did not exercise any stock options.

2022 Retention Cash Bonus and Performance Awards

On July 1, 2022, upon recommendation of the Compensation Committee, the Board of Directors approved a cash and RSU retention award for the Company’s executive officers, including awards to Dr. Mahadevia, M.D., Mr. Shukla and Ms. Joseph consisting of the following:

- Subject to Dr. Mahadevia remaining actively employed with us through May 31, 2023, Dr. Mahadevia will receive: (i) a cash bonus of $254,000, which was paid on November 30, 2022 and (ii) if certain performance criteria are achieved, a number of shares of common stock to be issued to him on May 31, 2023 having a value of $508,000 based on the common stock price at such time, subject to the discretion of the Board or the Compensation Committee to pay in cash or a combination of cash and stock.
- Subject to Mr. Shukla remaining actively employed with us through May 31, 2023, Mr. Shukla shall receive: (i) a cash bonus of $168,000, which was paid on November 30, 2022 and (ii) if certain performance criteria are achieved, a number of shares of common stock to be issued to him on May 31, 2023 having a value of $336,000 based on the common stock price at such time, subject to the discretion of the Board or the Compensation Committee to pay in cash or a combination of cash and stock.
- Subject to Ms. Joseph remaining actively employed with us through May 31, 2023, Ms. Joseph shall receive: (i) a cash bonus of $157,500, which was paid on November 30, 2022 and (ii) if certain performance criteria are achieved, a number of shares of common stock to be issued to her on May 31, 2023 having a value of $315,000 based on the common stock price at such time, subject to the discretion of the Board or the Compensation Committee to pay in cash or a combination of cash and stock.

The RSUs are eligible for vesting based on the achievement of certain performance criteria by May 31, 2023 relating to pipeline execution, business development, and financial stewardship. RSUs for which the performance criteria have not been achieved as specified by May 31, 2023 will lapse and be forfeited. The RSUs will be subject to acceleration of vesting in the event of termination of employment without cause by us or by the executive for good reason (each as defined in the executive’s employment agreement).

Potential Payments upon Termination or Change-In-Control

The employment agreements provide for the following severance payments upon termination by us without Cause or by the employee for Good Reason: (i) payment of the employee's then-current base salary for a period of nine months following termination (12 months in the case of the Chief Executive Officer); (ii) a pro-rated target bonus for the period during which the employee was employed in the year of termination; and (iii) continued coverage under our group health insurance plan until the earlier of 12 months from termination or the date the employee becomes eligible for medical benefits with another employer.

Further, the agreements provide that upon termination by us without Cause or by the employee for Good Reason within 90 days prior to or one year following the earlier to occur of a Change of Control (as defined in the executive's employment agreements) or the execution of a definitive agreement the consummation of which would result in a Change of Control, the employee will be entitled to receive: (i) a lump sum payment equal to 12 months of the employee's then-current base salary plus a pro-rated target bonus for the period during which the employee was employed in the year of termination; (ii) acceleration of unvested equity awards as of the date of termination in accordance with the terms of the executive's employment agreement, as described above under "Narrative Disclosure to Summary Compensation Table;" and (iii) continued coverage under our group health insurance plan until the earlier of 12 months from termination or the date the employee becomes eligible for medical benefits with another employer. Payment in each case is subject to the employee's execution of a release satisfactory to us following such termination. In addition, if the employee's employment terminates as a result of disability or death, he or she shall be entitled to receive a pro-rated target bonus for the period during which the employee was employed in the year of termination.

Director Compensation

The following table shows the total compensation paid or accrued during the fiscal year ended December 31, 2022 to each of our current non-employee directors. Directors who are employed by us are not compensated for their service on our Board of Directors.

Name	Fees Earned or Paid in Cash ($)	Stock Awards ($) (1)	Option Awards* ($) (2)(5)		Total($)
Milind Deshpande, Ph.D.	95,000	14,550	—		109,550
Scott Jackson	57,500	14,550	—		72,050
John C. Pottage, Jr., M.D.	60,000	14,550	—		74,550
Cynthia Smith	50,000	14,550	—		64,550
Frank E. Thomas	47,500	14,550	20,016	(3)	82,066
Kathleen Tregoning	10,000	14,550	40,033	(4)	64,583
Patrick Vink, M.D.	50,000	14,550	20,016	(3)	84,566

(1) These amounts represent the aggregate grant date fair value for RSU awards computed in accordance with ASC 718. A discussion of the assumptions used in determining grant date fair value may be found in Note 8 to our consolidated financial statements, included in this Annual Report on Form 10-K for the fiscal year ended December 31, 2022.

(2) These amounts represent the aggregate grant date fair value of options granted to each director in the fiscal year ended December 31, 2022, computed in accordance with FASB ASC Topic 718. A discussion of the assumptions used in determining grant date fair value may be found in Note 8 to our consolidated financial statements, included in this Annual Report on Form 10-K for the fiscal year ended December 31, 2022.

(3) Represents an option to purchase 2,214 shares of common stock at an exercise price of $13.19. The shares underlying the option award vested and became fully exercisable on December 31, 2022.

(4) Represents an option to purchase 4,428 shares of common stock at an exercise price of $13.19. The shares underlying the option award vested and became fully exercisable on December 31, 2022.

(5) As of December 31, 2022, the aggregate number of options held by each of our current non-employee directors was as follows (representing both exercisable and unexercisable option awards, none of which have been exercised):

Name	Number of Shares Underlying Outstanding Stock Options
Milind Deshpande, Ph.D.	98,664
Scott Jackson	45,000

John C. Pottage, Jr., M.D.	48,219
Cynthia Smith	50,848
Frank E. Thomas	78,893
Kathleen Tregoning	34,428
Patrick Vink, M.D.	81,596

Non-Employee Director Compensation Policy

Under our Non-Employee Director Compensation Policy as amended (the "Non-Employee Director Compensation Policy"), each non-employee director is eligible to receive compensation for his or her service consisting of annual cash retainers and equity awards. Our non-employee directors received the following annual retainers for their service as of December 31, 2022:

Position	Retainer
Board Member	$ 40,000
Board Chairperson (additional retainer)	30,000
Lead Director, if any (additional retainer)	18,750
Audit Committee Chair	20,000
Compensation Committee Chair	20,000
Nominating and Governance Committee Chair	15,000
Audit Committee Member	10,000
Compensation Committee Member	10,000
Nominating and Governance Committee Member	7,500

Our Non-Employee Director Compensation Policy provides the following with respect to equity awards to non-employee directors: (i) the initial equity award consisting of a non-qualified stock option to purchase shares of our common stock upon first appointment to our Board of Directors and vesting in equal monthly installments until the third anniversary of the grant date subject to the non-employee director's continued service in the amount of 15,000 shares, and (ii) annual equity awards consisting of a non-qualified stock option to purchase shares of our common stock vesting on the first anniversary of the grant date subject to the non-employee director's continued service in the amount of 7,500 shares. The policy also provides that, prior to the beginning of each calendar year, a non-employee director may elect to receive all or a portion of his or her base annual fee for service on our Board of Directors in the form of a non-qualified stock option to purchase a number of shares of our common stock based on the Black-Scholes value of such option, which option will be granted on the first business day of the calendar year. These options vest in four quarterly installments on the last day of each calendar quarter during the calendar year, subject to the continued service of the non-employee director.

In July 2022, upon the recommendation of the Compensation Committee, the Board of Directors approved an RSU grant representing 15,000 shares of common stock to be issued to each director on the date of the 2022 annual meeting of stockholders in lieu of the annual equity award consisting of a stock option to purchase 7,500 shares of our common stock as described in the current Non-Employee Director Compensation Policy. The RSUs will vest on the first anniversary of the grant date, subject to the director's continued service, and were issued under, and are subject to the terms of, our 2017 Plan.

Directors may be reimbursed for travel, food, lodging and other expenses directly related to their service as directors. Directors are also entitled to the protection provided by their indemnification agreements and the indemnification provisions in our amended and restated certificate of incorporation and amended and restated By-Laws.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

The following table sets forth certain information with respect to the beneficial ownership of our common stock as of March 1, 2023 for (a) the executive officers named in the Summary Compensation Table on Item 11 of this Amendment, (b) each of our directors and director nominees, (c) all of our current directors and executive officers as a group and (d) each stockholder known by us to own beneficially more than 5% of our common stock. Beneficial ownership is determined in accordance with the rules of the SEC and includes voting or investment power with respect to the securities. We deem shares of common stock that may be acquired by an individual or group within 60 days of March 1, 2023 pursuant to the exercise of options to be outstanding for the purpose of computing the percentage ownership of such individual or group, but not outstanding for the purpose of computing the percentage ownership of any other person shown in the table. Except as indicated in footnotes to this table, we believe that the stockholders named in this table have sole voting and investment power with respect to all shares of common stock shown to be beneficially owned by them based on information provided to us by these stockholders. Percentage of ownership is based on 52,571,813 shares of common stock outstanding on March 1, 2023.

Name of Beneficial Owner	Number of Shares Beneficially Owned	Percent of Shares Beneficially Owned
Principal Stockholders		
GSK Equity Investments, Limited (1)	9,190,606	17.48%
Named Executive Officers and Directors		
Ankit Mahadevia, M.D. (2)	1,192,901	2.22%
Satyavrat Shukla (3)	57,701	*
Tamara Joseph (4)	71,390	*
Milind Deshpande, Ph.D. (5)	100,118	*
Scott Jackson (6)	29,167	*
John C. Pottage, Jr., M.D. (7)	33,219	*
Cynthia Smith (8)	35,848	*
Frank E. Thomas (9)	63,893	*
Kathleen Tregoning (10)	19,248	*
Patrick Vink, M.D. (11)	70,464	*
All current executive officers and directors as a group (12 persons) (12)	1,884,699	3.47%

* Indicates beneficial ownership of less than 1%.

(1) Consists of shares of common stock owned by GSK Equity Investments, Limited (formerly S.R. One, Limited), and Glaxo Group Limited, each of which is an indirect wholly owned subsidiary of GSK plc. The address for GSK plc is 980 Great West Road, Brentford, Middlesex TW8 9GS, England. This information is based solely on a Schedule 13D/A filed by GlaxoSmithKline plc with the SEC on January 20, 2023, which reported ownership as of November 14, 2022.

(2) Consists of (i) 65,817 shares of common stock held by Mahadevia-Mehta Family Trust, of which Dr. Mahadevia is the trustee, and (ii) 40,811 shares of common stock and (iii) 1,086,273 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Dr. Mahadevia.

(3) Consists of 57,701 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Mr. Shukla.

(4) Consists of (i) 12,127 shares of common stock and (ii) 59,263 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Ms. Joseph.

(5) Consists of (i) 16,454 shares of common stock and (ii) 83,664 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Dr. Deshpande.

(6) Consists of 29,167 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Mr. Jackson.

(7) Consists of 33,219 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Dr. Pottage.

(8) Consists of 35,848 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Ms. Smith.

(9) Consists of 63,893 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Mr. Thomas.

(10) Consists of 19,248 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Ms. Tregoning.

(11) Consists of 70,464 shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Dr. Vink.

(12) See 2 through 11 above; also includes shares of common stock underlying options that are exercisable as of March 1, 2023 or will become exercisable within 60 days after such date held by Mr. Keutzer and Dr. Hamed, who are executive officers but not named executive officers.

Equity Compensation Plan Information

The following table provides certain aggregate information with respect to all of our equity compensation plans in effect as of December 31, 2022:

Plan category	Number of securities to be issued upon exercise of outstanding options, warrants and rights (#)	Weighted-average exercise price of outstanding options, warrants and rights ($)	Number of securities remaining for future issuance under equity compensation plans (excluding securities reflected in column (a) (#)
Equity compensation plans approved by stockholders[1]	3,632,832	10.52	4,382,875
Equity compensation plans not approved by stockholders[2]	346,267	15.93	1,030,096
Total:	3,979,099	10.99	5,412,971

(1) This plan category consists of our 2017 Plan.

(2) This plan category consists of our 2019 Plan.

Benefits Programs

Each named executive employee is eligible to participate in our benefits programs, which include health, life, disability and dental insurance and a 401(k) retirement savings plan.

Spero Therapeutics, Inc.'s 2017 Stock Incentive Plan

We adopted the Spero Therapeutics, Inc. 2017 Plan on June 28, 2017, as amended on October 18, 2017 and August 17, 2021 and September 15, 2022. The 2017 Plan will expire on June 30, 2027. Under the 2017 Plan, we may grant incentive stock options, non-qualified stock options, restricted and unrestricted stock awards and other stock-based awards.

Since its adoption, there have been 8,811,104 shares of our common stock authorized for issuance under the 2017 Plan. As of March 1, 2023, a total of 1,369,656 shares are available for future grant under the 2017 Plan.

Our Board of Directors is authorized to administer the 2017 Plan. In accordance with the provisions of the 2017 Plan, our Board of Directors determines the terms of the options and other awards issued pursuant thereto, including the following:

- which employees, directors and consultants shall be granted awards;
- the number of shares of common stock subject to options and other awards;
- the exercise price of each option, which generally shall not be less than fair market value of the common stock on the date of grant;
- the termination or cancellation provisions applicable to the options;
- the terms and conditions of other awards, including conditions for repurchase, termination or cancellation, issue price and repurchase price; and
- all other terms and conditions upon which each award may be granted in accordance with the 2017 Plan.

No participant may receive awards for more than 1,000,000 shares of our common stock in any fiscal year.

In addition, our Board of Directors or any committee to which our Board of Directors delegates authority may, with the consent of the affected plan participants, amend outstanding awards consistent with the terms of the 2017 Plan.

Upon a merger, consolidation, or sale of all or substantially all of our assets, our Board of Directors or any committee to which our Board of Directors delegates authority, or the Board of Directors of any corporation assuming the our obligations, may, in its sole discretion, take any one or more of the following actions pursuant to the 2017 Plan, as to some or all outstanding awards, to the extent not otherwise agreed under any individual agreement:

- provide that outstanding options will be assumed or substituted for options of the successor corporation;
- provide that the outstanding options must be exercised within a certain number of days, either to the extent the options are then exercisable, or at our Board of Directors' discretion, any such options being made partially or fully exercisable;
- terminate outstanding options in exchange for a cash payment of an amount equal to the difference between (a) the consideration payable upon consummation of the corporate transaction to a holder of the number of shares into which such option would have been exercisable to the extent then exercisable, or in our Board of Directors' discretion, any such options being made partially or fully exercisable, and (b) the aggregate exercise price of those options;
- provide that outstanding stock grants will be substituted for shares of the successor corporation or consideration payable with respect to our outstanding stock in connection with the corporate transaction; and
- terminate outstanding stock grants in exchange for payment of an amount equal to the consideration payable upon consummation of the corporate transaction to a holder of the same number of shares comprising the stock grant, to the extent the stock grant is no longer subject to any forfeiture or repurchase rights, or at our Board of Directors' discretion, all forfeiture and repurchase rights being waived upon the corporate transaction. For purposes of determining such payments, in the case of a corporate transaction the consideration for which, in whole or in part, is other than cash, the consideration other than cash shall be valued at the fair market value thereof as determined in good faith by our Board of Directors.

Spero Therapeutics, Inc.'s 2019 Inducement Equity Incentive Plan

On March 11, 2019, the Board of Directors adopted Spero Therapeutics, Inc.'s 2019 Plan, as amended on June 23, 2020 and December 22, 2022. The Board of Directors initially reserved 331,500 shares of our common stock under the 2019 Inducement Plan to be used exclusively for grants of awards to individuals that were not previously our employees or directors, as an inducement to the individual's entry into employment with us within the meaning of Rule 5635(c)(4) of the Nasdaq Listing Rules. As previously disclosed, in June 2020, the Board of Directors approved an amendment to the 2019 Inducement Plan to increase the number of shares of common stock authorized for issuance thereunder by 700,000 shares. In December 2022, the Board of Directors approved an amendment to the 2019 Inducement Plan to increase the number of shares of common stock authorized for issuance thereunder by 875,000 shares. The 2019 Inducement Plan was adopted without stockholder approval pursuant to Rule 5635(c)(4). The 2019 Inducement Plan provides for the grant of equity-based awards, including options, restricted and unrestricted stock awards, and other stock-based awards, and its terms are substantially similar to the 2017 Plan, but with such other terms and conditions intended to comply with the Nasdaq inducement award exception.

As of March 1, 2023, there were 1,047,267 shares outstanding and 834,096 shares available for grant under the 2019 Inducement Plan.

Rule 10b5-1 Sales Plans

Our directors and executive officers may adopt written plans, known as Rule 10b5-1 plans, in which they will contract with a broker to buy or sell shares of our common stock on a periodic basis. Under a Rule 10b5-1 plan, a broker executes trades pursuant to parameters established by the director or officer when entering into the plan, without further direction from the director or officer. The director or officer may amend or terminate the plan in limited circumstances. Our directors and executive officers may also buy or sell additional shares of our common stock outside of a Rule 10b5-1 plan when they are not in possession of material, nonpublic information.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

Related Party Transactions

The following is a description of transactions since January 1, 2021, to which we have been a party, in which the amount involved exceeds $120,000, and in which any of our directors, executive officers or holders of more than 5% of our capital stock, or an affiliate or immediate family member thereof, had or will have a direct or indirect material interest. We refer to such transactions as "related party transactions" and such persons as "related parties." With the approval of our Board of Directors, we have engaged in the related party transactions described below. We believe the terms obtained or consideration that we paid or received, as applicable, in connection with the transactions described below were comparable to terms available or the amounts that would be paid or received, as applicable, from unaffiliated third parties.

Transactions with GSK

License Agreement

On September 21, 2022, we entered into the GSK License Agreement with GSK. Pursuant to the terms of the GSK License Agreement, we granted GSK an exclusive royalty-bearing license, with the right to grant sublicenses, under our intellectual property and regulatory documents and a sublicense under certain intellectual property of Meiji and Meiji's regulatory documents to develop, manufacture and commercialize the GSK Licensed Products in the GSK Territory. Under the terms of the GSK License Agreement, we received an upfront payment of $66 million for GSK to secure rights to the medicine and are eligible to receive up to $525.0 million in development, sales, and commercial milestones payments, as well as low single-digit to low double-digit tiered royalties on net product sales. Royalties are subject to reduction in the event of third-party licenses, entry of a generic product or expiration of patent and regulatory exclusivity prior to the tenth anniversary of the first commercial sale of a GSK Licensed Product in a particular country. The terms of the License Agreement are described further above under "Business - Collaboration, License and Service Agreements - Tebipenem HBr Agreements - GSK License Agreement."

Share Purchase Agreement

Concurrently with the execution of the GSK License Agreement, on the GSK Effective Date, we entered into the GSK SPA with GGL, an affiliate of GSK, pursuant to which GGL purchased on the GSK Closing Date 7,450,000 shares of our common stock at a purchase price of approximately $1.20805 per share, for an aggregate purchase price of $9.0 million. The GSK SPA contains certain standstill, lock-up and registration rights provisions.

Indemnification Agreements with Officers and Directors and Directors' and Officers' Liability Insurance

We have entered into indemnification agreements with each of our executive officers and directors. The indemnification agreements, our amended and restated certificate of incorporation and our amended and restated By-Laws require us to indemnify our directors to the fullest extent not prohibited by Delaware law. Subject to certain limitations, our amended and restated certificate of incorporation also requires us to advance expenses incurred by our directors and officers, subject to limited exceptions. We also maintain a general liability insurance policy which covers certain liabilities of our directors and officers arising out of claims based on acts or omissions in their capacities as directors or officers.

Policies and Procedures for Related Party Transactions

We have adopted a written policy that requires all future transactions between us and any director, executive officer, holder of 5% or more of any class of our capital stock or any member of the immediate family of, or entities affiliated with, any of them, or any other related persons, as defined in Item 404 of Regulation S-K, or their affiliates, in which the amount involved is equal to or greater than the threshold amount proscribed by Item 404 of Regulation S-K, be approved in advance by our Audit Committee. Any request for such a transaction must first be presented to our Audit Committee for review, consideration and approval. In approving or rejecting any such proposal, our Audit Committee is to consider the relevant facts and circumstances available and deemed relevant to the Audit Committee, including, but not limited to, the extent of the related party's interest in the transaction, and whether the transaction is on terms no less favorable to us than terms we could have generally obtained from an unaffiliated third party under the same or similar circumstances.

Director Independence

Our Board of Directors undertook a review of the composition of our Board of Directors and independence of each director. Based upon information requested from and provided by each director concerning his or her background, employment and affiliations, including family relationships, our Board of Directors has determined that each of Milind Deshpande, Ph.D., Scott Jackson, John C. Pottage, Jr., M.D., Cynthia Smith, Frank E. Thomas, Kathleen Tregoning and Patrick Vink, M.D. would qualify as "independent" as that term is defined by Nasdaq Listing Rule 5605(a)(2). Ankit Mahadevia, M.D. would not qualify as "independent" under applicable Nasdaq Listing Rules applicable to the Board of Directors generally or to separately designated Board committees because he currently serves as our Chief Executive Officer. In making such determinations, our Board of Directors considered the relationships that each of our non-employee directors has with our company and all other facts and circumstances deemed relevant in determining independence, including the beneficial ownership of our capital stock by each non-employee director.

Subject to some exceptions, Nasdaq Listing Rule 5605(a)(2) provides that a director will only qualify as an "independent director" if, in the opinion of our Board of Directors, that person does not have a relationship that would interfere with the exercise of independent judgment in carrying out the responsibilities of a director, and that a director cannot be an "independent director" if (a) the director is, or in the past three years has been, an employee of ours; (b) a member of the director's immediate family is, or in the past three years has been, an executive officer of ours; (c) the director or a member of the director's immediate family has received more than $120,000 per year in direct compensation from us within the preceding three years, other than for service as a director or benefits under a retirement plan or non-discretionary compensation (or, for a family member, as an employee); (d) the director or a member of the director's immediate family is a current partner of our independent public accounting firm, or has worked for such firm in any capacity on our audit at any time during the past three years; (e) the director or a member of the director's immediate family is, or in the past three years has been, employed as an executive officer of a company where one of our executive officers serves on the compensation committee; or (f) the director or a member of the director's immediate family is an executive officer, partner or controlling stockholder of a company that makes payments to, or receives payments from, us in an amount which, in any period during our past three fiscal years, exceeds the greater of 5% of the recipient's consolidated gross revenues for that year or $200,000 (except for payments arising solely from investments in our securities or payments under charitable contribution matching programs). Additionally, in order to be considered an independent member of an audit committee under Rule 10A-3 under the Exchange Act, a member of an audit committee may not, other than in his or her capacity as a member of the audit committee, the Board of Directors, or any other committee of the Board of Directors, accept, directly or indirectly, any consulting, advisory, or other compensatory fee from the applicable company or any of its subsidiaries or otherwise be an affiliated person of the applicable company or any of its subsidiaries. To be considered an independent member of the compensation committee under Rule under the Exchange Act, the Board must consider and determine whether a director has a relationship to such company which is material to that director's ability to be independent from management in connection with the duties of a compensation committee member, including, but not limited to: the source of compensation of the director, including any consulting advisory or other compensatory fee paid by such company to the director; and whether the director is affiliated with the company or any of its subsidiaries or affiliates.

Item 14. Principal Accountant Fees and Services.

PricewaterhouseCoopers LLP was our independent registered public accounting firm for the fiscal years ended December 31, 2022 and 2021.

The following table presents fees for professional audit services and other services rendered by PricewaterhouseCoopers LLP to us for the fiscal years ended December 31, 2022 and December 31, 2021:

	Fiscal Year 2022	Fiscal Year 2021
Audit Fees(1)	$ 1,024,500	$ 902,500
Audit-Related Fees(2)	75,000	55,000
Tax Fees	—	—
All Other Fees(3)	956	956
Total	$ 1,100,456	$ 958,456

(1) Audit fees consisted of audit work performed in the preparation of financial statements, the review of the interim consolidated financial statements, and related services that are normally provided in connection with registration statements.

(2) Audit related fees consist of fees billed by PricewaterhouseCoopers LLP for assurance and related services that are reasonably related to the performance of the audit or review of our consolidated financial statements.

(3) All other fees represent payment for access to the PricewaterhouseCoopers LLP online accounting research and financial disclosure databases.

Policy on Audit Committee Pre-Approval of Services

Consistent with SEC policies regarding auditor independence, the Audit Committee has responsibility for appointing, setting compensation and overseeing the work of our independent registered public accounting firm. In recognition of this responsibility, the Audit Committee reviews and pre-approves all audit and permissible non-audit services provided by our independent registered public accounting firm; provided, however, that de minimis non-audit services may instead be approved in accordance with applicable SEC rules.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

(1) Consolidated Financial Statements

See Index to Consolidated Financial Statements at Item 8 herein.

(2) Financial Statement Schedules

All schedules are omitted because they are not applicable or the required information is shown in the consolidated financial statements or notes thereto.

(3) Exhibits

The following is a list of exhibits filed as part of this Annual Report on Form 10-K.

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File / Registration Number
3.1	Amended and Restated Certificate of Incorporation of the Registrant		Form 8-K (Exhibit 3.1)	11/6/2017	001-38266
3.2	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of the Registrant		Form 8-K (Exhibit 3.1)	8/18/2021	001-38266
3.3	Amended and Restated Bylaws of the Registrant		Form 8-K (Exhibit 3.2)	11/6/2017	001-38266
3.4	Certificate of Designation of Preferences, Rights and Limitations of Series A Convertible Preferred Stock		Form 8-K (Exhibit 3.1)	7/17/2018	001-38266
3.5	Certificate of Designation of Preferences, Rights and Limitations of Series B Convertible Preferred Stock		Form 8-K (Exhibit 3.1)	11/16/2018	001-38266
3.6	Certificate of Designation of Preferences, Rights and Limitations of Series C Convertible Preferred Stock		Form 8-K (Exhibit 3.1)	2/28/2020	001-38266
3.7	Certificate of Designation of Preferences, Rights and Limitations of Series D Convertible Preferred Stock		Form 8-K (Exhibit 3.1)	9/14/2020	001-38266
4.1	Form of Common Stock Certificate		Form S-1 (Exhibit 4.1)	10/6/2017	333-220858
4.2	Description of Registrant's Securities	X			
10.1#	2017 Stock Incentive Plan, as amended		Form 8-K (Exhibit 10.1)	9/19/2022	001-38266
10.2#	Form of Stock Option Agreement under the 2017 Stock Incentive Plan, as amended		Form S-8 (Exhibit 4.6)	9/20/2021	001-38266
10.3#	Form of Restricted Stock Unit Agreement under the 2017 Stock Incentive Plan, as amended		Form 8-K (Exhibit 10.1)	8/30/2021	001-38266
10.4#	2019 Inducement Equity Incentive Plan, as amended	X			
10.5#	Form of Stock Option Agreement under the 2019 Inducement Equity Incentive Plan, as amended	X			
10.6#	Form of Restricted Stock Unit Agreement under the 2019 Inducement Equity Incentive Plan, as amended	X			

10.7#	Form of Director and Officer Indemnification Agreement	Form S-1 (Exhibit 10.4)	10/6/2017	333-220858
10.8#	Non-Employee Director Compensation Policy, as amended	Form 10-K (Exhibit 10.7)	3/31/2022	001-38266
10.9#	Employment Agreement, dated October 20, 2017, by and between the Registrant and Ankit Mahadevia, M.D.	Form S-1/A (Exhibit 10.5)	10/23/2017	333-220858
10.10#	Amendment to Employment Agreement, dated November 10, 2022, by and between the Registrant and Ankit Mahadevia, M.D.	Form 10-Q (Exhibit 10.6)	11/14/2022	001-38266
10.11#	Employment Agreement, dated December 9, 2020, by and between the Registrant and Satyavrat Shukla	Form 10-K (Exhibit 10.8)	3/11/2021	001-38266
10.12#	Amendment to Employment Agreement, dated November 10, 2022, by and between the Registrant and Satyavrat Shukla	Form 10-Q (Exhibit 10.7)	11/14/2022	001-38266
10.13#	Employment Agreement, dated August 11, 2022, by and between the Registrant and Kamal Hamed	Form 10-Q (Exhibit 10.5)	11/14/2022	001-38266
10.14#	Amendment to Employment Agreement, dated November 10, 2022, by and between the Registrant and Kamal Hamed, M.D., M.P.H., M.B.A.	Form 10-Q (Exhibit 10.8)	11/14/2022	001-38266
10.15#	Employment Agreement, dated January 1, 2020, by and between the Registrant and Timothy Keutzer	Form 10-K (Exhibit 10.12)	3/16/2020	001-38266
10.16#	Amendment to Employment Agreement, dated November 10, 2022, by and between the Registrant and Timothy Keutzer	Form 10-Q (Exhibit 10.9)	11/14/2022	001-38266
10.17#	Employment Agreement, dated November 6, 2020, by and between the Registrant and Tamara Joseph	Form 10-K (Exhibit 10.13)	3/11/2021	001-38266
10.18#	Amendment to Employment Agreement, dated November 10, 2022, by and between the Registrant and Tamara Joseph	Form 10-Q (Exhibit 10.10)	11/14/2022	001-38266
10.19#	Separation Agreement, dated May 3, 2022, by and between the Registrant and Cristina Larkin	Form 10-Q (Exhibit 10.1)	8/10/2022	001-38266
10.20#	Consulting Agreement, dated May 3, 2022, by and between the Registrant and Cristina Larkin	Form 10-Q (Exhibit 10.3)	8/10/2022	001-38266
10.21#	Amendment 1 to Consulting Agreement, dated August 4, 2022, by and between the Registrant and Cristina Larkin	Form 10-Q (Exhibit 10.1)	11/14/2022	001-38266
10.22#	Separation Agreement, dated May 3, 2022, by and between the Registrant and David Melnick, M.D.	Form 10-Q (Exhibit 10.2)	8/10/2022	001-38266
10.23#	Consulting Agreement, dated May 3, 2022, by and between the Registrant and David Melnick, M.D.	Form 10-Q (Exhibit 10.4)	8/10/2022	001-38266
10.24	Lease Agreement, dated August 24, 2015, by and between the Registrant and U.S. REIF Central Plaza Massachusetts, LLC	Form S-1 (Exhibit 10.11)	10/6/2017	333-220858
10.25	First Amendment to Lease Agreement, dated January 17, 2018, by and between the Registrant and U.S. REIF Central Plaza Massachusetts, LLC	Form 8-K (Exhibit 99.1)	1/23/2018	001-38266

10.26	Second Amendment to Lease Agreement, dated December 16, 2019, by and between the Registrant and U.S. REIF Central Plaza Massachusetts, LLC	Form 8-K (Exhibit 99.1)	12/19/2019	001-38266
10.27	Third Amendment to Lease Agreement, dated May 4, 2020, by and between the Registrant and U.S. REIF Central Plaza Massachusetts, LLC	Form 10-Q (Exhibit 10.4)	8/6/2020	001-38266
10.28	Sublease, dated July 6, 2016, by and between the Registrant and Tetraphase Pharmaceuticals, Inc.	Form S-1 (Exhibit 10.12)	10/6/2017	333-220858
10.29†	Stock Purchase Agreement, dated June 6, 2016, by and among Spero Cantab, Inc., the Registrant, Spero Cantab UK Limited, PBB Distributions Limited, New Pharma License Holdings Limited, Cantab Anti-Infectives Ltd and Pro Bono Bio PLC, as amended by Amendment to Stock Purchase Agreement, dated July 18, 2017	Form S-1 (Exhibit 10.13)	10/6/2017	333-220858
10.30†	Assignment and License Agreement, dated May 9, 2016, by and among Spero Trinem, Inc., the Registrant and Vertex Pharmaceuticals Incorporated	Form S-1/A (Exhibit 10.14)	10/23/2017	333-220858
10.31†	License Agreement, dated June 14, 2017, by and between the Registrant and Meiji Seika Pharma Co., Ltd., as supplemented by Addendum to License Agreement, dated June 14, 2017	Form S-1 (Exhibit 10.15)	10/6/2017	333-220858
10.32†	Contract Award, dated July 12, 2018, issued by the Biomedical Advanced Research and Development Authority of the United States Department of Health and Human Services	Form 10-Q (Exhibit 10.1)	11/8/2018	001-38266
10.33††	Amended and Restated License Agreement, dated January 15, 2021, by and between the Registrant and Everest Medicines II Limited	Form 10-K (Exhibit 10.25)	3/11/2021	001-38266
10.34	Exchange Agreement, dated November 15, 2018, by and among Spero Therapeutics, Inc. and Biotechnology Value Fund, L.P., Biotechnology Value Fund II, L.P., Biotechnology Value Trading Fund OS, L.P. and MSI BVF SPV LLC	Form 8-K (Exhibit 10.1)	11/16/2018	001-38266
10.35††	License Agreement, dated June 30, 2021, by and between the Registrant and Pfizer Inc.	Form 10-Q (Exhibit 10.1)	8/5/2021	001-38266
10.36	Share Purchase Agreement, dated June 30, 2021, by and between the Registrant and Pfizer Inc.	Form 10-Q (Exhibit 10.2)	8/5/2021	001-38266

10.37††	License Agreement, dated September 21, 2022, by and between the Registrant and GlaxoSmithKline Intellectual Property (No. 3) Limited		Form 10-Q (Exhibit 10.3)	11/14/2022	001-38266
10.38	Share Purchase Agreement, dated September 21, 2022, by and between the Registrant and Glaxo Group Limited		Form 10-Q (Exhibit 10.4)	11/14/2022	001-38266
10.39	Controlled Equity Offering Sales Agreement, dated March 11, 2021, by and between the Registrant and Cantor Fitzgerald & Co.		Form 10-K (Exhibit 10.28)	3/11/2021	001-38266
10.40	Securities Purchase Agreement, dated June 12, 2019, by and between the Registrant and Novo Holdings A/S		Form 10-Q (Exhibit 10.1)	8/8/2019	001-38266
10.41	Form of Proprietary Information and Inventions Assignment Agreement		Form S-1/A (Exhibit 10.17)	10/23/2017	333-220858
21.1	List of Subsidiaries of the Registrant		Form 10-K (Exhibit 21.1)	3/16/2020	001-38266
23.1	Consent of PricewaterhouseCoopers LLP, independent registered public accounting firm	X			
31.1	Certification of Principal Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002	X			
31.2	Certification of Principal Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002	X			
32*	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, by Principal Executive Officer and Principal Financial Officer	X			
101.INS	XBRL Instance Document - the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document	X			
101.SCH	Inline XBRL Taxonomy Extension Schema Document	X			
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document	X			
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document	X			
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document	X			
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document	X			
104	Cover Page Interactive Data File (embedded within the Inline XBRL document)	X			

† Confidential treatment received as to portions of the exhibit. Confidential materials omitted and filed separately with the SEC.

†† Certain confidential portions of this Exhibit were omitted by means of marking such portions with brackets ("[***]") because the identified confidential portions (i) are not material and (ii) is the type that the Registrant treats as private or confidential.

Management contract or compensatory plan.

* The certification attached as Exhibit 32 that accompanies this Annual Report on Form 10-K is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of Spero Therapeutics, 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 this Form 10-K, irrespective of any general incorporation language contained in such filing.

Item 16. Form 10-K Summary.

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

SPERO THERAPEUTICS, INC.

Date: March 30, 2023

By: /s/ Ankit Mahadevia, M.D.
Ankit Mahadevia, M.D.
President and Chief Executive Officer

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints each of Ankit Mahadevia, M.D. and Satyavrat Shukla his or her true and lawful attorney-in-fact and agent, with full power of substitution, for him or her and in his or her name, place and stead, in any and all capacities, to sign any and all amendments to this Annual Report on Form 10-K, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorney-in-fact and agent, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he or she might or could do in person, hereby ratifying and confirming all that said attorney-in-fact and agent, or his substitutes or substitute, may lawfully do or cause to be done by virtue hereof.

IN WITNESS WHEREOF, each of the undersigned has executed this Power of Attorney as of the date indicated opposite his name.

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 in the capacities and on the dates indicated.

Name	Title	Date
/s/ Ankit Mahadevia, M.D. Ankit Mahadevia, M.D.	President, Chief Executive Officer and Director *(Principal Executive Officer)*	March 30, 2023
/s/ Satyavrat Shukla Satyavrat Shukla	Chief Financial Officer and Treasurer *(Principal Financial Officer and Principal Accounting Officer)*	March 30, 2023
/s/ Milind Deshpande, Ph.D. Milind Deshpande, Ph.D.	Director	March 30, 2023
/s/ Scott Jackson Scott Jackson	Director	March 30, 2023
/s/ John C. Pottage, M.D. John C. Pottage, M.D.	Director	March 30, 2023
/s/ Cynthia Smith Cynthia Smith	Director	March 30, 2023
/s/ Frank E. Thomas Frank E. Thomas	Director	March 30, 2023
/s/ Kathleen Tregoning Kathleen Tregoning	Director	March 30, 2023
/s/ Patrick Vink, M.D. Patrick Vink, M.D.	Director	March 30, 2023