# 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 001-39376**

# POSEIDA THERAPEUTICS, INC.

**(Exact name of Registrant as specified in its Charter)**

| **Delaware** | **47-2846548** |
|---|---|
| **(State or other jurisdiction of incorporation or organization)** | **(I.R.S. Employer Identification No.)** |
| **9390 Towne Centre Drive San Diego, CA** | **92121** |
| **(Address of principal executive offices)** | **(Zip Code)** |

**Registrant's telephone number, including area code: (858) 779-3100**

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, $0.0001 par value per share | PSTX | 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, 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 officers 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 Exchange Act). YES ☐ NO ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the Registrant as of June 30, 2022 was approximately $99.9 million, based on the closing price of the Registrant's common stock as reported by The Nasdaq Global Select Market on such date.

The number of shares of the Registrant's common stock outstanding as of March 3, 2023 was 86,527,203.

DOCUMENTS INCORPORATED BY REFERENCE

Certain information required to be disclosed in Part III of this report is incorporated by reference from the registrant's definitive Proxy Statement for the 2023 Annual Meeting of Stockholders, which proxy statement will be filed not later than 120 days after the end of the fiscal year covered by this report.

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**Special Note Regarding Forward-Looking Statements**

This Annual Report includes forward-looking statements. All statements other than statements of historical facts contained in this Annual Report are forward-looking statements, including statements about:

- our expectations regarding the timing, scope and results of our development activities, including our ongoing and planned clinical trials;
- the timing of and plans for regulatory filings;
- our plans to obtain and maintain regulatory approvals of our product candidates in any of the indications for which we plan to develop them, and any related restrictions, limitations, and/or warnings in the label of an approved product candidate;
- the potential benefits of our product candidates and technologies;
- our expectations regarding the use of our platform technologies to generate novel product candidates;
- the market opportunities for our product candidates and our ability to maximize those opportunities;
- our business strategies and goals;
- estimates of our expenses, capital requirements, any future revenue, and need for additional financing;
- our expectations regarding manufacturing capabilities and plans, including the operation of our pilot manufacturing facility;
- the performance of our third-party suppliers and manufacturers;
- our ability to attract and/or retain new and existing collaborators with development, regulatory, manufacturing and commercialization expertise and our expectations regarding the potential benefits to be derived from such collaborations;
- our expectations regarding our ability to obtain and maintain intellectual property protection for our platform technologies and product candidates and our ability to operate our business without infringing on the intellectual property rights of others;
- our expectations regarding developments and projections relating to our competitors, competing therapies that are or become available, and our industry;
- our expectations regarding the impact of the COVID-19 pandemic and the Russia-Ukraine conflict on our business and our operations, anticipated timelines, our industry and the economy;
- future changes in or impact of law and regulations in the United States and foreign countries; and
- the sufficiency of our existing cash, cash equivalents and short-term investments to fund our operations.

The words “believe,” “may,” “will,” “estimate,” “continue,” “anticipate,” “design,” “intend,” “expect,” “could,” “plan,” “potential,” “predict,” “seek,” “should,” “would” or the negative version of these words and similar expressions are intended to identify forward-looking statements. We have based these forward-looking statements on our current expectations and projections about future events and trends that we believe may affect our financial condition, results of operations, strategy, short- and long-term business operations and objectives and financial needs.

These forward-looking statements are subject to a number of risks, uncertainties and assumptions, including those described in the section titled “Risk Factors.” Moreover, we operate in a very competitive and rapidly changing environment. New risks emerge from time to time. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. In light of these risks, uncertainties and assumptions, the forward-looking events and circumstances discussed in this Annual Report may not occur and actual results could differ materially and adversely from those anticipated or implied in the forward-looking statements.

You should not rely upon forward-looking statements as predictions of future events. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee that the future results, advancements, discoveries, levels of activity, performance or events and circumstances reflected in the forward-looking statements will be achieved or occur. Moreover, except as required by law, neither we nor any other person assumes responsibility for the accuracy and completeness of the forward-looking statements. We undertake no obligation to update publicly any forward-looking statements for any reason after the date of this Annual Report to conform these statements to actual results or to changes in our expectations.

You should read this Annual Report and the documents that we reference in this Annual Report and have filed with the SEC with the understanding that our actual future results, levels of activity, performance and events and circumstances may be materially different from what we expect.

**Summary of Risks Associated with Our Business**

*Below is a summary of the principal factors that make an investment in our securities speculative or risky. This summary does not address all of the risks that we face. Additional discussion of the risks summarized in this risk factor summary, and other risks that we face, can be found in the section titled "Risk Factors" and should be carefully considered.*

- The COVID-19 pandemic continues to adversely impact our business, including our clinical trials, supply chain and business development activities.
- We are a clinical-stage cell and gene therapy company with a limited operating history. We have incurred net losses since our inception and anticipate that we will continue to incur significant losses for the foreseeable future. We have never generated any revenue from product sales and may never be profitable.
- Our product candidates are in the early stages of development and we have a limited history of conducting clinical trials to test our product candidates in humans.
- Our product candidates are based on novel technologies, which make it difficult to predict the timing, results and cost of product candidate development and likelihood of obtaining regulatory approval.
- Serious adverse events, undesirable side effects or other unexpected properties of our product candidates may be identified during development or after approval, which could lead to the discontinuation of our clinical development programs, refusal by regulatory authorities to approve our product candidates or, if discovered following marketing approval, revocation of marketing authorizations or limitations on the use of our product candidates thereby limiting the commercial potential of such product candidate.
- We rely on third parties to conduct our clinical trials and perform some of our research and preclinical studies. If these third parties do not satisfactorily carry out their contractual duties or fail to meet expected deadlines, our development programs may be delayed or subject to increased costs, each of which may have an adverse effect on our business and prospects.
- We operate a pilot manufacturing facility to develop and manufacture preclinical and clinical materials for all of our CAR-T product candidates which requires significant resources. A failure to successfully operate our pilot facility could lead to substantial delays and adversely affect our research and development efforts, including clinical trials, and the future commercial viability, if approved, of our CAR-T product candidates.
- We face substantial competition, which may result in others discovering, developing or commercializing products more quickly or marketing them more successfully than us.
- We are highly dependent on our key personnel, and if we are not successful in attracting and retaining highly qualified personnel, we may not be able to successfully implement our business strategy.
- We are currently party to several in-license agreements under which we acquired rights to use, develop, manufacture and/or commercialize certain of our platform technologies and resulting product candidates. If we breach our obligations under these agreements, we may be required to pay damages, lose our rights to these technologies or both, which would adversely affect our business and prospects.

- Our collaborators may not devote sufficient resources to the development or commercialization of our product candidates or may otherwise fail in development or commercialization efforts, which could adversely affect our ability to develop or commercialize certain of our product candidates and our financial condition and operating results.
- We will need to obtain substantial additional funding to complete the development and any commercialization of our product candidates. If we are unable to raise this capital when needed, we may be forced to delay, reduce or eliminate our product development programs or other operations.
- If we are unable to obtain and maintain sufficient intellectual property protection for our platform technologies and product candidates, or if the scope of the intellectual property protection is not sufficiently broad, our competitors could develop and commercialize products similar or identical to ours, and our ability to successfully commercialize our products may be adversely affected.
- If we are sued for infringing intellectual property rights of third parties, such litigation could be costly and time consuming and could prevent or delay us from developing or commercializing our product candidates.

## PART I

### Item 1. Business.

We are a clinical-stage cell and gene therapy company advancing a new class of treatments for patients with cancer and rare diseases. We have discovered and are developing a broad portfolio of product candidates in a variety of indications based on our core proprietary platforms, including our non-viral piggyBac DNA Delivery System, Cas-CLOVER Site-specific Gene Editing System and nanoparticle- and AAV-based gene delivery technologies.

Our core platform technologies have utility, either alone or in combination, across many cell and gene therapeutic modalities and enable us to engineer our portfolio of product candidates that are designed to overcome the primary limitations of current generation cell and gene therapeutics.

### Cell Therapy

Within cell therapy, we believe our technologies allow us to create product candidates with engineered cells, containing a high percentage of stem cell memory T-cells, or $T_{SCM}$ cells, that may engraft in the patient's body and potentially drive lasting durable responses. Our chimeric antigen receptor T cell, or CAR-T, therapy portfolio currently consists of allogeneic, or off-the-shelf, product candidates. In the industry, allogeneic CAR-T cell products are earlier in development than the autologous products, due in part to the need for a gene editing technology in their production, but this approach has the potential to be the next significant advance in the field as ready to use, off-the-shelf products of consistently high quality. We have used the learnings of our autologous programs in both hematological and solid tumor indications to help inform our allogeneic programs. We are advancing a broad pipeline with CAR-T product candidates in both hematological and solid tumor oncology indications.

We are internally focused on solid tumor cell therapy. P-MUC1C-ALLO1 is currently in a Phase 1 trial and has the potential to treat a wide range of solid tumors, including breast, ovarian and other epithelial-derived cancers. In December 2022, we announced early clinical data showing safety and efficacy. In addition, we have several additional solid tumor allogeneic programs advancing toward anticipated IND filings, including P-PSMA-ALLO1, a preclinical stage program being developed for the treatment of metastatic castrate resistant prostate cancer, or mCRPC. This program is using the findings from our autologous version of this program, P-PSMA-101, in which we treated 38 patients in a Phase 1 study, and we believe these findings will be useful in the allogeneic program. We are also exploring a dual target solid tumor program, currently preclinical, of which the targets are not yet disclosed, as well as other combinations including potential dual products containing both a CAR-T and a T-cell receptor, or TCR.

*Strategic Partnership*

In August 2022, we announced a partnership with F. Hoffmann-La Roche Ltd and Hoffmann-La Roche Inc., or, collectively Roche, in which they have licensed or optioned our lead hematological indications. Included in the upfront license, Roche licensed P-BCMA-ALLO1 and P-CD19CD20-ALLO1, or each, a Tier 1 program. P-BCMA-ALLO1 is currently in a Phase 1 trial, being developed for patients with relapsed/refractory multiple myeloma, using the learnings from our first autologous program P-BCMA-101. P-CD19CD20-ALLO1 is currently a preclinical stage program being developed for the treatment of B-Cell hematological indications, for which we expect an IND filing in mid-2023. In addition to the two licensed programs, Roche has an option to license P-CD70-ALLO1 and P-BCMACD19-ALLO1, or each a Tier 2 program. P-CD70-ALLO1 is a preclinical stage program being developed to treat hematological indications. P-BCMACD19-ALLO1 is a preclinical dual target program, being developed to treat multiple myeloma. In addition to the Tier 1 and Tier 2 programs, we entered into a research collaboration, in which Roche has an exclusive license under certain of our intellectual property to develop, manufacture and commercialize up to six allogeneic CAR-T cell therapy products in hematological indications, or each, a Collaboration Program.

Under the Collaboration and License Agreement that we entered into with Roche, or the Roche Collaboration Agreement, Roche made an upfront payment to us of $110.0 million. Subject to Roche exercising its Tier 2 Program

options, designating Collaboration Programs, and exercising its option for the Licensed Products, as defined below, commercial license and contingent on, among other things, the products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs achieving specified development, regulatory, and net sales milestone events, we are eligible to receive certain reimbursements, fees and milestone payments, including the near-term fees and milestone payments described above, in the aggregate up to $6.0 billion, comprised of (i) $1.5 billion for the Tier 1 Programs; (ii) $1.1 billion for the Tier 2 Programs, (iii) $2.9 billion for the Collaboration Programs; and (iv) $415.0 million for the Licensed Products. We are further entitled to receive, on a product-by-product basis, tiered royalty payments in the mid-single to low double digits on net sales of products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs and in the low to mid-single digits for Licensed Products, in each case, subject to certain customary reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country or ten years from first commercial sale of such product in such country.

*Cell Therapy Pipeline*


**Gene Therapy**

Within gene therapy, we believe our technologies have the potential to create next generation therapies that can deliver long-term, stable gene expression that does not diminish over time and may have the capacity to result in single treatment cures. We believe our proprietary gene engineering technologies have the potential to address the limitations of the transient nature of traditional gene therapies, thereby offering distinct advantages starting in liver-directed gene therapy. Furthermore, we believe that we have the potential to pursue multiple *in vivo* and *ex vivo* approaches in a wide array of cell types and tissues for non-liver-directed gene therapies.

We are internally focused on *in vivo* gene therapy. Our lead program, P-OTC-101, is a liver-directed gene therapy combining piggyBac technology with AAV and nanoparticles for the *in vivo* treatment of Ornithine Transcarbamylase Deficiency, or OTCD. OTCD is an often fatal or morbid urea cycle disease caused by congenital mutations in the Ornithine Transcarbamylase, or OTC, gene with a high unmet medical need. We are developing the P-OTC-101 program utilizing a hybrid of non-viral nanoparticle delivery system to deliver RNA and AAV to deliver DNA and are working on an updated timeline for the program.

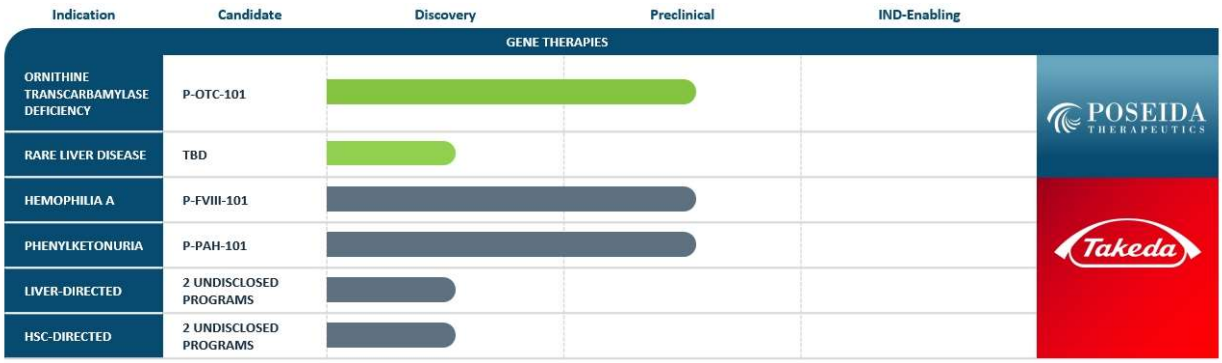
*Strategic Partnership*

In October 2021, we entered into a Collaboration and License Agreement with Takeda, or the Takeda Collaboration Agreement, pursuant to which we granted to Takeda a worldwide exclusive license under our piggyBac, Cas-CLOVER, biodegradable DNA and RNA nanoparticle delivery technology and other proprietary genetic engineering platforms to research, develop, manufacture and commercialize gene therapy products for certain indications, including Hemophilia A. We collaborate with Takeda to initially develop up to six *in vivo* gene therapy programs and Takeda also has an option to add two additional programs to the collaboration. We are

obligated to lead research activities up to candidate selection, after which Takeda is obligated to assume responsibility for further development, manufacturing and commercialization of each program.

Under the Takeda Collaboration Agreement, Takeda made an upfront payment to us of $45.0 million. Takeda is also obligated to provide funding for all collaboration program development costs including our P-FVIII-101 and P-PAH-101 programs; provided that we are obligated to perform certain platform development activities at our own cost. Timelines for P-FVIII-101, P-PAH-101 and other programs subject to the Takeda Collaboration Agreement will be driven by Takeda. Under the Takeda Collaboration Agreement, we are eligible to receive preclinical milestone payments that could potentially exceed $82.5 million in the aggregate if preclinical milestones for all six programs are achieved. We are also eligible to receive future clinical development, regulatory and commercial milestone payments of $435.0 million in the aggregate per target, with a total potential deal value over the course of the collaboration of up to $2.7 billion, if milestones for all six programs are achieved and up to $3.6 billion if the milestones related to the two optional programs are also achieved. We are entitled to receive tiered royalty payments on net sales in the mid-single to low double digits, subject to certain standard reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country, ten years from first commercial sale of such product in such country, or expiration of regulatory exclusivity for such product in such country.

*Gene Therapy Pipeline*




**Our Proprietary Cell and Gene Engineering Platform Technologies**

We have developed a proprietary suite of gene engineering technologies that have broad utility. The breadth and depth of our technology platforms fall into three primary categories: (1) gene insertion, (2) gene editing and (3) gene delivery, supported by additional CAR-T tools.

- ***Gene insertion***. Our proprietary, non-viral piggyBac DNA Delivery System, which includes our Super piggyBac transposase enzyme, is highly efficient at stable gene insertion and has a significantly larger genetic cargo capacity as compared to viral methods (potentially greater than 20x lentivirus). As a result, our product candidates can contain transgenes large enough to include multiple chimeric antigen receptor, or CAR, and/or T cell receptor, or TCR, genes, selection genes, safety switch genes and potentially other cargo for specific treatment applications, making it a highly versatile platform. Importantly, piggyBac works in a wide variety of cell types, both dividing and non-dividing, T cells, B cells, natural killer cells, hematopoietic stem cells, or HSCs, induced pluripotent stem cells, primary hepatocytes and numerous other cell types giving it broad reach and applicability.
- ***Gene editing with precise specificity***. Our proprietary, highly precise Cas-CLOVER site-specific gene editing technology is easy to use, highly efficient and capable of multiplexing and has shown low to no off-target activity in our preclinical studies, which we believe provides a distinct tolerability advantage over other gene editing systems. In addition, unlike many other gene editing technologies, Cas-CLOVER can efficiently edit resting T cells, allowing for the maintenance of the highly desirable $T_{SCM}$ product composition in allogeneic product candidates, an important component of our CAR-T approach.

Both of our proprietary site-specific gene editing platforms, Cas-CLOVER, and a related technology called TAL-CLOVER, can also be used for *in vivo* gene therapies.

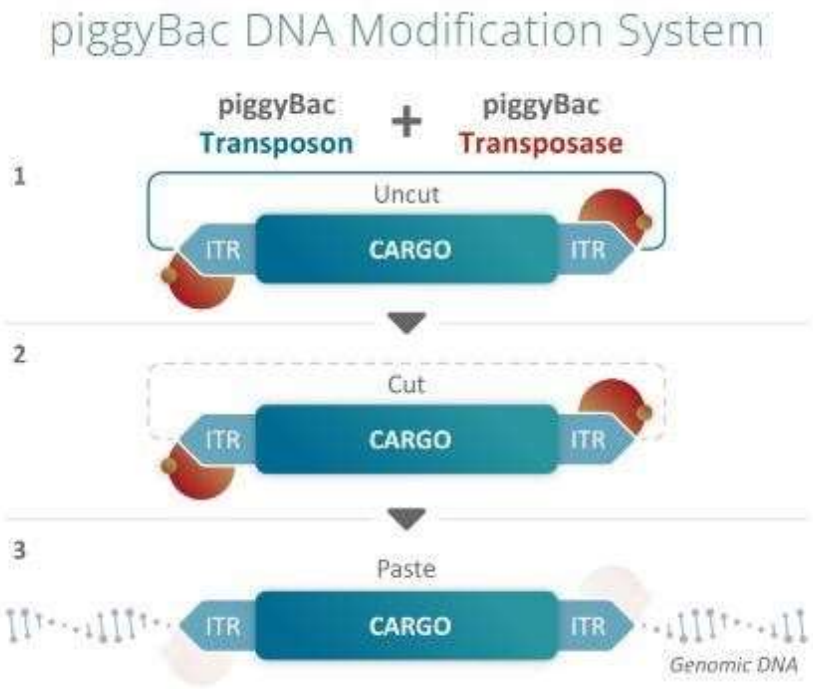
- ***Gene delivery***. We have numerous technologies and platforms for delivering DNA, RNA and proteins, including into cells both *ex vivo* and *in vivo*. These include proprietary nanoparticle technology, AAV technology, and both *ex vivo* and *in vivo* electroporation, which is a process by which we use a pulse of electricity to briefly increase the permeability of cells.
- ***Additional proprietary tools.*** We also have a number of other technologies and tools that have been developed for specific applications including:
    - *$T_{SCM}$ Phenotype.* We have developed and patented a number of manufacturing methods and media to preserve a high percentage of $T_{SCM}$ in our product candidates. We believe that the $T_{SCM}$ cell phenotype is key to success in CAR-T therapies.
    - *Positive selection.* We create product candidates utilizing a fully human drug resistance gene that can be employed during manufacturing to create a purified product that is essentially 100% CAR-positive, minimizing one of the sources of CAR-T toxicity and thereby potentially enhancing the therapeutic index. Our initial use for positive selection is for CAR-T, but this technology has utility in other cell types.
    - *Booster molecules.* We have developed a technology that enables improved expansion of gene-edited allogeneic cells without affecting their desirable $T_{SCM}$ characteristics. The booster molecule is an RNA-based technology introduced to T cells during the manufacturing process, which results in transient expression of a receptor on the surface of T cells that allows the cells to respond to antibody-based activator molecules, resulting in significant expansion of the cells without causing maturation or exhaustion of the cells. Using this approach, we can create potentially hundreds of doses from a single manufacturing run yet maintain the high percentage of desirable $T_{SCM}$ cells in the final product candidate. This technology is currently used in our allogeneic CAR-T programs but may have utility in other cell types.
    - *Safety switch.* We have developed a proprietary safety switch comprised of fully human genes that can be activated by administration of a small molecule, and thereafter, has the potential to rapidly eliminate some or all of the genetically modified cells in the patient after administration.
    - *CAR binding modalities.* In addition to traditional scFv binders, we have access to and utilize novel binder technologies, such as heavy-chain-only antibody fragments, which, compared to scFv, are more stable, result in less T cell exhaustion and may result in lower immunogenicity.
    - *Armoring platforms*. We can use our genetic engineering tools to make other modifications to our product candidates to potentially improve their performance against solid tumors, an approach commonly referred to as "armoring". We have several types of armoring platforms:
        - *Conditional gene expression system*: Due to the very large cargo capacity of piggyBac, we have demonstrated the ability to deliver into the genome a conditional gene expression system that expresses one or more genes of interest only when the cell becomes activated or stimulated by binding of the CAR molecule to its specific target. This approach is superior to constitutive expression systems in that tight conditional regulation limits gene expression to relevant sites, such as the tumor microenvironment. In this way, supporting molecules such as pro/anti-inflammatory molecules, checkpoint inhibitors, cytokines, interleukins and chemokines can be expressed by the T cell and/or delivered locally to the tumor or target cell.
        - *Decoy receptors*: CAR-T therapies can be enhanced by using piggyBac to deliver molecules that sequester and block negative immune regulators, such as PD-1 and TGFβR2. Decoy/null or positive switch receptors can be used to block or convert to activators, respectively, regulatory signals from the tumor microenvironment that otherwise work to exhaust T cell responses.
        - *Gene knockout*: Our Cas-CLOVER site-specific gene editing platform can be used to armor CAR-T therapies by targeting functional regulatory molecules, such as checkpoint blockade

genes. These protein receptors are involved in exhaustion mechanisms by the tumor microenvironment.

***Gene insertion: piggyBac DNA Delivery System***

DNA transposons are genetic elements that efficiently move from a plasmid to a chromosome via a cut and paste mechanism. DNA transposons have been used as a gene transfer method, including in CAR-T manufacturing. The piggyBac DNA Delivery System is our proprietary non-viral gene engineering technology that can be used to add therapeutic transgene DNA to the genome using the highly efficient Super piggyBac transposase enzyme, a hyperactive enzyme that was genetically modified to enable very high efficiency transposition of piggyBac transposons. We believe piggyBac enables efficient and precise transposition and multiple differentiated product attributes.

The image below depicts the piggyBac DNA Delivery System:




Therapeutic genes encoded within the cargo region of the piggyBac DNA transposon transgene are flanked by non-translated inverted terminal repeat sequences, or ITRs, that are specifically recognized by the transposase enzyme for the highly efficient process of stably integrating the therapeutic transgene cargo into specific sequences (TTAA nucleotides) in the genome. The transposase enzyme can be co-delivered to the cell as a protein or encoded in either DNA or RNA.

The piggyBac platform is our core technology used for the development of CAR-T and other gene therapy product candidates in our pipeline. We believe our piggyBac DNA Delivery System enables multiple differentiated product attributes including:

- CAR-T product candidates with a high percentage of desirable $T_{SCM}$ cells, leading to better engraftment and duration of response with the potential for re-response, as well as a better tolerability profile;
- very large cargo capacity (potentially greater than 20x lentivirus)—allows efficient delivery of large therapeutic transgenes, including the possibility of multiple CAR or TCR molecules and incorporation of selection genes, safety switches and/or armoring strategies;

- non-viral delivery system that reduces the risk of mutagenesis and oncogenesis compared to viral delivery systems;
- high insertion efficiency and stable therapeutic transgene expression in a wide range of dividing and non-dividing cells and tissues; and
- shorter timelines and less costly manufacturing than viral methods.

The piggyBac transposon preferentially transposes therapeutic transgenes into early memory T cells, including $T_{SCM}$ cells. We believe retroviral transgene delivery methods, such as lentivirus and γ-retrovirus, are not efficient at delivering transgenes into early memory T cells. This is a key differentiator that allows us to manufacture CAR-T products with a high percentage of $T_{SCM}$ cells, giving them desirable characteristics.

While the genetic cargo capacity of viruses typically used in CAR-T manufacturing, such as lentivirus and γ-retrovirus, is limited to approximately 10-20 kilobases, or kb, piggyBac has demonstrated cargo delivery of greater than 200 kb, allowing transfer of multiple useful genes. The very large cargo capacity of piggyBac permits incorporation of multiple genes into our product candidates to further enhance tolerability and potency, with all CAR-T cells in our current CAR-T product candidates carrying a CAR molecule gene, a safety switch gene and a selection gene. The cargo capacity also allows for packaging of multiple CAR-T encoding genes and/or TCR genes allowing for the creation of dual and other multi-CAR-T product candidates.

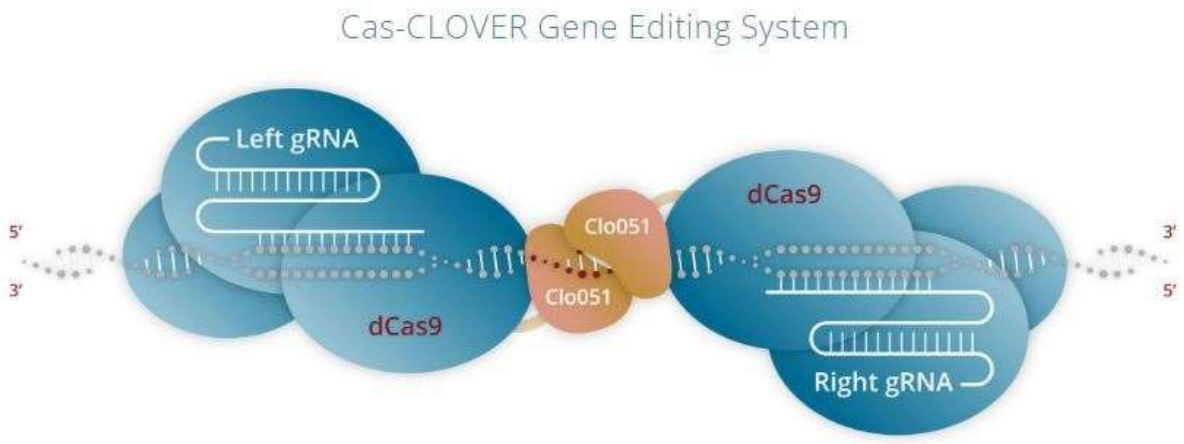
PiggyBac ITRs and other components act as strong insulators, ensuring stable transgene expression and reducing risks of oncogenesis. PiggyBac has shown lower integration into intragenic regions compared with lentivirus, meaning that it is less likely to cause a detrimental mutation.

Additionally, piggyBac is estimated to have a significantly lower cost in production of GMP material and a much shorter timeline for GMP production as compared to GMP production of viral vectors.

The image below depicts our piggyBac transposon transgene approach for creating CAR-T product candidates:


***Gene Editing with Precise Specificity: Cas-CLOVER Site-Specific Gene Editing Technology***

We have developed gene editing technology that uses a proprietary obligate homodimer nuclease system named CLOVER, which consists of parts of the Type IIS restriction endonuclease, Clo051. Genome cutting by this enzyme is strictly dependent upon dimerization, which makes it a fully dimeric system and gives it precise site-specificity. Cas-CLOVER uses a CRISPR (Clustered, Regularly Interspaced Short Palindromic Repeats) associated protein 9, or Cas9, enzyme that has been permanently altered and is unable to cut DNA (called dCas9). The dCas9 acts only as a DNA binding protein when combined with an appropriate guide RNA (gRNA). Cas-CLOVER combines the advantages of the first-generation CRISPR system (ease of design, low cost, multiplexing ability) with the advantages of the obligate homodimer nuclease systems (precise specificity). Importantly for T cell applications, Cas-CLOVER works well in resting T cells, which allows us to avoid maturation and exhaustion during production and assists in preserving the $T_{SCM}$ phenotype.




The most widely used platform for gene editing is CRISPR and an associated protein, Cas9. This gene editing technology is derived from a naturally occurring viral defense mechanism in bacteria. It works by binding the Cas9 enzyme to guide RNA, which can direct the Cas9 enzyme to a specific DNA sequence to make cuts in double-stranded DNA. Once the DNA is cut, the cell uses naturally occurring DNA repair mechanisms to rejoin the cut ends.

The CRISPR/Cas9 technology has been shown to result in unwanted off-target cutting, which means additional cutting at unintended sites that are often similar but not identical to the target DNA site. This off-target cutting can result in permanent mutations to the genomic DNA, which may unintentionally lead to detrimental mutations and oncogenesis, thereby creating significant safety concerns when used for the manufacture of cell and gene therapeutics.

Another popular site-specific gene editing platform used for cell and gene therapeutic applications are the Transcription Activator-Like Effector Nucleases, or TALENs. They are constructed by fusing a TAL DNA-binding domain to a DNA cleavage domain, typically FokI, which functions as an obligate homodimer, meaning two half-sites must come together at the exact same place and the exact same time in order to make a cut. Given the requirement for two half-sites, this type of system is sometimes called a fully dimeric system.

While TALEN technology can often cut specific sites in DNA with much higher fidelity than CRISPR/Cas9, it is relatively labor intensive and expensive to build. Conceptually similar, ZFN technology is a gene editing technology comprised of a class of DNA binding proteins used to make double-stranded breaks in DNA. Like TALEN technology, ZFN requires more preparation and work to use through the creation of arrays needed to target specific desired edits. TALEN and ZFN technologies both require activation of the cells to edit and do not work well in resting T cells, and thus fail to preserve a high percentage of the $T_{SCM}$ phenotype for CAR-T.

Another emerging gene editing technology is known as base editors. Base editing uses components from CRISPR systems together with other enzymes to directly install point mutations into cellular DNA or RNA without making double-stranded DNA breaks. DNA base editors comprise a catalytically disabled nuclease fused to a nucleobase deaminase enzyme and, in some cases, a DNA glycosylase inhibitor. Base editing technology is known to create some level of unwanted off-target mutations but the full extent is not yet known and could present a safety concern for allogeneic CAR-T where products could be given to many patients.

***Gene Delivery Technologies: Nanoparticle Technology, In vivo and Ex vivo Electroporation and AAV***

In addition to our piggyBac platform for non-viral gene insertion and our Cas-CLOVER platform for gene editing, we have developed a set of platform technologies for gene delivery to allow us to deliver RNA, DNA and proteins into cells both *ex vivo* and *in vivo* for various applications. These technologies include nanoparticle technology, AAV technology and *ex vivo* and *in vivo* electroporation technologies and approaches. Because of the

breath of potential utility of piggyBac and Cas-CLOVER, we foresee a need for different delivery modalities for different applications.

In our allogeneic CAR-T product candidates, we edit the T cells *ex vivo* using electroporation to deliver the necessary piggyBac components required to stably insert the therapeutic transgene into the genome of the cells. We also introduce Cas-CLOVER into the T cells via electroporation to edit the cells to eliminate alloreactivity.

In some of our liver-directed gene therapy programs, we use AAV technology and lipid nanoparticles, or LNPs, to deliver piggyBac to the liver *in vivo*. We have developed a variety of distinct and proprietary nanoparticle compositions to achieve different delivery objectives. These nanoparticles fall generally into two categories, polymersomes and LNPs. Polymersomes are single component particles comprised of novel block co-polymers and are designed to deliver large complex molecules such as proteins. LNPs are multi-component nanoparticles composed of known and novel lipids and are designed to deliver nucleic acids including mRNA and DNA. We are evaluating these nanoparticle concepts to deliver both our piggyBac and Cas-CLOVER technologies.

Our longer-term goal for our nanoparticle platform is to be able to eliminate the need for AAV for *in vivo* gene therapies by using nanoparticles to deliver our technologies into cells. We have nominated one program, P-FVIII-101, using our fully non-viral delivery technology, and are actively maturing our proprietary nanoparticle technology platform to enable additional programs.

**Cell Therapy**

**Addressing the Limitations of Early-Generation CAR-T Therapies**

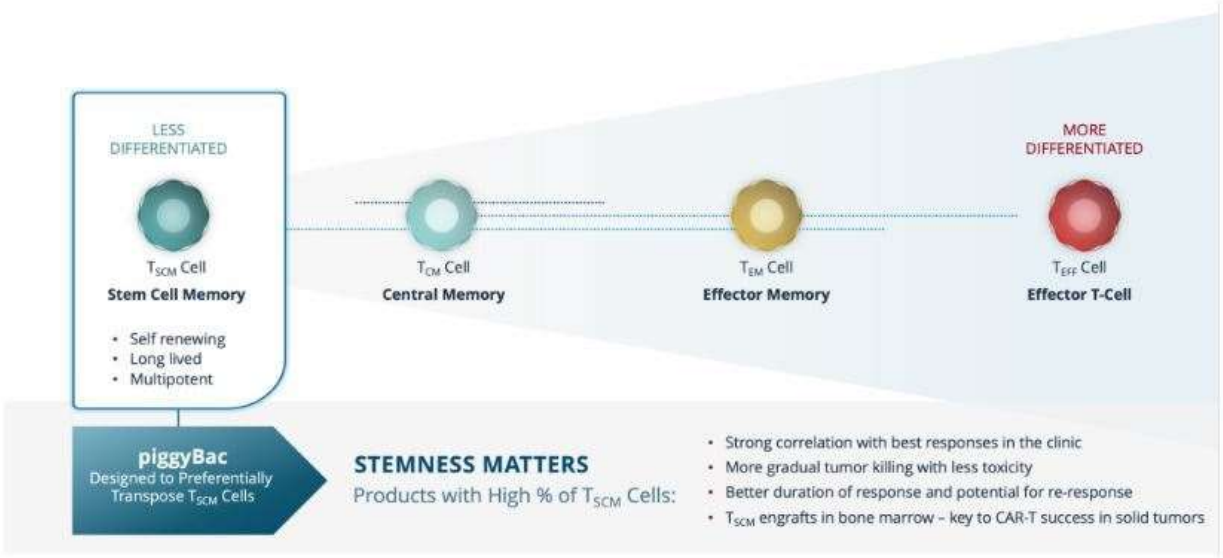
Although early-generation CAR-T therapy has shown significant potential, there are a number of limitations. The great majority of early-generation and current CAR-T therapies are produced using viral-based manufacturing. We believe that there are a number of inherent problems related to viral-based manufacturing that limit the potential of other CAR-T therapies. T cell engineering is typically achieved via viral transduction, the process of introducing foreign DNA into a cell using a virus, most notably with retroviruses, such as γ–retrovirus or lentivirus.

Despite extensive optimization of these viral vectors, their limitations are becoming more evident, including safety concerns regarding the insertional profile, limited genetic cargo capacity, and undesirable characteristics of the final product. We use our proprietary non-viral piggyBac DNA Delivery System to deliver CAR molecule genes to T cells. The most significant advantage of using a non-viral approach is the ability to generate CAR-T products comprised of a high percentage of $T_{SCM}$ cells. We believe this has the potential to result in therapies that elicit more consistent and durable responses with less toxicity. Additionally, we believe our non-viral approach will have much lower manufacturing costs and shorter manufacturing timelines. We have also developed allogeneic, or off-the-shelf, CAR-T therapies from healthy donors that will be potentially as good as or better than autologous CAR-T products, and be available off-the-shelf at a fraction of the cost of autologous therapies.

***Cell Type Matters - Stem Cell Memory***

$T_{SCM}$ cells are believed to be ideal for cell therapy because they have the potential to engraft, be long-lived, self-renewing and multi-potent in that they can create wave after wave of more differentiated cells. There is a one-way maturation pathway from $T_{SCM}$ cells to central memory T cells, or $T_{CM}$; then to effector memory T cells, or $T_{EM}$; and lastly, to $T_{EFF}$ cells. As T cells mature and differentiate, their core functions and capabilities change, impacting their potency and durability. Our approach is to utilize a high percentage of less differentiated T cells in our product candidates with the goal of increasing persistence and mitigating some of the key limitations of early-generation CAR-T products. We also believe that creating a product with high $T_{SCM}$ may be why we have seen such success in clinical efficacy for solid tumors where the $T_{SCM}$ cells can engraft and create wave after wave of cells to attack the tumor. Conceptually, products that are more maturated and contain more effector cells are like a drug, whereas our products that have a high percentage of $T_{SCM}$ cells are like a prodrug. The $T_{SCM}$ cells do not kill tumor cells, they engraft and create the more differentiated cells that do the killing.

The following figure illustrates this one-way T cell maturation pathway, from $T_{SCM}$ cell to $T_{EFF}$ cell:




Based upon our clinical data to date from our former autologous product candidates, we have observed a strong correlation between the percentage of $T_{SCM}$ in the product candidate and best clinical response. In addition to our own experience, there is growing evidence and recognition that $T_{SCM}$ is correlated with efficacy in the clinic.

**Gene Editing**

Gene editing tools are widely used to eliminate expression of certain cell surface molecules, which may be used to avoid the potential reactivity of donor cells against the patient, which results in graft-vs-host disease, or GvHD, as well as the reactivity of the patient's cells against the CAR-T product, a reaction called host-vs-graft. We believe it is imperative to use gene editing tools that can efficiently edit resting T cells when creating an allogeneic CAR-T product, as activating T cells will initiate the maturation pathway. Once T cells begin maturating, they start to lose their desirable $T_{SCM}$ characteristics and thereby become exhausted, rendering the resulting product less efficacious.

Unlike many other gene editing technologies, our approach using Cas-CLOVER can efficiently edit resting T cells, allowing for the maintenance of the highly desirable $T_{SCM}$ product composition in allogeneic product candidates, an important component of our CAR-T approach. Our goal with all of our allogeneic product candidates is to create a product with a profile comparable to or better than an autologous version of the same product and in the case of our first fully allogeneic product candidate for multiple myeloma, P-BCMA-ALLO1, our efficacy benchmark will be against P-BCMA-101 and other BCMA targeting programs.

**Cost, Scale & Reach**

Despite the potent activity from early CAR-T entrants to the market, commercial adoption has been relatively slow to date. We believe that there are two main hurdles to widespread adoption of CAR-T. The first hurdle is cost. The therapies themselves can cost hundreds of thousands of dollars, and there are potentially significant additional costs from managing the occasionally substantial toxicities from the early-generation CAR-T therapies. The second hurdle is the toxicities themselves. While some progress is being made in managing the side effects, the risk remains significant for many patients, requiring that these early generation CAR-T products to be administered only in large hospitals and treatment centers with intensive care units, as compared to more accessible community hospitals and outpatient infusion centers.

We believe that our approach could enable us to address these hurdles to unlock the potential of CAR-T therapies. The combination of our higher percentage $T_{SCM}$ product and a potentially improved tolerability profile may allow us to move beyond academic medical centers and broaden the reach of these products. In our first clinical trial, P-BCMA-101, we were already dosing on a fully outpatient basis, following discussions with the FDA and similarly, have received clearance for outpatient dosing on our P-MUC1C-ALLO1. We believe outpatient dosing will enable expanded reach and lower cost. In addition, our booster molecule technology allows us to drive scale to our allogeneic manufacturing process, resulting from the ability to produce potentially hundreds of doses of our allogeneic CAR-T product candidates from a single manufacturing run from a single healthy donor. This dramatically reduces the manufacturing cost of CAR-T therapy to levels in the range of traditional biologic therapeutics in oncology and enabling off-the-shelf availability for immediate use.

***CAR-T in Hematological Tumors***

Early-generation CAR-T therapeutics have demonstrated an ability to achieve impressive responses in hematological malignancies, even in pre-treated patients who are relapsed and/or refractory to prior lines of standard therapies. Dramatically higher response rates than those reported for all prior therapeutics have been achieved in some indications, with some patients likely being cured. Despite these outcomes, however, significant challenges remain with regard to safety and cost. Furthermore, we believe additional improvements could be made with regard to duration of response as a number of patients have relapsed after receiving CAR-T therapy and duration of response has generally been poor.

A major limitation of early-generation CAR-T therapies is the potential for severe toxicity, most notably CRS and neurotoxicity, either of which can be fatal. Current CAR-T therapeutics are administered at large medical centers with ICUs so that an ICU can be reserved for all patients being administered CAR-T in the case they experience these severe toxicities. Furthermore, the cost of dealing with the toxicities associated with CAR-T can oftentimes exceed the cost of the therapeutic itself. There are also significant cost, manufacturing and commercial scalability challenges ahead for other CAR-T candidates, mainly due to the nature of viral-based manufacturing. These issues greatly limit the commercial reach of current CAR-T products. There are several potential reasons for the poor duration of response, which generally fall into two categories: elimination of the CAR-T cells from the body and loss of expression of a CAR-T target on a tumor cell, known as antigen escape.

*Safety*

The excitement over the impressive responses seen initially with early-generation CAR-T approaches has unfortunately been tempered by potentially life-threatening toxicities, most notably CRS and neurotoxicity. Typical clinical symptoms of neurotoxicity include headache, confusion, delirium, language disturbance and seizures. As more is being understood about these toxicities, it is now appreciated that they may be caused by different molecular mechanisms. However, both are rooted in a T cell response that is essentially too rapid and too strong. The CAR-T cells and other immune cells of the patient release cytokines and other molecules that initiate immune cascades that can be fatal if not avoided or successfully treated.

$T_{SCM}$ cells express fewer cytotoxic effector molecules than more maturated T cells and are postulated to differentiate and develop cytotoxic capability gradually. We believe the $T_{SCM}$ cell phenotype may lead to a more controlled expansion of CAR-T and more gradual killing of tumor cells, thereby lessening the severity of toxicities, such as CRS and neurotoxicity, and resulting in a CAR-T product that can be administered on a fully outpatient basis.

A second safety feature incorporated into our CAR-T product candidates is the positive selection for CAR-positive cells during the manufacturing process. Drug resistance genes have been employed in other cellular therapeutics as a mechanism for selecting and purifying gene-modified cells to improve the efficiency of gene therapy. Our product candidates are engineered to express a variant of the human dihydrofolate reductase, or DHFR, gene. Cells containing this variant of the DHFR gene are slightly resistant to the drug methotrexate, or MTX. The advantage of DHFR over other drug-resistance strategies is that MTX is not genotoxic and preferentially kills dividing cells. Importantly, this gene-drug combination has been previously demonstrated to permit *ex vivo* selection of genetically modified T cells with relatively low concentrations of MTX.

Additionally, we enrich for gene-modified CAR-positive cells during *ex vivo* expansion, thereby purifying the therapeutic product and controlling for any patient-to-patient variability in raw material or manufacture, making our CAR-T product candidates essentially 100% CAR-positive. This contrasts with competing products that do not utilize positive selection and typically contain a significant number of CAR-negative cells that cannot kill cancer cells but are artificially activated and expanded outside of the body and may contribute to CRS and/or neurotoxicity. Thus, we believe that positive selection is another mechanism, in addition to the high percentage of $T_{SCM}$ cells, that may result in our CAR-T product candidates having a significantly greater therapeutic index.

Given that every CAR-T cell has a transgene, which is stably integrated into the genome, there is the possibility that the transgene delivery part of the CAR-T manufacturing process could create a detrimental mutation that allows the cell to expand in an uncontrolled manner, which can result in the cell itself becoming cancerous. Additionally, in the case of viral-manufacturing, some viral components that are integrated into the CAR-T cell as part of the transgene, such as the long terminal repeats, or LTRs, of the transgene may be able to activate a gene already in the cell, resulting in the cell becoming cancerous, a process called oncogenesis.

There has been an example of a clonal expansion in a patient who received a CAR-T product made from lentivirus. A clonal expansion means that a single T cell was given a proliferative advantage and was able to grow to a majority of all the CAR-positive cells in the patient. In this case, the clonal expansion was caused by the lentivirus inserting into a gene important for proliferation. Our CAR-T product candidates utilize our proprietary piggyBac technology. PiggyBac has shown low integration into intragenic regions, meaning that it is less likely to cause a detrimental mutation. Also, unlike retroviruses, piggyBac does not contain LTR sequences, but rather ITRs and other components which act as strong insulators, enhancing stable transgene expression and lowering risk of oncogenesis.

We have included a cellular safety switch in each of our product candidates as an additional safety mechanism. Both CRS and neurotoxicity are thought to be related to an overactive T cell response. Therefore, timely intervention to diminish the number of CAR-T cells should be an effective method of managing the majority of adverse events. We believe an ideal intervention technique is one that could be titrated such that not all CAR-T cells would be eliminated, leaving some for continued therapeutic effect.

*Commercial Scalability*

Another challenge with early-generation CAR-T products is their commercial scalability. Autologous CAR-T products are, by definition, individualized products. They are also typically expensive to produce, particularly when using viral-based manufacturing methods. We believe our non-viral piggyBac approach is more efficient and cost effective than historical CAR-T methods as it utilizes GMP nucleic acids, DNA and RNA, which are faster and cheaper to produce than GMP virus. We have further optimized the manufacturing process to eliminate some of the costly materials associated with the viral-based methods, including magnetic beads and cytokines.

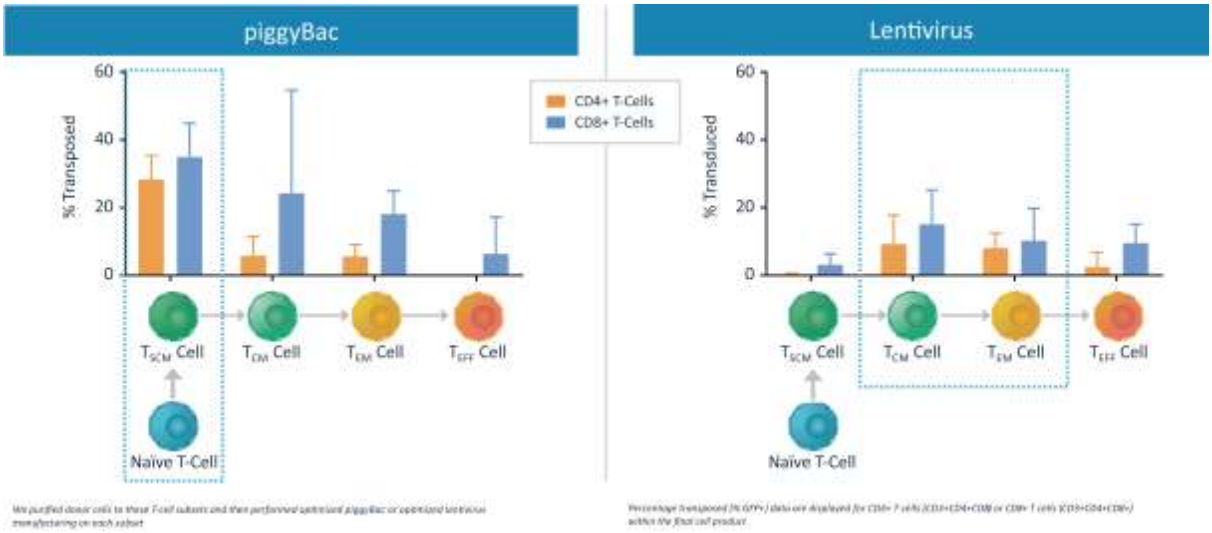
CAR-T products that elicit severe and potentially fatal toxicities, such as CRS and neurotoxicity, require that the drug be administered in a tertiary care hospital where the physicians are familiar with treating these toxicities and where admission to an intensive care unit is an option. The potential for these severe toxicities currently precludes administration in community hospitals or outpatient infusion centers. In our dose-escalation P-BCMA-101 Phase 1 clinical trial, to our knowledge no patient has had to be admitted to intensive care units for CRS or neurotoxicity. Based on these results, and following discussions with the FDA, we were able to dose on a fully outpatient basis. As we evaluate initial findings on our P-BCMA-ALLO1 program, if we continue to see the same safety responses as we did in the autologous trial, we plan to pursue outpatient dosing as well.

*Efficacy Challenge: Elimination of CAR-T Cells*

There are numerous explanations as to why CAR-T cells are eliminated from a patient after administration, but we believe the primary explanation is that the majority of T cells in other CAR-T products are more maturated and short-lived T cells, including $T_{EFF}$ cells. Not all T cells are created equally, and we believe the ability to develop a product that consists predominantly of early memory T cells, particularly $T_{SCM}$ cells, is the key to increasing duration of response and tolerability. Our non-viral piggyBac manufacturing method is the only commercially viable

approach known to us that can create CAR-T products with a high percentage of the highly desirable $T_{SCM}$ cells with the efficiency of our technology.

In order to test the ability of our piggyBac DNA Delivery System to preferentially deliver CAR-containing transgenes to $T_{SCM}$ cells, we conducted a preclinical experiment in which we separated T cells into their various subtypes, then individually put those subsets through either an optimized piggyBac manufacturing process or an optimized lentivirus process and measured the percentage of transposed or transduced cells in each final product subset. As shown in the figures below, piggyBac was very efficient at transposing (the piggyBac process of delivering the CAR-containing transgene) in $T_{SCM}$ cells, while lentivirus was relatively ineffective at transducing (the lentiviral process of delivering the CAR-containing transgene) in $T_{SCM}$ cells. We measured both CD4+ T cells (also known as T helper cells) and CD8+ T cells (also known as cytotoxic T cells) which represent two subsets of T cells believed to interact and be important in immune function and T cell response.




Given the one-way maturation pathway of T cells, we believe utilizing a genetic engineering method that preferentially modifies $T_{SCM}$ cells is essential for creating a final product with a high percentage of $T_{SCM}$ cells. During manufacturing, once we have completed the genetic modification step, we then perform a positive selection step to eliminate cells that have not been modified. Lastly, we activate and expand the remaining cells under conditions that favor self-renewal of $T_{SCM}$ cells without differentiation, resulting in a product that has a high percentage of $T_{SCM}$ cells, even when starting with patient material with a relatively low percentage of $T_{SCM}$ cells. Our non-viral piggyBac DNA Delivery System typically yields $T_{SCM}$ cell percentages reaching as high as 80%. We compared our piggyBac manufacturing method to a lentivirus-based manufacturing method that utilizes alternative media (Aim V, Thermo Fisher Scientific), different T cell stimulation (CD3/CD28 beads from Dynal/Thermo Fisher Scientific) and virus for vector integration (lentivirus). The sorted T cell subsets were put through the piggyBac process once in a pilot experiment with cells from one donor, and again in a comparison with the lentivirus process with cells from three donors. The early memory component, or combined $T_{SCM}$ and $T_{CM}$ cells, typically comprise greater than 90% of the cells of our product candidates. Notably, in December 2019, we were issued a U.S. patent that has claims that cover any modified T cell product that has 25% or more $T_{SCM}$ cells.

Others in the field of CAR-T development are also attempting to increase the percentage of $T_{SCM}$ cells in their products through alternative methods during the manufacturing process, including the addition of small molecule inhibitor drugs and various cytokines, reducing the time in culture, and physically enriching through sorting methods for early T cells. However, we believe these methods all have inherent problems that will limit the ability to successfully create a final product candidate with a high percentage of $T_{SCM}$ cells.

In both our own clinical data and in data published and presented by others, a higher percentage of $T_{SCM}$ cells in CAR-T products have been shown to correlate with clinical response, and our CAR-T product candidates contain

a high percentage of $T_{SCM}$ cells. Our goal is that our product candidates will overcome the limitations of other CAR-T products in many respects, including potency and durability of response.

More maturated T cells, which already have a short lifespan compared with $T_{SCM}$ cells, can be eliminated from the patient due to their inability to persist, leading to poor efficacy of the product. One reason that premature loss of CAR-T occurs is the presence of CAR binding molecules on the surface of the T cell that can interact with each other. This results in crosslinking of the CAR molecule and a phenomenon called tonic signaling, in which the CAR-T cells are essentially always stimulated and active. Tonic signaling results in premature loss of efficacy, poor expansion and cell death, referred to as T cell exhaustion. We use binding molecules, such as heavy-chain-only antibody fragments and carefully selected single-chain fragment variable antibodies to minimize the risk of crosslinking and tonic signaling.

*Efficacy Challenge: Antigen Escape and Antibodies*

Some CAR-T products have been shown to lose efficacy due to what is called antigen escape, which occurs when expression of a CAR-T target on a tumor cell is lost or drastically reduced due to selective pressure from the CAR-T therapeutic, resulting in an expansion of the tumor cells that have escaped the ability of the CAR-T to kill them. To avoid antigen escape, we have focused our efforts on selecting targets where we believe expression is less likely to be reduced. For example, BCMA is important for cell proliferation, and so is considered less likely to be lost by the tumor cell following CAR-T treatment.

Another method to prevent antigen escape involves pursuing multiple targets on the cancer cell with the same CAR-T product. The likelihood that a cancer cell will be able to simultaneously downregulate or lose expression of multiple targets, as opposed to any single target, is greatly reduced. While the genetic cargo capacity of viral vectors is quite limited, piggyBac has demonstrated the ability to deliver greater than 20 times more genetic cargo capacity, allowing transfer of multiple CAR molecule genes simultaneously. We believe the large genetic cargo capacity of piggyBac could allow us to further address antigen escape by including two or more CARs or TCRs on the same T cell. We have several Dual CAR programs currently in preclinical development designed to seek improved efficacy including potentially addressing antigen escape in various indications.

In our P-BCMA-101 Phase 1 clinical trial, we observed that some patients have formed antibodies, also known as anti-drug antibodies in response to our treatment. This is not uncommon in biologic drug development, including CAR-T development. Based upon our data to date, it appears that anti-drug antibodies are more likely to form at higher dose cohorts. In our expanded Phase 1 clinical trial for P-BCMA-101 we investigated additional dosing strategies that may reduce or eliminate the impact of anti-drug antibodies, including administering the dose in smaller cycles over the first 30 days and adding rituximab to the preconditioning regimen to potentially suppress any antibody response. As presented at ASH in December 2021, the P-BCMA-101 arm using rituximab showed the absence of antidrug antibodies.

***CAR-T in Solid Tumors***

*Efficacy Challenge*

In addition to the standard concerns regarding persistence of T cells in the treatment of hematologic malignancies, there are factors that exacerbate this problem when using CAR-T products for the treatment of solid tumors. To date, the great majority of early-generation CAR-T products have not demonstrated significant responses in solid tumors and there are a number of potential explanations for this poor efficacy. First, it is possible that CAR-T cells have more difficulty accessing solid tumor cells. In some diseases, such as acute lymphoblastic leukemia, the tumor cells are easily accessible by the CAR-T cells. However, in most solid tumors, there are a number of factors that may make it more difficult for CAR-T cells to access the tumor. Second, it is possible that solid tumor cells have changes in expression of certain checkpoint genes that render them resistant to killing by T cells. Third, the center of many solid tumors is very hypoxic, or low in oxygen concentration, and this environment is not thought to be conducive to T cell function.

There have been a few exceptions to the poor efficacy of CAR-T in solid tumors, notably in glioblastoma multiforme and hepatocellular carcinoma, where treatment with CAR-T has led to complete responses, or a CR, in

solid tumors. In these rare cases, the patient was treated with numerous administrations of CAR-T product. Though CAR-T cells are not as effective against solid tumor cells as they are against hematological tumor cells, this can potentially be overcome by giving multiple administrations of CAR-T, resulting in numerous waves of more maturated T cells killing the cancer cells. This approach would be more viable if there were an unlimited number of cells with which to treat the patient. However, manufacturing early-generation CAR-T products is relatively time consuming and expensive, and the final product is comprised of a limited number of cells, thereby making this approach impractical for many patients.

Our solid tumor product candidates, including P-MUC1C-ALLO1, are comprised of a high percentage of $T_{SCM}$ cells, which we believe are able to engraft, self-renew and mature into every T cell subtype, including the $T_{EFF}$ cells, which can persistently attack the tumor until deep responses are potentially achieved. Therefore, we believe our CAR-T product candidates have the potential to achieve high rates of response against solid tumors with a single administration. In early clinical results from P-PSMA-101, our first solid tumor program, we have seen promising efficacy. As reported on February 17, 2022, of the first 14 patients, 71% have seen a reduction of PSA, of which in 36% of patients saw a PSA reduction of greater than 50%. In addition, one patient demonstrated evidence of near complete tumor elimination as evidenced by PSMA PET and other markers.

*Safety*

Our solutions for addressing CAR-T related toxicity concerns regarding CRS and neurotoxicity with respect to hematological tumors also apply to solid tumors. However, there are additional toxicity concerns for CAR-T products when administered to treat solid tumors. When compared to hematological tumors, solid tumors generally have fewer unique surface targets that are not also expressed on healthy cells, so greater care must be taken when choosing targets to avoid on-target/off-tumor toxicity, which occurs when a CAR-T cell recognizes the intended target on a healthy cell and kills that cell. We seek to address this risk by choosing targets that are overexpressed in cancer cells, such as MUC1-C, and by using binding molecules that we believe are more effective at binding the cancerous form of the target.

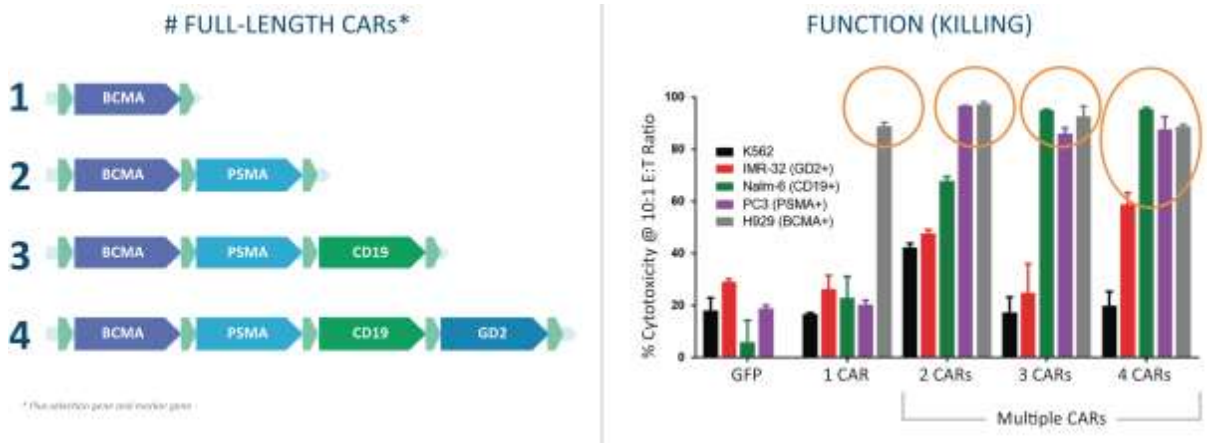
In our P-PSMA-101 trial, we experienced a clinical hold early in the study to evaluate the death of a patient, which may have been related to treatment with P-PSMA-101 but also partially due to a patient noncompliance event. Following protocol amendments, the clinical hold was lifted and we have since dosed additional patients in the trial without experiencing additional patient deaths potentially related to treatment. As reported on February 17, 2022 at ASCO-GU, we observed CRS in 57% of patients, with 14% of patients experiencing Grade 3 or higher and observed immune effector cell-associated neurotoxicity syndrome, or ICANS in 14% of the evaluable patients. We wound-down this program in 2022 to focus on our allogeneic version of this product candidate, P-PSMA-ALLO1.

As we expand our solid tumor CAR-T pipeline, we expect it to become harder to identify targets that are unique to the solid tumor cells. Therefore, we are developing sophisticated systems designed to direct a CAR-T cell to kill a tumor cell based on presence or absence of a combination of targets. For example, we believe that we can develop a CAR-T that will kill only tumor cells that have both target A and target B on their surface but will not kill normal cells with target A or target B singularly on their surface.

A related strategy is developing a CAR-T that will kill a cell only if it expresses target A and B (which may be present on both cancer cells and normal cells) but not target C (which may only be present on normal cells). All such strategies require the co-expression of more than two CAR molecules on the surface of the same CAR-T cell. We believe the piggyBac DNA Delivery System can enable these approaches due to its large genetic cargo capacity. In contrast, viral-based approaches are typically unable to deliver more than two full-length CAR molecules.

We have demonstrated that we can produce CAR-T cells that express up to four full-length CAR molecule genes, each with a different target specificity, along with two additional genes, using a single piggyBac transposon

in manufacturing (left panel). We further demonstrated that, when expressed, all CAR molecules perform specific killing of corresponding cell lines that express the target (right panel):




Specific killing was evaluated via reporter-based killing assays where the indicated human tumor cells were genetically modified to express the luciferase gene. These tumor cells were co-cultured in vitro with CAR-T cells for 24 hours at a defined effector to target ratio of ten to one (10:1). The CAR-T cells expressed different combinations of full-length CARs: (1) BCMA CARTyrin, (2) BCMA CARTyrin and PSMA CARTyrin, (3) BCMA CARTyrin, PSMA CARTyrin and CD19 scFv-based CAR or (4) BCMA CARTyrin, PSMA CARTyrin, CD19 scFV-based CAR and GD2 scFv-based CAR. Cytotoxicity (specific lysis) was evaluated by adding luciferin substrate and reading luminescence signal and percent cytotoxicity was calculated by enumerating the luminescence of tumor cells alone versus tumor cells with CAR-T cells. Each individual CAR demonstrated cytotoxicity against its cognate antigen, even when expressed in the presence of three additional full-length CARs.

Another approach to treating solid tumors is to express a variation of a TCR that is specific for a cancer-associated protein that is only expressed inside of the cancer cell, in contrast to a CAR molecule that only recognizes targets on the surface of the cell. We believe we can use the TCR strategy in combination with the CAR strategy by expressing combinations of both CAR and TCR molecules on the surface of the same cell using the piggyBac manufacturing method.

*Commercial Scalability*

We believe each of the commercial and scalability benefits of our approach in hematological tumors would also apply to solid tumors.

***Allogeneic or Off-The-Shelf CAR-T Therapies***

*Efficacy Challenge*

The goal of an allogeneic, or off-the-shelf, CAR-T product is to create a large number of doses of CAR-T from a single donor or cell line. A successful allogeneic CAR-T product could be used as an off-the-shelf product to treat any patient with a specific indication, thereby greatly decreasing the costs associated with manufacturing. However, if an allogeneic product requires high doses or multiple doses in order to achieve the same activity as a similar autologous product, then many of the potential cost-saving advantages of an allogeneic product would not be realized.

Gene editing tools are widely used to eliminate expression of certain cell surface molecules, which may be used to avoid the potential reactivity of donor cells against the patient, which results in graft-vs-host disease, or GvHD, as well as the reactivity of the patient's cells against the CAR-T product, a reaction called host-vs-graft. We believe it is imperative to use gene editing tools that can efficiently edit resting T cells when creating an allogeneic CAR-T product, as activating T cells will initiate the maturation pathway. Once T cells begin maturating, they start

to lose their desirable TSCM characteristics and thereby become exhausted, rendering the resulting product less efficacious.

Unlike many other gene editing technologies, Cas-CLOVER can efficiently edit resting T cells, allowing for the maintenance of the highly desirable TSCM product composition in allogeneic product candidates, an important component of our CAR-T approach. Our goal with all of our allogeneic product candidates is to create a product with a profile comparable to or better than an autologous version of the same product; in the case of our first fully allogeneic product candidate for multiple myeloma, P-BCMA-ALLO1, our efficacy benchmark will be against P-BCMA-101 and other BCMA targeting programs.

*Safety*

In addition to the standard concerns regarding CRS and neurotoxicity, there are additional safety concerns relative to an allogeneic product. As mentioned above, an allogeneic product can cause two forms of alloreactivity: GvHD and host-vs-graft. Host-vs-graft is concerning only in that it may cause premature elimination of the allogeneic CAR-T cells, resulting in all of the previously discussed efficacy challenges related to poor persistence of product, but it does not create a safety concern.

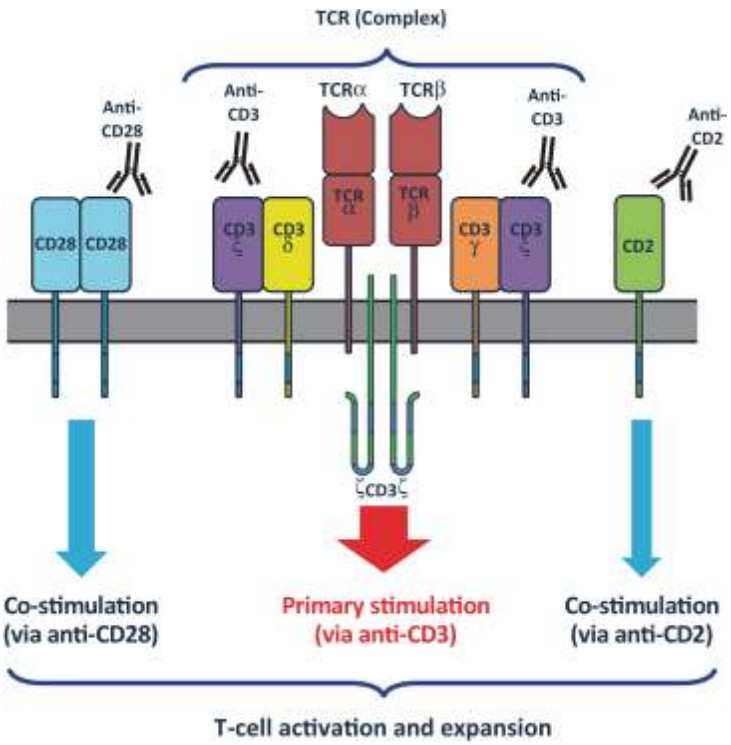
However, GvHD, a situation where the CAR-T cells are killing the healthy cells of the patient, is a serious and potentially fatal condition. Studies have suggested that the endogenous TCR is the molecule that needs to be eliminated in order to prevent GvHD. If this molecule is not completely eliminated in nearly 100% of CAR-T cells, then GvHD may become a problem. Our highly efficient Cas-CLOVER technology and subsequent purification step has resulted in cells that have TCR expression eliminated from at least 99% of the cells, a level we believe to be safely above that required to prevent GvHD.

An advantage of an allogeneic product is that many doses can be generated from a single individual donor or cell line. However, a potential disadvantage is that any detrimental mutation created during manufacturing would be potentially present in doses given to many patients, as opposed to an autologous product where this risk is limited to the individual patient. Therefore, it is especially important to minimize or completely prevent unwanted off-target mutations. It is well known that some gene editing technologies, such as CRISPR, have the possibility of creating unwanted mutations. In preclinical testing, our Cas-CLOVER technology has shown precise site-specificity, having no or very little propensity for creating off-target mutations. Based on our own preclinical data and previously published results on other fully dimeric CRISPR systems, we believe Cas-CLOVER is the most specific gene editing method available.

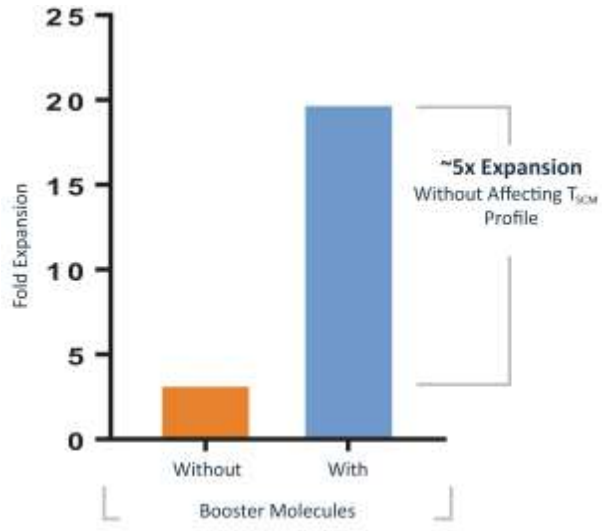
*Commercial Scalability*

A fully allogeneic CAR-T product offers the possibility of significant time and cost savings in manufacturing, thereby greatly decreasing the cost per dose and increasing patient accessibility. Nonetheless, a manufacturing process must still be run on individual donor or cell line material in order to create a fixed number of doses of an allogeneic product. One of the most expensive parts of a manufacturing run for viral-based manufacturing methods is the virus itself. The piggyBac manufacturing system uses only GMP DNA and RNA without the need for GMP virus. We believe this will result in product candidates that are significantly cheaper to produce, even in the context of an allogeneic CAR-T product. Furthermore, the development and manufacturing timelines for piggyBac are shorter than those for virus, meaning one can move from product concept to GMP material more quickly. As an example, we moved P-BCMA-101 from product concept to the first patient dosed in a clinical trial in less than two years, and we believe we can apply these learnings to meet or exceed these timelines for future product candidates.

Genetic modification of the TCR, necessary to avoid GvHD as discussed previously, creates T cells that may be difficult to expand during the manufacturing process. TCR is commonly used as a key receptor for T cell stimulation in most autologous CAR-T manufacturing strategies. However, in allogeneic strategies, knockout of any single component of the TCR causes loss of the entire TCR complex from the surface of the engineered T cell, thereby significantly reducing its responsiveness to anti-CD3 antibodies during manufacturing. These consequences of eliminating the TCR and other genetic modifications have been commonly referred to as the “Allo Tax.” The TCR complex is depicted in the figure below.



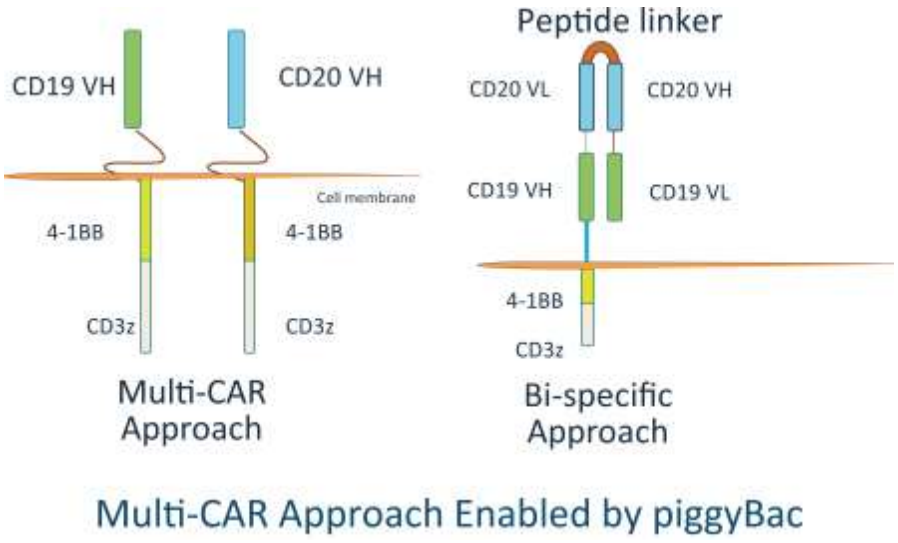

We have developed proprietary booster molecules that have the potential to overcome this issue, while retaining and potentially increasing the percentage of $T_{SCM}$ cells in the final product. Booster molecules are an RNA-based technology introduced to T cells during the manufacturing process, which results in transient expression of a receptor on the surface of T cells that allows the cells to respond to antibody-based activator molecules, resulting in significant expansion of the cells without causing maturation or exhaustion of the cells. The use of a proprietary booster molecule resulted in enhanced expansion and yield, resulting in the production of more than five-fold the number of cells than without the booster molecule from a single manufacturing run (see figure below).




We believe that we can create fully allogeneic product candidates retain a profile that is comparable to their corresponding autologous products, as applicable, but with the ability to create enough doses to potentially treat hundreds of patients from a single manufacturing run.

**Dual CAR-T Allogeneic Program Candidates**

The very large cargo capacity of piggyBac allows for the inclusion of much larger or more therapeutic transgenes compared to viral-based technologies. We believe that our ability to include two or more fully functional CAR and/or TCR molecules into a T cell could be a significant competitive advantage. Unlike some competitors that have tried to use a bi-specific or tandem binder to approach this problem, we believe that including two, or more, full CAR or TCR molecules has the potential to be a more effective approach.




***Allogeneic CAR-T***

The following table summarizes our current CAR-T product candidate portfolio:


Our fully allogeneic CAR-T product candidates are developed using well-characterized cells derived from a healthy donor as starting material with the goal of enabling treatment of potentially hundreds of patients from a single manufacturing run. Doses are cryopreserved and stored at treatment centers for future off-the-shelf use.

***P-MUC1C-ALLO1: Multiple Solid Tumor Indications***

*Overview*

P-MUC1C-ALLO1 is a fully allogeneic CAR-T product candidate with the potential to treat a wide range of solid tumor indications. The target, MUC1-C, is a tumor selective, aberrantly glycosylated, cleavage product of MUC1, that is highly expressed on most epithelial tumors. We designed P-MUC1C-ALLO1 to leverage the

learnings of our P-BCMA-ALLO1 and P-PSMA-101 programs. We are currently evaluating P-MUC1C-ALLO1 in a Phase 1 clinical trial and shared an initial early clinical data update on the program at the European Society for Medical Oncology Immuno-Oncology 2022 Annual Congress, or ESMO I-O, in December 2022. We anticipate a clinical data update on this program at a medical meeting in 2023.

We used our proprietary piggyBac DNA Delivery System to manufacture a highly purified P-MUC1C-ALLO1 product candidate containing a high percentage of $T_{SCM}$ cells that we believe may be the key to developing a CAR-T therapy to treat solid tumors. We use our proprietary Cas-CLOVER platform to genetically engineer T cells in order to reduce or eliminate both GvHD and host versus graft alloreactivity.

*Target Indication*

We intend to further evaluate and later determine clinical indications for initial development of P-MUC1C-ALLO1 in indications where MUC1-C expression occurs. Approximately 90% of cancers derive from epithelial tissues, and among these cancers a significant percentage express MUC1-C, including common cancers such as breast, colorectal, lung, ovarian, pancreatic and renal cancers.

| Tumor Type | MUC1 Expression (%) |
|---|---|
| Breast | 91 |
| Colorectal | 81 |
| Esophageal | 32 |
| Gastric | 77 |
| H&N SCCa | 82 |
| Mesothelioma | 75 |
| Multiple myeloma | 59 |
| Nasopharyngeal | 100 |
| NSCLC | 99 |
| Ovarian | 83 |
| Prostate | 79 |
| Pancreatic | 81 |
| RCC | 84 |

*Clinical Development Strategy*

We are currently evaluating P-MUC1C-ALLO1 in a Phase 1 clinical trial. P-MUC1C-ALLO1 was designed to leverage the learnings of our other programs. The current Phase 1 protocol allows for enrollment of up to 100 adult subjects with advanced or metastatic epithelial-derived cancers measurable by RECIST and refractory to or ineligible for standard of care therapy. Patients may be enrolled across four arms of single and multiple (cyclic) administrations using two different lymphodepletion regimens of up to five dose escalation cohorts each, using a standard 3 + 3 dose-escalation design. Enrollment will begin in cohorts with a standard 3-day cyclophosphamide and fludarabine lymphodepletion regimen given prior to cell infusion followed by cohorts adding rituximab to the lymphodepletion regimen to reduce the appearance of anti-CAR antibodies and potentially improve persistence. Planned dose escalation in each arm range from 0.75 to 15 x 106 cells/kg. Treated patients will undergo serial measurements of safety, tolerability, and tumor response and will be followed for up to 15 years after the last dose of P-MUC1C-ALLO1.

The primary objectives for this Phase 1 clinical trial include defining the maximum tolerated dose, or MTD, evaluation of overall safety and tolerability, and preliminary efficacy and disease response. Additional exploratory

endpoints will include assessing tumor expression of MUC1-C and correlation to response and expansion kinetics of P-MUC1-ALLO1.

In December 2022, we announced initial early clinical data at ESMO-IO. As of the cutoff date of November 14, 2022, the study had dosed seven patients with epithelial-derived cancers, including esophageal, colorectal, breast, pancreatic and prostate carcinomas, of which four were evaluable for response. Only one patient with breast cancer has been dosed to date; this patient, who has HR+, HER2- breast cancer, with four prior lines of treatment, achieved a partial response at a dose of 0.75x106 cells/kg. Two other patients with heavily pretreated gastrointestinal tumors (colorectal and pancreatic cancer) achieved stable disease at a dose of 0.75x106 cells/kg and 2x106 cells/kg each. Based on such initial early clinical data, P-MUC1C-ALLO1 was safe and well tolerated, with no DLTs, CRS, GVHD or ICANS.

***P-PSMA-ALLO1: Metastatic castrate resistant prostate cancer***

*Overview*

P-PSMA-ALLO1 is a fully allogeneic preclinical CAR-T product candidate being developed to treat mCRPC. P-PSMA-ALLO1 is being developed using the learnings of our autologous version of the program, P-PSMA-101, which was evaluated in a Phase 1 clinical trial, in which 38 patients were dosed and initial clinical findings were presented at ASCO-GU in February 2022.

P-PSMA-ALLO1 targets cells that express PSMA, which is highly expressed on mCRPC cells. PSMA is involved in folate uptake and is thought to confer a proliferative advantage to PSMA-expressing tumor cells. Additionally, PSMA levels increase as tumor cells become androgen-independent, a hallmark of advancing prostate disease. Therefore, we believe that PSMA may be less susceptible to antigen escape.

*Target Indication*

Prostate cancer is the fourth most common cancer globally and the second leading cause of cancer death among men in the United States, with about a 60% occurrence rate in men over the age of 65. In the United States alone, there are approximately 3.1 million men living with prostate cancer, with approximately 40,000 new cases of mCRPC estimated each year. The majority of prostate cancer patient deaths in the United States are due to mCRPC.

Treatment paradigms for prostate cancer vary based on the patient age and other underlying health conditions at the time of diagnosis. Treatment options for early prostate cancer range from active surveillance, radiation therapy, cryotherapy, hormone therapy and surgical treatment. Patients with metastatic disease receive medicines such as leuprolide to stop testosterone production. The paradigm for patients with metastatic disease further bifurcates between hormone sensitive disease and castrate resistant prostate cancer, or CRPC. CRPC cases are generally treated with testosterone blockers such as enzalutamide, darolutamide or apalutamide; abiraterone; chemotherapy drugs such as docetaxel or cabaziltaxel; Radium-223; Lutetium Lu 177; immunotherapy such as Sipuleucel-T and PARP inhibitors such as olaparib or rucaparib. However, CRPC remains a deadly disease and new therapies are needed.

Although five-year survival rates for patients with early prostate cancer are nearly 100%, a high unmet need for mCRPC remains, with a five-year survival rate of only approximately 30%. We believe P-PSMA-ALLO1, if successful in the clinic and approved, could dramatically increase survival, as well as quality of life for mCRPC patients.

***P-BCMA-ALLO1: Multiple Myeloma***

*Overview*

P-BCMA-ALLO1 is a fully allogeneic CAR-T product candidate being developed to treat multiple myeloma in partnership with Roche. We are currently evaluating P-BCMA-ALLO1 in a Phase 1 clinical trial and we presented initial data from our Phase 1 clinical trial at the ESMO I-O Annual Congress in December 2022. We anticipate a clinical data update on this program at a medical meeting in 2023, subject to clearance with Roche.

P-BCMA-ALLO1 is our first fully allogeneic CAR-T product candidate derived from healthy donor cells, giving it the potential to be used as an off-the-shelf therapy for unrelated multiple myeloma patients. We believe our technology and manufacturing processes are ideally suited to develop allogeneic CAR-T product candidates with reduced alloreactivity and without unwanted mutations. We use our proprietary Cas-CLOVER gene editing tool to genetically engineer T cells in order to reduce or eliminate both GvHD and host-vs-graft alloreactivity. Cas-CLOVER is designed to efficiently edit resting T cells and has demonstrated precise specificity, thereby limiting unwanted off-target mutations and helping to improve tolerability. P-BCMA-ALLO1 also includes a single chain VH BCMA binder that we believe based on preclinical data is better than the binder that was part of our P-BCMA-101 program.

*Target Indication*

Multiple myeloma is a deadly form of blood cancer that develops from abnormal plasma cells, a type of immune cell that is typically responsible for secreting antibodies to fight infection. The underlying cause of multiple myeloma is unknown, but it affects patients by creating abnormal plasma cells that secrete high levels of antibodies, or fragments of antibodies, resulting in kidney and other organ malfunction that is ultimately fatal. It can also cause overproduction of abnormal plasma cells in the blood and tumor masses called plasmacytomas in the bone marrow or soft tissue.

There are approximately 160,000 patients suffering from multiple myeloma in the United States, with nearly 35,000 new cases and nearly 13,000 deaths from the disease annually. It occurs more commonly in men than in women, typically affecting older adults, with the average age of diagnosis of approximately 70 years. Although several new drugs have been approved for the treatment of multiple myeloma, it remains an incurable disease for most patients. The current treatment paradigm in multiple myeloma begins with proteasome inhibitors (PIs), immunomodulatory drugs (IMiDs) and autologous stem cell transplants. The great majority of patients become refractory to these drugs and/or relapse, creating a high unmet need for treatments for relapsed/refractory patients. After failing proteasome inhibitors and IMiDs, patients are typically treated with monoclonal antibodies, different PIs and IMiDs or Chimeric Antigen Receptor T-cells (CAR-T). Most patients eventually move to palliative care. Without treatment, most multiple myeloma patients die within the first year after diagnosis. Approximately half of those treated under the current regimens survive for five years after diagnosis. We believe P-BCMA-ALLO1, if successful in the clinic, can dramatically increase survival, as well as quality of life for relapsed/refractory multiple myeloma patients.

*Clinical Development Strategy*

The primary objectives of the Phase 1 clinical trial are to evaluate safety and any dose limiting toxicities, or DLTs, and determine the MTD of a single-dose infusion of P-BCMA-ALLO1 in adult patients with multiple myeloma who are relapsed and/or refractory to conventional therapy. In addition, we are assessing anti-myeloma response activity using the International Myeloma Working Group, or IMWG, criteria.

We are initially focused on enrolling patients with relapsed/refractory multiple myeloma who have received at least three prior lines of therapy, including a proteasome inhibitor, an IMiD, and anti-CD38 therapy, and/or who are refractory to a proteasome inhibitor, an IMiD, and anti-CD38 therapy.

The trial is an open-label dose escalation trial enrolling up to 40 patients. The current protocol allows for enrollment of up to 40 adult subjects in up to five dose escalation cohorts each, using a standard 3 + 3 dose-escalation design. Before administering the P-BCMA-ALLO1 product candidate, subjects receive a conditioning lymphodepletion chemotherapy regimen. The regimen will be 300 mg/m2 of cyclophosphamide and 30 mg/m2 of fludarabine intravenously daily for three consecutive days, followed in two days by a single infusion of P-BCMA-ALLO1.

In December 2022, we announced initial clinical data at ESMO-IO. As of the November 11, 2022 data cutoff, the study had dosed 10 patients with relapsed/refractory (R/R) multiple myeloma. Of these 10 patients, six are evaluable for response (all at the lowest dose level of 0.75 x 106 cells/kg). The response evaluable patients were heavily pre-treated, having received an average of 6.5 prior lines of therapy with a median time since diagnosis of 5 years. Three patients had previously received BCMA-targeted therapy and four patients had high-risk cytogenetics.

As of the cutoff date, P-BCMA-ALLO1 achieved a 50% (3/6) overall response rate, with a 66% (2/3) ORR in patients who had previously received BCMA-targeted therapy and a 50% (2/4) ORR in patients with high-risk cytogenetics. Of the three responders in the first cohort (0.75 x 106 cells/kg), two patients were partial responses and one patient achieved a very good partial response. P-BCMA-ALLO1 was well tolerated. There were no cases of CRS, GVHD or ICANS. No DLTs were observed. There was one case of febrile neutropenia.

***P-CD19CD20-ALLO1*: *B-Cell Malignancies***

*Overview*

P-CD19CD20-ALLO1 is an allogeneic, off-the-shelf CAR-T product candidate in preclinical development for B cell leukemia and lymphoma indications, in partnership with Roche. P-CD19CD20-ALLO1 contains two fully functional CAR molecules to target cells that express either CD19 or CD20. We believe that by targeting both CD19 and CD20, we have the potential to overcome some of the issues of earlier generation CD19 CAR-T products where antigen escape has been observed.

*Clinical Development Strategy*

We anticipate an IND filing and initiation of a Phase 1 clinical trial for P-CD19CD20-ALLO1 in mid-2023. The trial will be an open-label dose escalation trial enrolling up to 70 patients.

***P-BCMACD19-ALLO1***. P-BCMACD19-ALLO1 is an allogeneic, off-the-shelf CAR-T product candidate in preclinical development for multiple myeloma. P-BCMACD19-ALLO1 contains two fully functional CAR molecules to target cells that express either BCMA or CD19. Based on published studies of CD19 therapeutic candidates in multiple myeloma patients, we believe that targeting both BCMA and CD19 may be more effective than targeting BCMA alone in some patients because it has been hypothesized that there could be myeloma stem cells that express CD19 but do not express BCMA. In addition, including CD19 may prevent anti-drug antibody responses that could shorten the effectiveness of a BCMA-only therapy in some patients. We are developing this product candidate to be fully allogeneic by applying our learnings from the P-BCMA-ALLO1 program. We anticipate an IND filing after analyzing preliminary results observed in the P-BCMA-ALLO1 Phase 1 clinical trial. Roche holds an exclusive option to acquire a license to this program.

*Additional Allogeneic Programs*

We have strategically designed our initial and upcoming clinical programs in order to best utilize the findings from our early studies to inform further pipeline development. We have several preclinical programs intended to represent second or third generation programs for our various targets, and are exploring additional indications utilizing different capabilities of our platform.

**Liver Directed Gene Therapy**

The concept of *in vivo* gene therapy arose during the early 1970's, with initial human testing beginning in 1980. However, early clinical failures held back the development of the field and associated funding and progress was slow until the last decade. Within the last decade, gene therapy has expanded and gained more acceptance. Due to some clinical successes and associated funding and merger and acquisition activity, the field is now emerging as a major focus of new therapeutic development. Despite this re-emergence of interest and development, much of the *in vivo* gene therapy work faces significant challenges.

Among the primary limitations of most current gene therapies are the fact that these therapies are generally transient in nature and, therefore, limited to a narrow range of indications. These limitations are driven by a number of factors associated with using AAV as the standard method of delivering the therapeutic transgene. First, specific AAV capsids can be used to effectively infect a number of cell types in vivo, but AAV does not generally integrate into the genome without the virus' rep gene, which is removed in gene therapy applications to accommodate the therapeutic transgene. The lack of integration results in low expression levels of the therapeutic transgene that generally decrease over time. As cells divide, expression is eventually lost, thus making it difficult or impossible to use AAV-mediated gene therapies in rapidly dividing tissues, such as the pediatric liver. Unfortunately, the pediatric

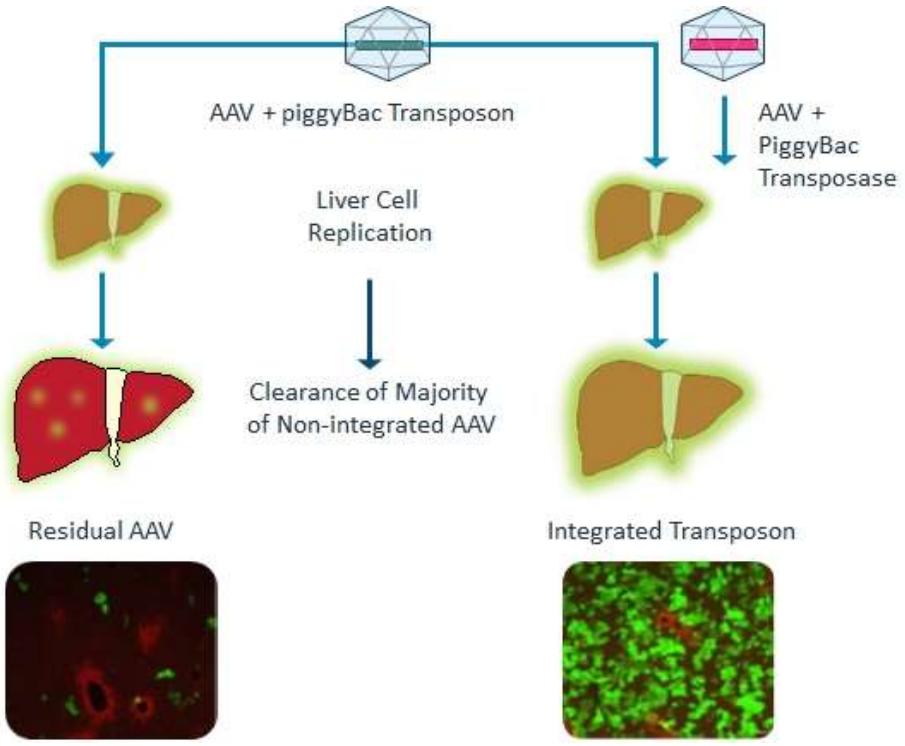
liver is the tissue that needs to be targeted in order to treat many monogenetic inborn errors of metabolism, particularly in the majority of patients that are more severely affected. Second, AAV has a relatively small cargo capacity, which can limit its ability to treat indications where a larger therapeutic transgene is needed to correct the underlying disease. The relatively small cargo capacity also limits the inclusion of additional features, such as larger tissue-specific promoters, insulators or safety switches. Third, AAV itself can be immunogenic with pre-existing antibodies in some patients. Furthermore, AAV-based therapies often elicit antibody-based immune reactions, making repeat dosing very challenging. Finally, earlier-generation AAV therapies require relatively high doses of virus to deliver enough of the gene to have a clinical effect, which creates safety issues associated with the AAV itself.

Our technology is designed to address the shortcomings of other AAV approaches in several important ways. First, by combining our piggyBac technology with AAV, we believe we can create a therapeutic that integrates the therapeutic transgene into the DNA and becomes a stable part of the patient's DNA, even in rapidly dividing cells. This results in the potential for single-treatment cures, even when treating indications that manifest predominantly in the pediatric liver. Second, piggyBac is highly efficient at integrating into DNA, resulting in stable and high expression levels of therapeutic transgenes even at relatively low doses, which we believe may allow potent activity in indications that are not currently treatable with AAV-only technologies. Furthermore, piggyBac in combination with AAV might be effective at much lower viral doses when compared with AAV-only technologies and would therefore mitigate some of the risk of toxicity due to AAV itself.

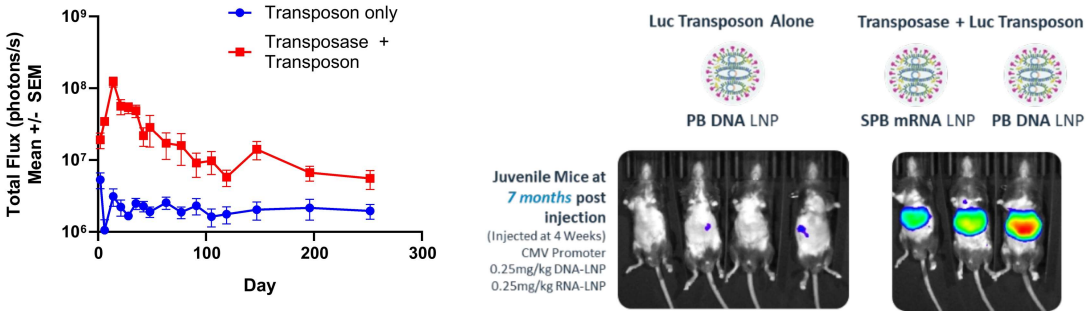
We are also combining our piggyBac technology with our nanoparticle technology to deliver therapeutic transgenes in an effort to eliminate the need for AAV altogether. This would completely avoid virus-related toxicity and also enable delivery of larger genes and repeat dosing, which would further expand the number of indications that could be treated.

While our technology platforms enable the development of *in vivo* gene therapies in a wide array of applications, we are focusing our initial efforts on liver-directed gene therapy, where we have promising preclinical data and believe we have a significant competitive advantage over early generation gene therapies. We believe that our technology has the potential to address indications and patient populations that AAV-only technologies will not be able to address. In some cases, we believe that by combining our piggyBac technology with AAV or nanoparticle delivery, we have the potential to transform those transient therapies into single-treatment, lifetime durable responses.

Any AAV-based system can be converted into a piggyBac-AAV vector by simply adding the piggyBac ITRs, which can be as small as 50 base pairs each, inside of the AAV ITRs (AAV + piggyBac transposon). We expect this vector will perform the same as a standard AAV vector in the absence of the piggyBac transposase, which can be delivered in a second AAV (AAV + piggyBac transposase). When using an enhanced green fluorescent protein (EGFP) reporter gene as a surrogate for a therapeutic transgene and injecting the AAV + piggyBac transposon (no transposase) into animals, we observed a low level of EGFP expression in the liver of the mouse (lower left panel). Similar to other standard AAV therapies, there was a low expression level due to episomal (non-integrated) AAV and as such, it diminished over time, especially as the cells divided. However, when the AAV + piggyBac transposon was co-injected with the AAV + transposase, we observed a high, stable level of expression in a majority of hepatocytes, as shown in the lower right panel. In this case, the piggyBac transposase pulled the transgene out of the transposon and stably integrated it into the genome. As the cells divided, they replicated the integrated therapeutic transgene so all progeny cells permanently expressed it. This strategy has been used in three separate mouse models of various severe congenital liver genetic diseases: OTCD, citrullinemia Type I and progressive familial intrahepatic cholestasis Type III, demonstrating the potential for single-treatment cures in each case.



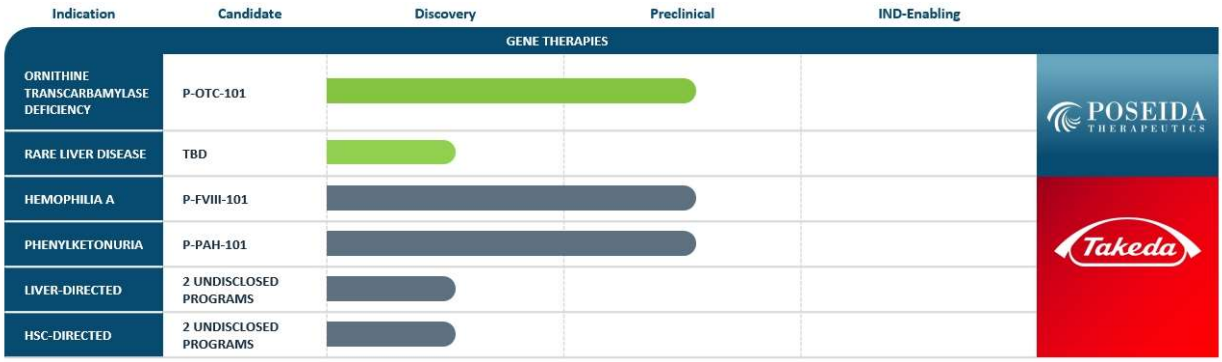

One of the goals for our gene therapy programs is to be able to deliver our gene engineering technologies by nanoparticle to eliminate the need to use AAV due to its limitations. In preclinical work, we are seeing positive results in delivering piggyBac transposon (DNA) and piggyBac transposase (RNA) into animal models, resulting in significant integration and transgene expression in all zones of the liver. The following figure represents an experiment where we co-administered piggyBac transposon (DNA) and piggyBac transposase (RNA) formulated into separate nanoparticles to a juvenile mouse and measured levels of expression of a reporter gene in the liver out to 7 months. These data, while preliminary, potentially represent a significant step forward toward our goal of nanoparticle delivery of piggyBac, which we believe would represent a significant advance compared to traditional gene therapy.



## Our Gene Therapy Programs

### Gene Therapy

The following table summarizes our current gene therapy product candidate portfolio including a representation of programs that we partnered with Takeda in 2022:




Our gene therapy product candidates have been developed by utilizing our piggyBac technology together with AAV or our nanoparticle technology to overcome the major limitations of traditional AAV gene therapy. We believe that our approach will result in integration and long-term stable expression at potentially much lower doses than AAV technology alone, thus also conferring cost and tolerability benefits. In one program, we have elected to deploy a fully non-viral delivery technology that does not require any AAV or other viral-based technology. Our eventual goal is to completely replace AAV with our nanoparticle technology, freeing future product development in gene therapy of AAV limitations.

#### *P-OTC-101*

*Overview*

P-OTC-101 is an *in vivo* liver-directed gene therapy candidate for the treatment of severe, early-onset OTCD, which we believe has the potential to achieve single-treatment, lifetime durable responses. We believe our approach will enable treatment of patients early in life, providing a key advantage over conventional AAV-based gene therapies that are unlikely to be effective in newborns and juveniles. We are evaluating our proprietary piggyBac DNA Delivery System combined with a liver-directed AAV or nanoparticles for the *in vivo* treatment of OTCD. OTCD is an often fatal or morbid urea cycle disease caused by congenital mutations in the OTC gene with a high unmet medical need.

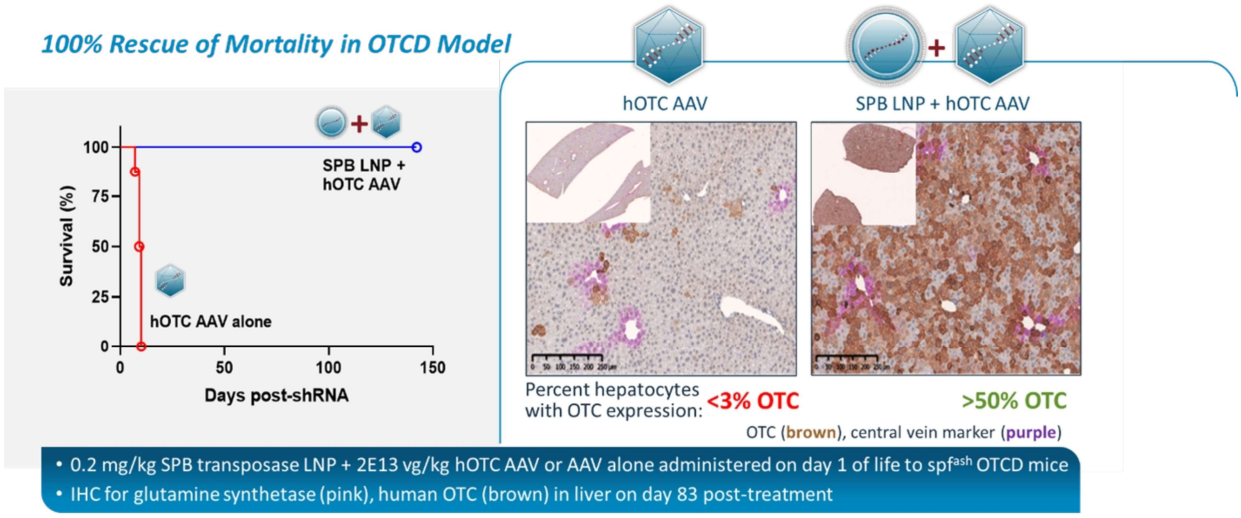
*Target Indication*

OTCD is a rare genetic disorder characterized by complete or partial lack of the enzyme OTC. OTC is an enzyme that plays a role in the breakdown and removal of nitrogen from the body, a process known as the urea cycle. The lack of the OTC enzyme results in excessive accumulation of nitrogen in the form of ammonia (hyperammonemia) in the blood. Excess ammonia, which is a neurotoxin, travels to the central nervous system through the blood, resulting in symptoms of lethargy, vomiting, irritability and, in more severe cases, decreased muscle tone, seizures, enlarged liver, respiratory difficulties and death. A severe form of the disorder affects some infants, typically newly born males. A milder form of the disorder affects some children later in infancy. More severe forms of OTC comprise a high unmet medical need.

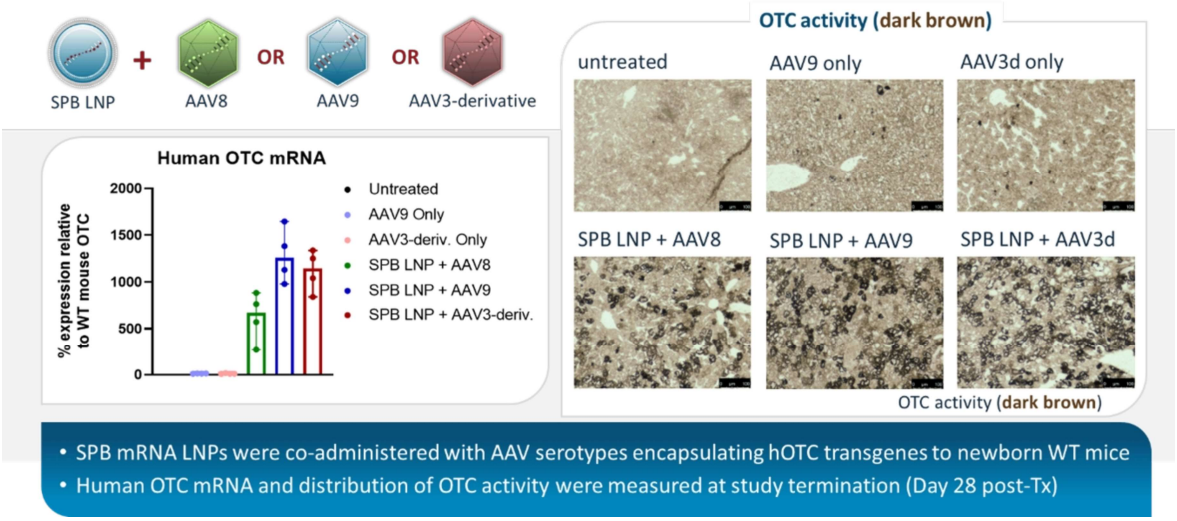
*Preclinical Data*

In our preclinical studies, the approach of combining piggyBac with AAV and LNPs, demonstrated stable and high-level expression of the therapeutic human OTC transgene in the mouse liver following administration to neonatal OTC-deficient mice. In contrast, mice that were administered a conventional AAV-based gene therapy comprising the same human OTC transgene (without piggyBac-mediated integration) demonstrated negligible

human OTC expression. Mice treated with the piggyBac approach uniformly survived into adulthood, while mice treated with the conventional AAV-based approach died.




In a separate study, three unique AAV capsids comprising a piggyBac transposon encoding our human OTC expression cassette were evaluated in a mouse model of OTCD. All three capsids demonstrated sustained human OTC mRNA transcription and corresponding OTC protein activity within the liver following a single treatment. These data suggest that piggyBac can be readily incorporated in a variety of existing, clinically mature AAV capsids. Further, the dramatic increase in OTC activity highlights the potential to lower the dose of piggyBac-OTC compared with standard AAV-alone therapies and the ability to still achieve single-treatment, durable responses, which would have additional cost and tolerability benefits compared to standard AAV therapies.




***P-FVIII-101***

*Overview*

P-FVIII-101 is a liver-directed gene therapy combining piggyBac technology with our nanoparticle delivery technology for the *in vivo* treatment of Hemophilia A.

We are using our proprietary piggyBac DNA Delivery System combined with our proprietary nanoparticle technology to deliver a Factor VIII therapeutic transgene. We have elected to deploy our fully non-viral delivery

system in this program, and are not reliant on AAV or other viral-based technologies. This program is included in the Takeda Collaboration Agreement, and therefore Takeda is obligated to fund the program and will determine the timeline to IND submission.

*Target Indication*

Hemophilia A is a bleeding disorder caused by a deficiency in Factor VIII production with a high unmet need. Disease can range in severity from mild to severe and Factor VIII levels are correlated with the severity of the disease.

*Preclinical Data*

Our preclinical data demonstrates an ability to correct Factor VIII deficiency to normal levels in a juvenile mouse model using nanoparticle delivery of our P-FVIII-101 potential product candidate. We presented preclinical data from this program at the American Society of Hematology (ASH) annual meeting in New Orleans in December 2022, which showed that P-FVIII-101 achieved and sustained normalized (>50%) human Factor VIII activity following a single dose and delivered therapeutic Factor VIII activity in mice following single and repeat doses, indicating the potential for dose titration. The data support that with our piggyBac delivery system, the therapeutic transgene expression cassette can be stably integrated into the genome of liver cells and provide consistent and durable therapeutic activity.

***P-PAH-101***

*Overview*

P-PAH-101 is a liver-directed gene therapy combining piggyBac technology with our nanoparticle delivery technology for the *in vivo* treatment of Phenylketonuria, or PKU. We are evaluating our proprietary piggyBac DNA Delivery System combined with a liver-directed AAV and nanoparticles for the *in vivo* treatment of PKU.

This program is included in the Takeda Collaboration Agreement, and therefore Takeda is obligated to fund the program and will determine the timeline to IND submission.

*Target Indication*

PKU is a metabolic disorder caused by a defect in the enzyme that normally converts phenylalanine to tyrosine. This causes buildup of phenylalanine, which is toxic to the brain, and leads to reduced pigmentation, as well as poor growth and neurological outcomes. Dietary protein restriction is the standard for care, but requires strict lifelong adherence that can be challenging for many patients, especially older children.

*Preclinical Data*

Our preclinical data demonstrates resolution of serum phenylalanine, a key PKU biomarker, to normal levels in a mouse model of classical phenylketonuria. In a separate study, we demonstrated expression of the therapeutic phenylalanine hydroxylase, or PAH transgene throughout the liver following a single treatment in juvenile mice. Our data demonstrate that the ability to maintain the high therapeutic PAH protein expression and broad hepatocyte distribution following treatment early in life is due to the integrating mechanism of our piggyBac platform.

***Additional Takeda funded Programs.*** In October 2021, we entered into the Takeda Collaboration Agreement, pursuant to which we granted to Takeda a worldwide exclusive license under our piggyBac, Cas-CLOVER, biodegradable DNA and RNA nanoparticle delivery technology and other proprietary genetic engineering platforms to research, develop, manufacture and commercialize gene therapy products for certain indications, including Hemophilia A. In addition to P-FVIII-101, as part of the Takeda Collaboration Agreement, we granted Takeda a license to five additional undisclosed preclinical programs in both liver and HSC-directed indications. We are obligated to lead research activities up to candidate selection, after which Takeda is obligated to assume responsibility for further development, manufacturing and commercialization of each program. Takeda will be responsible for all future development costs and timeline disclosures for these programs as well. Takeda is also

obligated to provide funding for all collaboration program development costs. Takeda also has an option to elect up to two additional programs for a total of eight programs should that option be exercised.

**Our Strategy**

Our mission is to develop next generation cell and gene therapeutics with the capacity to cure.

We intend to develop and commercialize novel cell and gene therapy products by using our broad gene engineering platform technologies to treat patients with high unmet medical need across a wide of array of indications. Our current pipeline includes allogeneic CAR-T product candidates for oncology indications and piggyBac + AAV and piggyBac + nanoparticle product candidates as liver-directed gene therapy programs for orphan genetic diseases. We plan to pursue our mission through the following strategies:

***Rapidly develop and commercialize allogeneic CAR-T therapies targeting hematological malignancies.*** We are developing P-BCMA-ALLO1, a product candidate for patients with relapsed/refractory multiple myeloma, to address cost and safety limitations of current CAR-T therapies utilized in this indication. Over time, we plan to develop our product candidates in earlier lines of treatment and for other hematological malignancies and will seek to commercialize in community hospital settings, and eventually in outpatient infusion sites. Our approach for P-BCMA-ALLO1 is using the findings from our P-BCMA-101 autologous program, which based on the toxicity profile observed in the Phase 1 clinical trial and following discussions with the FDA allowed us to dose on a fully outpatient basis.

***Leverage the strength and breadth of our platform technologies to develop allogeneic CAR-T therapies in solid tumors.*** Our platform technology is designed to address the historical CAR-T limitations in treating solid tumors, which result from the lack of product persistence needed to have a clinical impact on these indications. We are advancing P-MUC1C-ALLO1 as a candidate for the treatment of solid tumors, as well will continue to evaluate additional products likely using a combination of CAR and TCR approaches.

***Utilize our platform technologies to pursue liver-directed gene therapy programs.*** Our lead gene therapy product candidates, P-OTC-101 and P-PAH-101, utilize our piggyBac technology combined with AAV and nanoparticles to target orphan genetic diseases with the goal of developing single-treatment cures. In addition, P-FVIII-101 is being developed with nanoparticle-based delivery of our *in vivo* gene therapies, replacing the need for AAV technology. We believe that nanoparticle delivery of gene therapy could be a major advancement over AAV delivery by improving tolerability, lowering cost, allowing for re-dosing and addressing indications that AAV will not be able to effectively address, including diseases where correction necessitates delivery of large therapeutic transgenes. We and our current and future collaborators, including Takeda, currently plan to develop, and if approved, commercialize our gene therapy product candidates.

***Utilize our technology and capabilities to develop allogeneic multi-CAR-T products.*** Our Dual-CAR allogeneic product candidates include P-CD19CD20-ALLO1 for B cell malignancies, P-BCMACD19-ALLO1 for multiple myeloma and an undisclosed Dual CAR for solid tumors. We believe these multi-CAR programs highlight the ability of our piggyBac platform to enable product candidates that other technologies will not be able to achieve easily, if at all. We plan to continue developing multi-CAR product candidates, which we believe could represent a next generation of CAR-T therapies.

***Evaluate strategic partnerships and structures to create value and continue to innovate and develop our platform technologies.*** Our platform technologies are highly differentiated with the ability to create many product candidates across a wide array of therapeutic modalities and indications. As such, we have executed two key collaborations to expand our reach and create additional value in pursuit of our mission. In October 2021, we signed the Takeda Collaboration Agreement to further expand our gene therapy efforts. In August 2022, we announced the Roche Collaboration Agreement to further develop our allogeneic pipeline within hematological indications. Given the breadth of our technology, we believe there are additional areas in which we could evaluate strategic partnerships.

**Partnerships**

*Roche*

In August 2022, we announced a partnership with Roche in which they have licensed or optioned our lead hematological indications. Included in the upfront license, Roche licensed P-BCMA-ALLO1 and P-CD19CD20-ALLO1, or each, a Tier 1 program. P-BCMA-ALLO1, is currently in a Phase 1 trial, being developed for patients with relapsed/refractory multiple myeloma, using the learnings from our first autologous program P-BCMA-101. P-CD19CD20-ALLO1 is currently a preclinical stage program being developed for the treatment of B-Cell hematological indications, for which we expect an IND filing in the first half of 2023. In addition to the two licensed programs, Roche has an option to license P-CD70-ALLO1 and P-BCMACD19-ALLO1, or each a Tier 2 program. P-CD70-ALLO1 is a preclinical stage program being developed to treat hematological indications. P-BCMACD19-ALLO1, is a preclinical dual target program, being developed to treat multiple myeloma. In addition to the Tier 1 and Tier 2 programs, we entered into a research collaboration, in which Roche has an exclusive license under certain of our intellectual property to develop, manufacture and commercialize up to six allogeneic CAR-T cell therapy products in hematological indications.

Under the Roche Collaboration Agreement, Roche made an upfront payment to us of $110.0 million. Subject to Roche exercising its Tier 2 Program options, designating Collaboration Programs, and exercising its option for the Licensed Products commercial license and contingent on, among other things, the products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs achieving specified development, regulatory, and net sales milestone events, we are eligible to receive certain reimbursements, fees and milestone payments, including the near-term fees and milestone payments described above, in the aggregate up to $6.0 billion, comprised of (i) $1.5 billion for the Tier 1 Programs; (ii) $1.1 billion for the Tier 2 Programs, (iii) $2.9 billion for the Collaboration Programs; and (iv) $415.0 million for the Licensed Products. We are further entitled to receive, on a product-by-product basis, tiered royalty payments in the mid-single to low double digits on net sales of products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs and in the low to mid-single digits for Licensed Products, in each case, subject to certain customary reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country or ten years from first commercial sale of such product in such country.

*Takeda*

In October 2021, we entered into the Takeda Collaboration Agreement, pursuant to which we granted to Takeda a worldwide exclusive license under our piggyBac, Cas-CLOVER, biodegradable DNA and RNA nanoparticle delivery technology and other proprietary genetic engineering platforms to research, develop, manufacture and commercialize gene therapy products for certain indications, including Hemophilia A. We collaborate with Takeda to initially develop up to six *in vivo* gene therapy programs and Takeda also has an option to add two additional programs to the collaboration. We are obligated to lead research activities up to candidate selection, after which Takeda is obligated to assume responsibility for further development, manufacturing and commercialization of each program.

Under the Takeda Collaboration Agreement, Takeda made an upfront payment to us of $45.0 million. Takeda is also obligated to provide funding for all collaboration program development costs including our P-FVIII-101 and P-PAH-101 programs; provided that we are obligated to perform certain platform development activities at our own cost. Timelines for P-FVIII-101, P-PAH-101 and other programs subject to the Takeda Collaboration Agreement will be driven by Takeda. Under the Takeda Collaboration Agreement, we are eligible to receive preclinical milestone payments that could potentially exceed $82.5 million in the aggregate if preclinical milestones for all six programs are achieved. We are also eligible to receive future clinical development, regulatory and commercial milestone payments of $435.0 million in the aggregate per target, with a total potential deal value over the course of the collaboration of up to $2.7 billion, if milestones for all six programs are achieved and up to $3.6 billion if the milestones related to the two optional programs are also achieved. We are entitled to receive tiered royalty payments on net sales in the mid-single to low double digits, subject to certain standard reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country, ten years from first commercial sale of such product in such country, or expiration of regulatory exclusivity for such product in such country.

***Potential Additional Programs and Partnership Opportunities***

While we have leveraged our platform technologies to currently pursue the development of CAR-T and liver-directed gene therapy product candidates, our technologies have broad applicability across a wide array of cell and gene therapeutic modalities and diseases. Beyond the current pipeline, we and our collaborators have preclinical data that illustrate future potential applications of the technology platforms when combined in various ways. We may in the future use these tools to create T cell-based products to address indications beyond oncology, such as autoimmune diseases, infectious diseases, allergy-related diseases or even neurodegenerative diseases. CAR-T may also be used as an alternative and non-myeloablative preconditioning regimen for stem cell transplants. Our technologies also work well in other cell types and tissues including induced pluripotent stem cells, natural killer cells, HSCs, B cells, hepatocytes, muscles and many others, which could enable additional approaches for future therapeutics in a variety of indications. Lastly, we could use our Cas-CLOVER technology directly *in vivo*, similar to the approaches taken by other gene editing companies.

**Our Team**

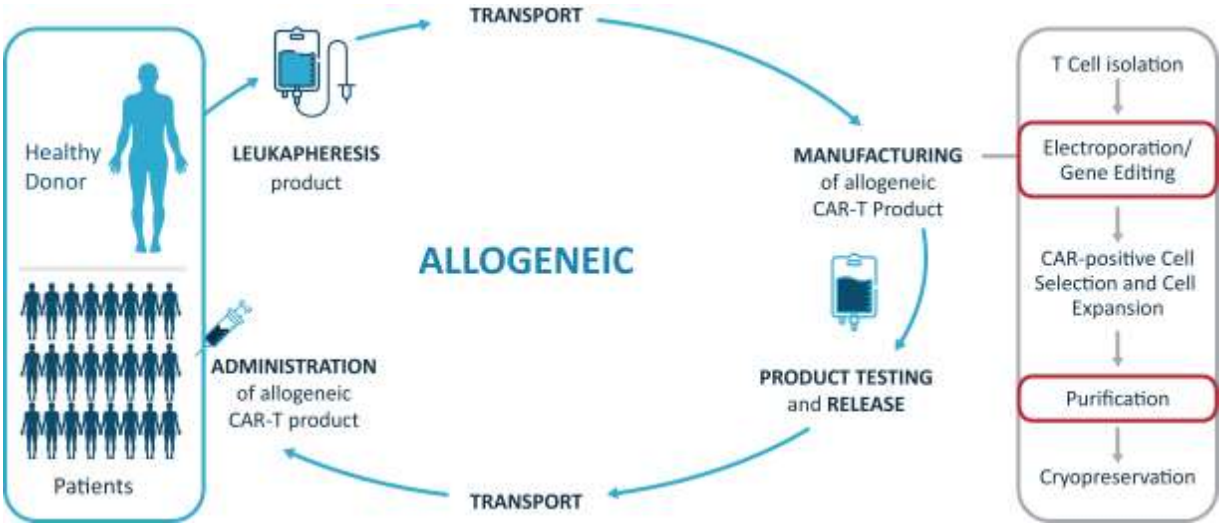
We are led by an experienced management team with an unwavering commitment to developing next generation cell and gene therapeutics with the capacity to cure. Our Chief Executive Officer, Mark J. Gergen, J.D., has over 25 years of experience in healthcare and life science companies and most recently served as our President and Chief Business Officer, until his transition to Chief Executive Officer in February 2022. Prior to joining our company in early 2018, Mr. Gergen was part of the executive management team for a number of successful biotechnology companies, including Amylin Pharmaceuticals, Mirati Therapeutics, and Halozyme Therapeutics. As of December 31, 2022, the management team was supported by 314 employees, 156 of whom hold advanced degrees, including 79 with a Ph.D. and/or M.D. degree, and many with extensive experience in drug discovery and development.

**Our CAR-T Manufacturing Processes**

Our CAR-T product candidates consist of healthy donor T cells that have been genetically engineered to express a CAR molecule and other genes. PBMCs are harvested by a standard leukapheresis procedure at the enrolling hospital, with the leukapheresis cells transported to the manufacturing site immediately subsequent to the procedure.

Manufacturing of CAR-T product candidates includes CD4-positive and CD8-positive T cell isolation via positive selection. This is followed by electroporation delivery of the piggyBac DNA transposon transgene (encoding the CAR molecule gene, the DHFR positive selection gene and the safety switch gene), the Super piggyBac transposase RNA (the enzyme that mobilizes the piggyBac transposon transgene), an mRNA encoding the Cas-CLOVER gene editing system along with guide RNA targeting two different genes involved with allogeneic rejection, as well as an mRNA encoding the booster molecule. After this, CAR-positive T cells are selected via methotrexate, the cells are expanded and then further purified for genetically modified cells.

The final product is then bagged and cryopreserved. Following product release for administration, cryopreserved product candidates are shipped by courier to the pharmacy or applicable cell therapy facility of the enrolling study center where they are stored until the time of administration.




**CAR-T Contract Manufacturing**

We have an internal pilot GMP manufacturing facility in San Diego adjacent to our headquarters to develop and manufacture preclinical materials and clinical supplies for Phase 1 and Phase 2 clinical trials. We commenced GMP manufacturing in the third quarter of 2021 and initially used the facility for manufacturing our P-MUC1C-ALLO1 program. We have now added our other product candidates and this is our sole source of clinical manufacturing.

We have previously worked with a number of third-party contract manufacturers for production of our product candidates. For the manufacturing of P-BCMA-ALLO1 we previously worked with WuXi AppTec, Inc., from which we received clinical supply. In the fourth quarter of 2022, we received clearance to manufacture P-BCMA-ALLO1 at our internal pilot plant manufacturing facility and this site will be the future source of product going forward. For our other product candidates, we are evaluating various third-party manufacturers for clinical supply. We also work with a variety of suppliers to provide our manufacturing raw materials and we currently source our media from Stemcell and DNA components from Aldevron. We believe that our relationships with our contract manufacturers and suppliers are good. In the future, we may also build one or more commercial manufacturing facilities for any approved product candidates.

**Commercialization Plans**

We possess global rights to our internal product candidates and discovery programs. We intend to retain significant development and commercialization rights to our product candidates and, if marketing approval is obtained, to commercialize our product candidates on our own, or potentially with a partner, in the United States and other regions. We currently have no sales, marketing, or commercial product distribution capabilities and have no experience as a company in marketing products. We plan to build the necessary infrastructure and capabilities over time in the United States, and potentially other regions, following further advancement of our product candidates. Clinical data, the size of the addressable patient population, the size of the commercial infrastructure and manufacturing needs may all influence or alter our commercialization plans.

**Competition**

The biotechnology industry, and specifically the CAR-T and gene therapy sciences, are characterized by intense and rapidly changing competition to develop new technologies and proprietary products. While we believe that our proprietary approach and scientific expertise in CAR-T and gene therapies provide us with competitive advantages, we face potential competition from many different sources, including larger and better-funded pharmaceutical companies, as well as academic and research institutions. Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are more effective, safer, have fewer or less severe side effects, are more convenient, or cost less than any products that we may develop. The key

competitive factors affecting the success of our programs are likely to be their efficacy, safety, convenience and cost.

There are other organizations currently working toward commercializing existing therapies and/or new therapies for our initially selected indications. If these efforts are successful and their product candidates are approved or marketed prior to ours, it is possible they may increase the barriers to adoption of our product candidates.

Due to the promising clinical therapeutic effect of CAR-T product candidates in clinical trials, we anticipate direct competition from other organizations developing advanced T cell therapies and other types of oncology therapies. This would include companies in the CAR-T space including: Adaptimmune Therapeutics plc, Allogene, Inc., Arcellx, Inc., Astellas Pharma, Inc., Autolus Ltd., Bellicum Pharmaceuticals Inc., Bluebird Bio, Inc., Cellectis S.A., Janssen Pharmaceuticals Inc., Juno Therapeutics, Inc. (acquired by Celgene Corporation, now a Bristol-Meyers Squibb Company), Kite Pharma, Inc. (a Gilead Sciences, Inc. company), Legend Biotech Corporation, Novartis AG and Takeda.

Immunotherapy and gene therapy approaches are further being pursued by several smaller biotechnology companies as well as larger pharmaceutical companies. We also face competition from non-cell-based treatments offered by companies such as Amgen Inc., AstraZeneca plc, Bristol-Myers Squibb Company, F. Hoffman-La Roche AG, GlaxoSmithKline plc, Merck & Co., Inc. and Pfizer Inc. Many of our competitors, either alone or with their collaboration partners, have substantially greater financial, technical and other resources, such as larger research and development staff and/or greater expertise in research and development, manufacturing, preclinical testing and conducting clinical trials.

Recent approvals and M&A activity have also spurred the creation of many companies now pursuing gene therapy technologies and indications. The landscape is evolving rapidly and these companies are too numerous to list, but would include companies such as Alnylam Pharmaceuticals, Inc., Astellas, Beam Therapeutics, Inc., BioMarin Pharmaceuticals, Inc., Bluebird Bio, Cellectis, CRISPR Therapeutics, AG, Editas Medicines, Inc., F. Hoffman-La Roche AG (acquired Spark Therapeutics, Inc.), Generation Bio, Inc., Intellia Therapeutics, Inc., LogicBio Therapeutics, Inc, Moderna, Inc., Novartis AG (acquired AveXis, Inc.), Passage Bio, Inc., Sangamo Therapeutics, Inc., Sarepta Therapeutics, Inc. and Ultragenyx, Inc.

In addition, smaller or early-stage companies may compete with us through collaborative arrangements with more established companies. Competition may increase further as a result of advances in the commercial applicability of technologies and greater availability of capital for investment in these enterprises. Mergers and acquisitions in the pharmaceutical, biotechnology and gene therapy industries are prevalent and may result in even more resources being concentrated among a smaller number of our competitors. Our competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials.

**Intellectual Property**

Intellectual property is of vital importance in our field and in biotechnology generally. We seek to protect and enhance proprietary technology, inventions, and improvements that are commercially important to the development of our business by seeking, maintaining, and defending patent rights, whether developed internally, acquired or licensed from third parties. We will also seek to rely on regulatory protection afforded through orphan drug designations, inclusion in expedited development and review, data exclusivity, market exclusivity and patent term extensions where available.

Our intellectual property estate is designed to provide multiple layers of protection, including: (1) patent rights with claims directed to platform technologies; (2) patent rights with claims directed to core components used in our products; (3) patent rights covering specific products; (4) patent rights covering methods of treatment for therapeutic indications; (5) patent rights covering methods of use for core components and platform technologies; and (6) patent rights covering innovative manufacturing processes. We also rely on trade secrets that may be important to the development of our business.

We believe our current layered patent estate, together with our efforts to develop and patent next generation technologies, provides us with substantial intellectual property protection.

We have filed or will file for patent protection in the United States and internationally for P-MUC1C-ALLO1, P-PSMA-ALLO1, P-BCMA-ALLO1, and our Dual CAR product candidates, our cell therapy candidates and for P-OTC-101, P-FVIII-101, and P-PAH-101, our gene therapy product candidates. However, the area of patent and other intellectual property rights in biotechnology is an evolving one with many risks and uncertainties.

With respect to the platform technologies and core components described above (e.g., $T_{SCM}$ compositions and manufacturing method, genetically-modified HSC manufacturing method, inducible safety switch, piggyBac DNA Delivery System, Cas-CLOVER gene editing technology, booster molecules for enhanced immune cell expansion, armoring strategies, and nanoparticle delivery methods) the intellectual property estate is comprised predominantly of company-owned or company-acquired intellectual property. We expect to file additional patent applications in support of current and new product candidates as well as new platform and core technologies. Our commercial success will depend in part on obtaining and maintaining patent protection and trade secret protection of our current and future product candidates and the methods used to develop and manufacture them, as well as successfully defending these patents against third-party challenges and operating without infringing on the proprietary rights of others. Our ability to stop third parties from making, using, selling, offering to sell or importing our products depends on the extent to which we have rights under valid and enforceable patents or trade secrets that cover these activities. We cannot be sure that patents will be granted with respect to any of our pending patent applications or with respect to any patent applications filed by us in the future, nor can we be sure that any of our existing patents or any patents that may be granted to us in the future will be commercially useful in protecting our product candidates, discovery programs and processes. For this and more comprehensive risks related to our intellectual property, please see the section titled “Risk Factors—Risks Related to Our Intellectual Property.”

The term of individual patents depends upon the legal term of the patents in the countries in which they are obtained. In most countries in which we file, including the United States, the patent term is 20 years from the earliest date of filing 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 or delays on the part of a patentee. In the United States, the patent term of a patent that covers an FDA-approved drug may also be eligible for patent term extension, which permits patent term restoration as compensation for the patent term lost during the FDA regulatory review process. The Hatch-Waxman Act permits a patent term extension of up to five years beyond the expiration of the patent. The length of the patent term extension is related to the length of time the drug is under regulatory review. Patent term 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 an approved drug may be extended and only those claims covering the approved drug, a method for using it, or a method for manufacturing it may be extended. Similar provisions are available in Europe and other foreign jurisdictions to extend the term of a patent that covers an approved drug. In the future, if and when our products receive FDA approval, we expect to apply for patent term extensions on patents covering those products. We plan to seek patent term extensions to any of our issued patents in any jurisdiction where these are available, however there is no guarantee that the applicable authorities, including the FDA in the United States, will agree with our assessment of whether such extensions should be granted, and if granted, the length of such extensions. For more information regarding the risks related to our intellectual property, see the section titled “Risk Factors—Risks Related to Our Intellectual Property.”

In some instances, we submit patent applications directly with the USPTO as provisional patent applications. Provisional applications for patents were designed to provide a lower-cost first patent filing in the United States. Corresponding non-provisional patent applications must be filed not later than 12 months after the provisional application filing date. The corresponding non-provisional application benefits in that the priority date(s) of the patent application is/are the earlier provisional application filing date(s), and the patent term of the finally issued patent is calculated from the later non-provisional application filing date. This system allows us to obtain an early priority date, add material to the patent application(s) during the priority year, obtain a later start to the patent term and to delay prosecution costs, which may be useful in the event that we decide not to pursue examination in an application. While we intend to timely file non-provisional patent applications relating to our provisional patent applications, we cannot predict whether any such patent applications will result in the issuance of patents that provide us with any competitive advantage.

We file U.S. non-provisional applications and Patent Cooperation Treaty, or PCT, applications that claim the benefit of the priority date of earlier filed provisional applications, when applicable. The PCT system allows a single application to be filed within 12 months of the original priority date of the patent application, and to designate all of the 152 PCT member states in which national patent applications can later be pursued based on the international patent application filed under the PCT. The PCT searching authority performs a patentability search and issues a non-binding patentability opinion which can be used to evaluate the chances of success for the national applications in foreign countries prior to having to incur the filing fees. Although a PCT application does not issue as a patent, it allows the applicant to seek protection in any of the member states through national-phase applications. At the end of the period of two and a half years from the first priority date of the patent application, separate patent applications can be pursued in any of the PCT member states either by direct national filing or, in some cases by filing through a regional patent organization, such as the European Patent Organization. The PCT system delays expenses, allows a limited evaluation of the chances of success for national/regional patent applications and enables substantial savings where applications are abandoned within the first two and a half years of filing.

For all patent applications, we determine claiming strategy on a case-by-case basis. Advice of counsel and our business model and needs are always considered. We file patents containing claims for protection of all useful applications of our proprietary technologies and any products, as well as all new applications and/or uses we discover for existing technologies and products, assuming these are strategically valuable. We continuously reassess the number and type of patent applications, as well as the pending and issued patent claims to ensure that maximum coverage and value are obtained for our processes, and compositions, given existing patent office rules and regulations. Further, claims may be modified during patent prosecution to meet our intellectual property and business needs.

We recognize that the ability to obtain patent protection and the degree of such protection depends on a number of factors, including the extent of the prior art, the novelty and non-obviousness of the invention, and the ability to satisfy the enablement requirement of the patent laws. In addition, the coverage claimed in a patent application can be significantly reduced before the patent is issued, and its scope can be reinterpreted or further altered even after patent issuance. Consequently, we may not obtain or maintain adequate patent protection for any of our future product candidates or for our technology platform. We cannot predict whether the patent applications we are currently pursuing will issue as patents in any particular jurisdiction or whether the claims of any issued patents will provide sufficient proprietary protection from competitors. Any patents that we hold may be challenged, circumvented or invalidated by third parties.

In addition to patent protection, we also rely on trademark registration, trade secrets, know how, other proprietary information and continuing technological innovation to develop and maintain our competitive position. We seek to protect and maintain the confidentiality of proprietary information to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection. Although we take steps to protect our proprietary information and trade secrets, including through contractual means with our employees and consultants, third parties may independently develop substantially equivalent proprietary information and techniques or otherwise gain access to our trade secrets or disclose our technology. Thus, we may not be able to meaningfully protect our trade secrets. It is our policy to require our employees, consultants, outside scientific collaborators, sponsored researchers and other advisors to execute confidentiality agreements upon the commencement of employment or consulting relationships with us. These agreements provide that all confidential information concerning our business or financial affairs developed or made known to the individual during the course of the individual's relationship with us is to be kept confidential and not disclosed to third parties except in specific circumstances. Our agreements with employees also provide that all inventions conceived by the employee in the course of employment with us or from the employee's use of our confidential information are our exclusive property. However, such confidentiality agreements and invention assignment agreements can be breached and we may not have adequate remedies for any such 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. For more information regarding the risks related to our intellectual property, see the section titled "Risk Factors—Risks Related to Our Intellectual Property."

The patent positions of biotechnology companies like ours are generally uncertain and involve complex legal, scientific and factual questions. Our commercial success will also depend in part on not infringing upon the

proprietary rights of third parties. It is uncertain whether the issuance of any third-party patent would require us to alter our development or commercial strategies, or our products or processes, obtain licenses or cease certain activities. Our breach of any license agreements or our failure to obtain a license to proprietary rights required to develop or commercialize our future products may have a material adverse impact on us. If third parties prepare and file patent applications in the United States that also claim technology to which we have rights, we may have to participate in interference or derivation proceedings in the USPTO to determine priority of invention. For more information, see the section titled "Risk Factors—Risks Related to Our Intellectual Property."

When available to expand market exclusivity, our strategy is to obtain, or license additional intellectual property related to current or contemplated development platforms, core elements of technology and/or product candidates.

***Company-Owned Intellectual Property***

P-MUC1C-ALLO1 is covered by a number of filings, including, a published PCT application filed in December 2020 that entered the national stage in June of 2022. National phase applications are pending in several countries outside the United States, including most major market countries. Composition of matter claims issuing from these applications would not expire before 2040.

P-BCMA-ALLO1 is covered by a number of filings, including, a published PCT application filed in December 2018 that entered the national stage in June of 2020. National phase applications are pending in several countries outside the United States, including most major market countries. Composition of matter claims issuing from this application would not expire before 2038.

Our P-PSMA-ALLO1 and Dual CAR Programs, including P-CD19CD20-ALLO1, P-BCMACD19-ALLO1 and Dual CAR (Undisclosed), are earlier in development and our program specific intellectual property coverage is still being developed.

Core components of each of these product candidates are protected by company-owned platform applications directed to scFv binders (P-MUC1C-ALLO1) or heavy-chain-only antibody fragment binders (P-BCMA-ALLO1), booster molecules for enhanced immune cell expansion (currently all allogeneic products), early memory T-cells (including $T_{SCM}$) and methods of producing same (P-MUC1C-ALLO1, P-BCMA-ALLO1), methods of using the same in the treatment of cancer (all products), piggyBac transposition systems (all products), inducible safety switches (all products), marker genes for facilitating simultaneous selection and expansion of modified cells for product manufacture, and self-cleaving peptides for trivalent transposon constructs (all products). Notably in December 2019, we were issued a U.S. patent that has claims that cover any modified T cell product that has 25% or more $T_{SCM}$ cells and has a patent term expiring in 2037. We also have issued U.S. patents covering manufacturing methods and cell culture media used to produce these genetically modified $T_{SCM}$ cells that have patent terms expiring in 2037. We also have an issued composition of matter patent in the U.S. protecting our Cas-CLOVER Site-specific Gene Editing System that has a patent term expiring in 2037. We also have issued composition of matter patents in the U.S. protecting our piggyBac DNA Delivery System that have patent terms expiring in 2030.

Our gene therapy programs, include P-OTC-101, P-FVIII-101, and P-PAH-101. P-OTC-101 is covered by a number of filings, including a published PCT application filed in March 2021 that entered national phase in September 2022. National phase applications are pending in several countries outside the United States, including most major market countries. Composition of matter claims issuing from these applications would not expire before 2041. In addition, we have a number of applications for delivery technology, including a published PCT application filed in February 2022 and a published PCT application filed in March 2022, which will enter national phase in August 2023 and September 2023, respectively. Composition of matter claims issuing from these applications would not expire before 2042. Finally, we own two pending provisional applications filed January 2023 that are due for conversion to non-provisional applications in January 2024. Composition of matter claims issuing from these applications would not expire before 2044.

***Acquired Intellectual Property***

As a spin-out from Transposagen Biopharmaceuticals, Inc., or Transposagen, at inception, we acquired intellectual property related to piggyBac transposition systems and methods for use. This acquisition further comprised intellectual property related to next-generation gene editing systems and methods for use.

We acquired Vindico NanoBioTechnology, LLC (formerly known as Vindico NanoBioTechnology, Inc.) in October 2016. As part of this transaction, we acquired intellectual property related to polymer-based nanoparticle compositions and methods of use for delivery of, for example, gene therapy technologies.

***Collaboration Agreements***

*Roche Collaboration Agreement*

In July 2022, we entered into the Roche Collaboration Agreement with Roche, pursuant to which we granted to Roche: (i) an exclusive, worldwide license under certain of our intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from each of our existing P-BCMA-ALLO1 and P-CD19CD20-ALLO1 programs, or each, a Tier 1 Program; (ii) an exclusive option to acquire an exclusive, worldwide license under certain of our intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from our existing P-BCMACD19-ALLO1 and P-CD70-ALLO1 programs, or each, a Tier 2 Program; (iii) an exclusive license under certain of our intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from the up to six Collaboration Programs, as defined below, designated by Roche; (iv) an option for a non-exclusive, commercial license under certain limited intellectual property to develop, manufacture and commercialize certain Roche proprietary cell therapy products for up to three solid tumor targets to be identified by Roche, or Licensed Products; and (v) the right of first offer for two of our early-stage existing programs within hematologic malignancies.

For each Tier 1 Program, we will perform development activities through a Phase 1 dose escalation clinical trial, and Roche is obligated to reimburse a specified percentage of certain costs incurred by us in our performance of such activities, up to a specified reimbursement cap for each Tier 1 Program. For each Tier 2 Program, we will perform research and development activities either through selection of a development candidate for IND-enabling studies or, subject to Roche's election and payment of an option maintenance fee, through completion of a Phase 1 dose escalation clinical trial. In addition, for each Tier 2 Program for which Roche exercises its option for an exclusive license, Roche is obligated to pay us an option exercise fee. For each Tier 1 Program and Tier 2 Program, we will perform manufacturing activities until the completion of a technology transfer to Roche.

The parties will conduct an initial two-year research program to explore and preclinically test a specified number of agreed-upon next generation therapeutic concepts relating to allogeneic CAR-T cell therapies. Subject to Roche's election and payment of a fee, the parties would subsequently conduct a second research program of 18 months under which the parties would explore and preclinically test a specified number of additional agreed-upon next generation therapeutic concepts relating to allogeneic CAR-T therapies. Roche may designate up to six heme malignancy-directed, allogeneic CAR-T programs from the two research programs, for each of which we will perform research and development activities through selection of a development candidate for IND-enabling activities, or each, a Collaboration Program. Upon its designation of each Collaboration Program, Roche is obligated to pay a designation fee. After we complete lead optimization activities for a Collaboration Program, Roche may elect to transition such program to Roche with a payment to us or terminate it. Alternatively, Roche may elect, for a limited number of Collaboration Programs, to have us conduct certain additional development and manufacturing activities through the completion of a Phase 1 dose escalation clinical trial, in which case Roche will pay certain milestones and reimburse a specified percentage of our costs incurred in connection with such development and manufacturing activities. For each Collaboration Program, we will perform manufacturing activities until the completion of a technology transfer to Roche.

Under the Roche Collaboration Agreement, Roche paid an upfront payment to us of $110.0 million. Subject to Roche exercising its Tier 2 Program options, designating Collaboration Programs, and exercising its option for the Licensed Products commercial license and contingent on, among other things, the products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs achieving specified development, regulatory, and net sales milestone events, we are eligible to receive certain reimbursements, fees and milestone payments,

including the near-term fees and milestone payments described above, in the aggregate up to $6.0 billion, comprised of (i) $1.5 billion for the Tier 1 Programs; (ii) $1.1 billion for the Tier 2 Programs, (iii) $2.9 billion for the Collaboration Programs; and (iv) $415.0 million for the Licensed Products.

We are further entitled to receive, on a product-by-product basis, tiered royalty payments in the mid-single to low double digits on net sales of products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs and in the low to mid-single digits for Licensed Products, in each case, subject to certain customary reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country or ten years from first commercial sale of such product in such country.

The Roche Collaboration Agreement became effective in September 2022 upon the expiration or termination of the applicable waiting period under the Hart-Scott-Rodino Antitrust Improvements Act of 1976, as amended, and will continue on a product-by-product and country-to-country basis until there is no remaining royalty or other payment obligations. The Roche Collaboration Agreement includes standard termination provisions, including for material breach or insolvency and for Roche's convenience. Certain of these termination rights can be exercised with respect to a particular product or license, as well as with respect to the entire Roche Collaboration Agreement.

*Takeda Collaboration Agreement*

On October 11, 2021, we entered into the Takeda Collaboration Agreement with Takeda pursuant to which we granted to Takeda a worldwide exclusive license under our piggyBac, Cas-CLOVER, biodegradable DNA and RNA nanoparticle delivery technology and other proprietary genetic engineering platforms to research, develop, manufacture and commercialize gene therapy products for certain indications, including Hemophilia A. The parties will collaborate to initially develop up to six *in vivo* gene therapy programs and Takeda also has an option to add two additional programs to the collaboration. We are obligated to lead research activities up to candidate selection, after which Takeda is obligated to assume responsibility for further development and commercialization of each program.

Under the Takeda Collaboration Agreement, we received an upfront payment from Takeda of $45.0 million. Takeda is also obligated to provide funding for all collaboration program development costs; provided that we are obligated to perform certain platform development activities at its own cost. Under the Takeda Collaboration Agreement, we are eligible to receive preclinical milestone payments that could potentially exceed $82.5 million in the aggregate if preclinical milestones for all six programs are achieved. We are also eligible to receive future clinical development, regulatory and commercial milestone payments of $435.0 million in the aggregate per target, with a total potential deal value over the course of the collaboration of up to $2.7 billion, if milestones for all six programs are achieved and up to $3.6 billion if the milestones related to the two optional programs are also achieved. We are entitled to receive tiered royalty payments on net sales in the mid-single to low double digits, subject to certain standard reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country, ten years from first commercial sale of such product in such country, or expiration of regulatory exclusivity for such product in such country.

Either party may terminate the Takeda Collaboration Agreement in the event of an uncured material breach of the other party, in the case of insolvency of the other party or in the event the other party makes certain challenges to the patents of such party. Takeda may terminate the Takeda Collaboration Agreement for convenience upon prior written notice or in the event of a safety concern immediately upon written notice.

***In-License Agreements***

*April 2017 Commercial License Agreement with TeneoBio, Inc. (a subsidiary of Amgen Inc.)*

On April 27, 2017, we entered into a commercial license agreement, or the 2017 TeneoBio Agreement, with TeneoBio, Inc., or TeneoBio, pursuant to which we obtained an exclusive, sublicenseable, worldwide license to use and develop pharmaceutical products comprising allogeneic T-cells expressing a CAR molecule containing certain heavy-chain-only sequences provided by TeneoBio (a CAR containing a non-naturally occurring heavy-chain-only

antibody fragment) for the treatment of human disease. We utilize these license rights in our P-BCMA-ALLO1 product candidate.

Pursuant to the 2017 TeneoBio Agreement, we have paid TeneoBio $0.5 million through our selection of the antibodies licensed under the 2017 TeneoBio Agreement. We are required to pay TeneoBio up to an aggregate of $20.5 million upon the first achievement of certain clinical and regulatory milestones for any allogeneic product and up to an aggregate of $20.5 million upon the first achievement of certain clinical and regulatory milestones for any autologous product. We are also obligated to pay, on a product-by-product and country-by-country basis, a royalty in the low single-digit percentage on net sales of all licensed products.

The 2017 TeneoBio Agreement will terminate on the last to expire valid claim of the licensed patents in all countries. We may also terminate the 2017 TeneoBio Agreement at any time upon 60 days prior written notice to TeneoBio. Either party may terminate the 2017 TeneoBio Agreement upon a material breach by the other party that is not cured within 90 days after receiving written notice of the breach, or upon a bankruptcy of the other party.

*August 2018 Commercial License Agreement with TeneoBio, Inc. (a subsidiary of Amgen Inc.)*

On August 3, 2018, we entered into a commercial license agreement, or the 2018 TeneoBio Agreement, with TeneoBio for the development and use of TeneoBio's human heavy-chain-only antibodies in CAR-T cell therapies. Under the terms of the 2018 TeneoBio Agreement, we have the option to obtain exclusive rights to research, develop and commercialize up to a certain number of targets from TeneoBio.

Pursuant to the 2018 TeneoBio Agreement, we paid TeneoBio an upfront fee of $4.0 million. We are required to pay additional fees in the low to mid six figure dollar range upon (1) selecting exclusivity for a particular target, which restricts TeneoBio from licensing that particular target to a third party for a period of time, (2) continuing exclusivity for any selected target on each anniversary thereafter and (3) exercising our commercial option for each target. We are required to pay TeneoBio up to an aggregate of $31.0 million upon the first achievement of certain clinical and regulatory milestones for each product. We are also obligated to pay, on a product-by-product and country-by-country basis, a low single-digit percentage royalty on net sales of any licensed products. The royalty rate is subject to reduction upon certain events.

The 2018 TeneoBio Agreement will terminate on the last to expire valid claim of the licensed patents in all countries. We may also terminate the 2018 TeneoBio Agreement with respect to one or more targets at any time upon 60 days prior written notice. Either party may terminate the 2018 TeneoBio Agreement upon a material breach by the other party that is not cured within 90 days after receiving written notice of the breach, or upon a bankruptcy of the other party.

*October 2019 License Agreement with Xyone Therapeutics, Inc. (a successor-in-interest to Genus Oncology, LLC)*

On October 24, 2019, we entered into a license agreement, or the Xyone Agreement, with Xyone Therapeutics, or Xyone. Pursuant to the Xyone Agreement, we paid Xyone an upfront fee of $1.5 million and Xyone granted us the option, which was exercised for an additional $1.5 million in April 2020, to obtain an exclusive, sublicenseable, worldwide license under certain patents and a non-exclusive, sublicenseable, worldwide license under certain know-how controlled by Xyone to research, develop and commercialize pharmaceutical products incorporating CAR cells expressing antibodies and derivatives thereof targeting MUC1, or a Xyone licensed product, and a non-exclusive, sublicenseable, worldwide license under certain patents and know-how controlled by Xyone to research, develop and commercialize companion diagnostics for the treatment, prevention and palliation of human diseases and conditions. The licenses granted pursuant to the Xyone Agreement are subject to certain rights retained by an upstream licensor and the rights of the U.S. government. The retained rights of the upstream licensor pertain only to the ability of the upstream licensor to conduct teaching, education and other non-commercial research activities in the licensed field and for other academic, governmental or not-for-profit organizations to conduct non-commercial research activities in the licensed field, and do not limit our ability to pursue our programs and product candidates. We use a Xyone antibody or derivative thereof targeting MUC1 as a binder in our P-MUC1C-ALLO1 product candidate. Multiple other aspects of our P-MUC1C-ALLO1 product candidate are covered by other patents and intellectual property that we own or license and are not subject to rights of the U.S. government.

Pursuant to the Xyone Agreement, we are also required to pay Xyone up to an aggregate of $71.0 million upon first achievement of certain clinical, regulatory and sales milestones for any Xyone licensed product and companion diagnostics. We are also obligated to pay, on a product-by-product and country-by-country basis, tiered royalties in the low to mid-single-digit percentage on net sales of any Xyone licensed products and related companion diagnostics, subject to certain customary reductions.

The Xyone Agreement will expire on the last to expire royalty term, which is determined on a product-by-product and country-by-country basis, and is the later of (1) the last to expire valid claim within the licensed patents covering the Xyone licensed product in the country, (2) expiration of regulatory exclusivity for the Xyone licensed product in the country and (3) 10 years from the first commercial sale of the Xyone licensed product in the country. We may also terminate the Xyone Agreement at any time upon 30 days prior written notice to Xyone. Either party may terminate the Xyone license agreement upon a material breach by the other party that is not cured within 90 days after receiving written notice of the breach. Xyone also has the right to terminate the Xyone Agreement immediately upon our bankruptcy or if we fail to initiate a Phase 1 clinical trial for a Xyone licensed product within 20 months after approval of an IND submitted for such Xyone licensed product.

*Amended and Restated License Agreement with HMGU*

On March 12, 2021, we entered into an amended and restated patent license agreement, or the HMGU License Agreement, with Helmholtz-Zentrum München—Deutsches Forschungszentrum für Gesundheit und Umwelt GmbH, or HMGU, pursuant to which we obtained exclusive worldwide rights to research, develop, manufacture and commercialize products and services claimed by certain patent applications and patents owned by HMGU covering the nuclease Clo051 in certain fields of use, including human pharmaceutical products. We utilize these license rights in our Cas-CLOVER gene editing technology including P-BCMA-ALLO1, P-MUC1C-ALLLO1 and our other planned allogeneic programs.

Pursuant to the HMGU License Agreement, we paid HMGU an upfront fee of $11,506, equal to €10,000 on the date of payment. We are required to pay HMGU annual maintenance fees credited against royalties due for the same year. We are also required to pay HMGU up to an aggregate of €1.7 million upon the first achievement of certain clinical and regulatory milestones for the first licensed product where Clo051 is part of the therapeutic agent and up to an aggregate of €0.9 million upon the first of certain clinical and regulatory milestones for the first licensed product where Clo051 is not part of the therapeutic agent. We are obligated to pay, on a licensed product-by-licensed product or licensed service-by-licensed service and country-by-country basis, royalties in the low single-digit percentage range on annual net sales, with the royalty rates varying depending on whether the licensed products are therapeutics or the licensed services are for therapeutic use and whether Clo051 is part of the therapeutic agent or used to generate the therapeutic agent. We currently use Clo051 as part of our gene engineering technology to generate our product candidates.

The HMGU License Agreement will terminate on the last to expire royalty term, which is determined on a licensed product-by-licensed product and country-by-country basis. We also have the right to terminate the HMGU License Agreement upon giving written notice within 3 months prior to the end of a calendar year. Either party may terminate the HMGU License Agreement upon a material breach by the other party that is not cured within six weeks after receiving written notice of the breach. The HMGU License Agreement terminates automatically if we become bankrupt.

**Government Regulation**

The FDA and other regulatory authorities at federal, state, and local levels, as well as in foreign countries, extensively regulate, among other things, the research, development, testing, manufacture, quality control, import, export, safety, effectiveness, labeling, packaging, storage, distribution, record keeping, approval, advertising, promotion, marketing, post-approval monitoring, and post-approval reporting of biologics such as those we are developing. We, along with third-party contractors, will be required to navigate the various preclinical, clinical and commercial approval requirements of the governing regulatory agencies of the countries in which we wish to conduct studies or seek approval or licensure of our product candidates.

The process required by the FDA before biologic product candidates may be marketed in the United States generally involves the following:

- completion of preclinical laboratory tests and animal studies performed in accordance with the FDA's current Good Laboratory Practices regulation;
- submission to the FDA of an IND, which must become effective before clinical trials may begin and must be updated annually or when significant changes are made;
- approval by an independent Institutional Review Board, or IRB, or ethics committee at each treatment site before the trial is commenced;
- performance of adequate and well-controlled human clinical trials to establish the safety, purity and potency of the proposed biologic product candidate for its intended purpose;
- preparation of and submission to the FDA of a BLA after completion of all pivotal clinical trials;
- satisfactory completion of an FDA Advisory Committee review, if applicable;
- a determination by the FDA within 60 days of its receipt of a BLA to file the application for review;
- satisfactory completion of an FDA pre-approval inspection of the manufacturing facility or facilities at which the proposed product is produced to assess compliance with cGMP and to assure that the facilities, methods and controls are adequate to preserve the biological product's continued safety, purity and potency, and of selected clinical investigation sites to assess compliance with Good Clinical Practices, or GCP; and
- FDA review and approval of the BLA to permit commercial marketing of the product for particular indications for use in the United States.

***Preclinical and Clinical Development***

Prior to beginning the first clinical trial with a product candidate, we must submit an IND to the FDA. An IND is a request for authorization from the FDA to administer an investigational new drug product to humans. The central focus of an IND submission is on the general investigational plan and the protocol(s) for clinical studies. The IND also includes results of animal and in vitro studies assessing the toxicology, pharmacokinetics, pharmacology, and pharmacodynamic characteristics of the product; chemistry, manufacturing, and controls information; and any available human data or literature to support the use of the investigational product. An IND must become effective before human clinical trials may begin. The IND automatically becomes effective 30 days after receipt by the FDA, unless the FDA, within the 30-day time period, raises safety concerns or questions about the proposed clinical trial. In such a case, the IND may be placed on clinical hold and the IND sponsor and the FDA must resolve any outstanding concerns or questions before the clinical trial can begin. Submission of an IND therefore may or may not result in FDA authorization to begin a clinical trial. In addition to the submission of an IND to the FDA before initiation of a clinical trial in the United States, certain human clinical trials involving recombinant or synthetic nucleic acid molecules are subject to the FDA's oversight and other clinical trial regulations, and oversight at the local level as set forth in the NIH Guidelines. Specifically, under the NIH Guidelines, supervision of human gene transfer trials includes evaluation and assessment by an IBC, a local institutional committee that reviews and oversees research utilizing recombinant or synthetic nucleic acid molecules at that institution. The IBC assesses the safety of the research and identifies any potential risk to public health or the environment, and such review may result in some delay before initiation of a clinical trial. While the NIH Guidelines are not mandatory unless the research in question is being conducted at or sponsored by institutions receiving NIH funding of recombinant or synthetic nucleic acid molecule research, many companies and other institutions not otherwise subject to the NIH Guidelines voluntarily follow them.

Clinical trials involve the administration of the investigational product to human subjects under the supervision of qualified investigators in accordance with GCPs, which include the requirement that all research subjects provide their informed consent for their participation in any clinical study. Clinical trials are conducted under protocols detailing, among other things, the objectives of the study, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated. A separate submission to the existing IND must be made for

each successive clinical trial conducted during product development and for any subsequent protocol amendments. Furthermore, an independent IRB for each site proposing to conduct the clinical trial must review and approve the plan for any clinical trial and its informed consent form before the clinical trial begins at that site and must monitor the study until completed. Regulatory authorities, the IRB or the sponsor may suspend a clinical trial at any time on various grounds, including a finding that the subjects are being exposed to an unacceptable health risk or that the trial is unlikely to meet its stated objectives. Some studies also include oversight by an independent group of qualified experts organized by the clinical study sponsor, known as a data safety monitoring board, which provides authorization for whether or not a study may move forward at designated check points based on access to certain data from the study and may halt the clinical trial if it determines that there is an unacceptable safety risk for subjects or other grounds, such as no demonstration of efficacy. There are also requirements governing the reporting of ongoing clinical studies and clinical study results to public registries.

For purposes of BLA approval, human clinical trials are typically conducted in three sequential phases that may overlap.

- Phase 1—The investigational product is initially introduced into healthy human subjects or patients with the target disease or condition. These studies are designed to test the safety, dosage tolerance, absorption, metabolism and distribution of the investigational product in humans, the side effects associated with increasing doses, and, if possible, to gain early evidence on effectiveness.
- Phase 2—The investigational product is administered to a limited patient population with a specified disease or condition to evaluate the preliminary efficacy, optimal dosages and dosing schedule and to identify possible adverse side effects and safety risks. Multiple Phase 2 clinical trials may be conducted to obtain information prior to beginning larger and more expensive Phase 3 clinical trials.
- Phase 3—The investigational product is administered to an expanded patient population to further evaluate dosage, to provide statistically significant evidence of clinical efficacy and to further test for safety, generally at multiple geographically dispersed clinical trial sites. These clinical trials are intended to establish the overall risk/benefit ratio of the investigational product and to provide an adequate basis for product approval.

In some cases, the FDA may require, or companies may voluntarily pursue, additional clinical trials after a product is approved to gain more information about the product. These so-called Phase 4 studies may be made a condition to approval of the BLA. Concurrent with clinical trials, companies may complete additional animal studies and develop additional information about the biological characteristics of the product candidate and must finalize a process for manufacturing the product in commercial quantities in accordance with cGMP requirements. The manufacturing process must be capable of consistently producing quality batches of the product candidate and, among other things, must develop methods for testing the identity, strength, quality and purity of the final product, or for biologics, the safety, purity and potency. Additionally, appropriate packaging must be selected and tested, and stability studies must be conducted to demonstrate that the product candidate does not undergo unacceptable deterioration over its shelf life.

***BLA Submission and Review***

Assuming successful completion of all required testing in accordance with all applicable regulatory requirements, the results of product development, nonclinical studies and clinical trials are submitted to the FDA as part of a BLA requesting approval to market the product for one or more indications. The BLA must include all relevant data available from pertinent preclinical and clinical studies, including negative or ambiguous results as well as positive findings, together with detailed information relating to the product's chemistry, manufacturing, controls, and proposed labeling, among other things. The submission of a BLA requires payment of a substantial application user fee to FDA, unless a waiver or exemption applies, and the sponsor of an approved BLA is also subject to an annual program fee.

Once a BLA has been submitted, the FDA's goal is to review standard applications within ten months after it accepts the application for filing, or, if the application qualifies for priority review, six months after the FDA accepts the application for filing. In both standard and priority reviews, the review process is often significantly extended by FDA requests for additional information or clarification. The FDA reviews a BLA to determine, among other things,

whether a product is safe, pure and potent and the facility in which it is manufactured, processed, packed, or held meets standards designed to assure the product's continued safety, purity and potency. The FDA may convene an advisory committee to provide clinical insight on application review questions. Before approving a BLA, the FDA will typically inspect the facility or facilities where the product is manufactured. The FDA will not approve an application unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Additionally, before approving a BLA, the FDA will typically inspect one or more treatment sites to assure compliance with GCP. If the FDA determines that the application, manufacturing process or manufacturing facilities are not acceptable, it will outline the deficiencies in the submission and often will request additional testing or information. Notwithstanding the submission of any requested additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval.

After the FDA evaluates a BLA and conducts inspections of manufacturing facilities where the investigational product and/or its drug substance will be produced, the FDA may issue an approval letter or a Complete Response letter. An approval letter authorizes commercial marketing of the product with specific prescribing information for specific indications. A Complete Response letter will describe all of the deficiencies that the FDA has identified in the BLA, except that where the FDA determines that the data supporting the application are inadequate to support approval, the FDA may issue the Complete Response letter without first conducting required inspections, testing submitted product lots, and/or reviewing proposed labeling. In issuing the Complete Response letter, the FDA may recommend actions that the applicant might take to place the BLA in condition for approval, including requests for additional information or clarification. The FDA may delay or refuse approval of a BLA if applicable regulatory criteria are not satisfied, require additional testing or information and/or require post-marketing testing and surveillance to monitor safety or efficacy of a product.

If regulatory approval of a product is granted, such approval will be granted for particular indications and may entail limitations on the indicated uses for which such product may be marketed. For example, the FDA may approve the BLA with a Risk Evaluation and Mitigation Strategy, or REMS, to ensure the benefits of the product outweigh its risks. A REMS is a safety strategy to manage a known or potential serious risk associated with a product and to enable patients to have continued access to such medicines by managing their safe use, and could include medication guides, physician communication plans, or elements to assure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. The FDA also may condition approval on, among other things, changes to proposed labeling or the development of adequate controls and specifications. Once approved, the FDA may withdraw the product approval if compliance with pre- and post-marketing requirements is not maintained or if problems occur after the product reaches the marketplace. The FDA may require one or more Phase 4 post market studies and surveillance to further assess and monitor the product's safety and effectiveness after commercialization and may limit further marketing of the product based on the results of these post-marketing studies.

***Expedited Development and Review Programs***

The FDA offers a number of expedited development and review programs for qualifying product candidates. The fast track program is intended to expedite or facilitate the process for reviewing new products that meet certain criteria. Specifically, new products are eligible for fast track designation if they are intended to treat a serious or life-threatening disease or condition and demonstrate the potential to address unmet medical needs for the disease or condition. Fast track designation applies to the combination of the product and the specific indication for which it is being studied. The sponsor of a fast track product has opportunities for frequent interactions with the review team during product development and, once a BLA is submitted, the product may be eligible for priority review. A fast track product may also be eligible for rolling review, where the FDA may consider for review sections of the BLA on a rolling basis before the complete application is submitted, if the sponsor provides a schedule for the submission of the sections of the BLA, the FDA agrees to accept sections of the BLA and determines that the schedule is acceptable, and the sponsor pays any required user fees upon submission of the first section of the BLA.

A product intended to treat a serious or life-threatening disease or condition may also be eligible for breakthrough therapy designation to expedite its development and review. A product can receive breakthrough therapy designation if preliminary clinical evidence indicates that the product 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 designation includes all of the fast track program features, as well as more intensive FDA interaction and guidance beginning as early as Phase 1 and an organizational commitment to expedite the development and review of the product, including involvement of senior managers.

Any marketing application for a biologic submitted to the FDA for approval, including a product with a fast track designation and/or breakthrough therapy designation, may be eligible for other types of FDA programs intended to expedite the FDA review and approval process, such as priority review and accelerated approval. A product is eligible for priority review if it has the potential to provide a significant improvement in the treatment, diagnosis or prevention of a serious disease or condition compared to marketed products. For products containing new molecular entities, priority review designation means the FDA's goal is to take action on the marketing application within six months of the 60-day filing date (compared with ten months under standard review).

Additionally, products studied for their safety and effectiveness in treating serious or life-threatening diseases or conditions may receive accelerated approval upon a determination that the product has an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit, or on a clinical endpoint that can be measured earlier than irreversible morbidity or mortality, that is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the availability or lack of alternative treatments. As a condition of accelerated approval, the FDA will generally require the sponsor to perform adequate and well-controlled post-marketing clinical studies to verify and describe the anticipated effect on irreversible morbidity or mortality or other clinical benefit. In addition, the FDA currently requires as a condition for accelerated approval pre-approval of promotional materials, which could adversely impact the timing of the commercial launch of the product.

In 2017, FDA established a new regenerative medicine advanced therapy, or RMAT, designation as part of its implementation of the 21st Century Cures Act. The RMAT designation is intended to fulfill the 21st Century Cures Act requirement that FDA facilitate an efficient development program for, and expedite review of, any drug that meets the following criteria: (1) it qualifies as a RMAT, which is defined as a cell therapy, therapeutic tissue engineering product, human cell and tissue product, or any combination product using such therapies or products, with limited exceptions; (2) it is intended to treat, modify, reverse, or cure a serious or life-threatening disease or condition; and (3) preliminary clinical evidence indicates that the drug has the potential to address unmet medical needs for such a disease or condition. Like breakthrough therapy designation, RMAT designation provides potential benefits that include more frequent meetings with FDA to discuss the development plan for the product candidate and eligibility for rolling review and priority review. Products granted RMAT designation may also be eligible for accelerated approval on the basis of a surrogate or intermediate endpoint reasonably likely to predict long-term clinical benefit, or reliance upon data obtained from a meaningful number of sites, including through expansion to additional sites. Once approved, when appropriate, the FDA can permit fulfillment of post-approval requirements under accelerated approval through the submission of clinical evidence, clinical studies, patient registries, or other sources of real-world evidence such as electronic health records; through the collection of larger confirmatory datasets; or through post-approval monitoring of all patients treated with the therapy prior to approval.

Fast track designation, breakthrough therapy designation, priority review, accelerated approval, and RMAT designation do not change the standards for approval but may expedite the development or approval process.

***Orphan Drug Designation***

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

If a product that has orphan drug designation subsequently receives the first FDA approval for the disease for which it has such designation, the product is entitled to orphan drug exclusive approval (or exclusivity), which

means that the FDA may not approve any other applications, including a full BLA, to market the same biologic 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. Orphan drug exclusivity does not prevent FDA from approving a different drug or biologic for the same disease or condition, or the same drug or biologic for a different disease or condition. Among the other benefits of orphan drug designation are tax credits for certain research and a waiver of the BLA application fee.

A designated orphan drug may not receive orphan drug exclusivity if it is approved for a use that is broader than the indication for which it received orphan designation. In addition, exclusive marketing rights in the United States may be lost if the FDA later determines that the request for designation was materially defective or if the manufacturer is unable to assure sufficient quantities of the product to meet the needs of patients with the rare disease or condition.

***Post-Approval Requirements***

Any products manufactured or distributed by us pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to record-keeping, reporting of adverse experiences, periodic reporting, product sampling and distribution, and advertising and promotion of the product. After approval, most changes to the approved product, such as adding new indications or other labeling claims, are subject to prior FDA review and approval. There also are continuing user fee requirements, under which FDA assesses an annual program fee for each product identified in an approved BLA. Biologic manufacturers and their subcontractors are required to register their establishments with the FDA and certain state agencies, and are subject to periodic unannounced inspections by the FDA and certain state agencies for compliance with cGMP, which impose certain procedural and documentation requirements upon us and our third-party manufacturers. 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 requirements upon us and any third-party manufacturers that we may decide to use. Accordingly, manufacturers must continue to expend time, money and effort in the area of production and quality control to maintain compliance with cGMP and other aspects of regulatory compliance.

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

- restrictions on the marketing or manufacturing of a product, complete withdrawal of the product from the market or product recalls;
- fines, warning letters or holds on post-approval clinical studies;
- refusal of the FDA to approve pending applications or supplements to approved applications, or suspension or revocation of existing product approvals;
- product seizure or detention, or refusal of the FDA to permit the import or export of products;
- consent decrees, corporate integrity agreements, debarment or exclusion from federal healthcare programs;
- mandated modification of promotional materials and labeling and the issuance of corrective information;
- the issuance of safety alerts, Dear Healthcare Provider letters, press releases and other communications containing warnings or other safety information about the product; or
- injunctions or the imposition of civil or criminal penalties.

The FDA closely regulates the marketing, labeling, advertising and promotion of biologics. A company can make only those claims relating to safety and efficacy, purity and potency that are approved by the FDA and in accordance with the provisions of the approved label. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off label uses. Failure to comply with these requirements can result in, among other things, adverse publicity, warning letters, corrective advertising and potential civil and criminal penalties. Physicians may prescribe legally available products for uses that are not described in the product's labeling and that differ from those tested by us and approved by the FDA. Such off-label uses are common across medical specialties. Physicians may believe that such off-label uses are the best treatment for many patients in varied circumstances. The FDA does not regulate the behavior of physicians in their choice of treatments. The FDA does, however, restrict manufacturer's communications on the subject of off-label use of their products.

***Biosimilars and Reference Product Exclusivity***

The Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, or collectively, the ACA, signed into law in 2010, includes a subtitle called the Biologics Price Competition and Innovation Act of 2009, or BPCIA, which created an abbreviated approval pathway for biological products that are biosimilar to or interchangeable with an FDA-approved reference biological product. To date, a number of biosimilars have been licensed under the BPCIA, and numerous biosimilars have been approved in Europe. The FDA has issued several guidance documents outlining an approach to review and approval of biosimilars.

Biosimilarity, which requires that there be no clinically meaningful differences between the biological product and the reference product in terms of safety, purity, and potency, can be shown through analytical studies, animal studies, and a clinical study or studies. Interchangeability requires that a product is biosimilar to the reference product and the product must demonstrate that it can be expected to produce the same clinical results as the reference product in any given patient and, for products that are administered multiple times to an individual, the biologic and the reference biologic may be alternated or switched after one has been previously administered without increasing safety risks or risks of diminished efficacy relative to exclusive use of the reference biologic. Complexities associated with the larger, and often more complex, structures of biological products, as well as the processes by which such products are manufactured, pose significant hurdles to implementation of the abbreviated approval pathway that are still being worked out by the FDA.

Under the BPCIA, an application for a biosimilar product may not be submitted to the FDA until four years following the date that the reference product was first licensed by the FDA. In addition, the approval of a biosimilar product may not be made effective by the FDA until 12 years from the date on which the reference product was first licensed. During this 12-year period of exclusivity, another company may still market a competing version of the reference product if the FDA approves a full BLA for the competing product containing that applicant's own preclinical data and data from adequate and well-controlled clinical trials to demonstrate the safety, purity and potency of its product. The BPCIA also created certain exclusivity periods for biosimilars approved as interchangeable products. At this juncture, it is unclear whether products deemed "interchangeable" by the FDA will, in fact, be readily substituted by pharmacies, which are governed by state pharmacy law.

A biological product can also obtain pediatric market exclusivity in the United States. Pediatric exclusivity, if granted, adds six months to existing exclusivity periods and patent terms. This six-month exclusivity, which runs from the end of other exclusivity protection or patent term, may be granted based on the voluntary completion of a pediatric study in accordance with an FDA-issued "Written Request" for such a study.

The BPCIA is complex and continues to be interpreted and implemented by the FDA. In addition, recent government proposals have sought to reduce the 12-year reference product exclusivity period. Other aspects of the BPCIA, some of which may impact the BPCIA exclusivity provisions, have also been the subject of recent litigation. As a result, the ultimate impact, implementation, and impact of the BPCIA is subject to significant uncertainty.

***Other U.S. Healthcare Laws and Compliance Requirements***

In the United States, our activities are potentially subject to regulation by various federal, state and local authorities in addition to the FDA, including but not limited to, the Centers for Medicare & Medicaid Services, or

CMS, other divisions of the U.S. Department of Health and Human Services, or HHS (such as the Office of Inspector General and the Health Resources and Service Administration), the Department of Justice, or the DOJ, and individual U.S. Attorney offices within the DOJ, and state and local governments. For example, sales, marketing and scientific/educational grant programs may have to comply with the anti-fraud and abuse provisions of the Social Security Act, the false claims laws, the privacy and security provisions of the Health Insurance Portability and Accountability Act, or HIPAA, and similar state laws, each as amended, as applicable.

The federal Anti-Kickback Statute prohibits, among other things, any person or entity, from knowingly and willfully offering, paying, soliciting or receiving any remuneration, directly or indirectly, overtly or covertly, in cash or in kind, to induce or in return for purchasing, leasing, ordering or arranging for the purchase, lease or order of any item or service reimbursable, in whole or in part, under Medicare, Medicaid or other federal healthcare programs. The term remuneration has been interpreted broadly to include anything of value. The federal Anti-Kickback Statute has been interpreted to apply to arrangements between therapeutic product manufacturers on one hand and prescribers and purchasers on the other. There are a number of statutory exceptions and regulatory safe harbors protecting some common activities from prosecution. The exceptions and safe harbors are drawn narrowly and practices that involve remuneration that may be alleged to be intended to induce prescribing, purchasing or recommending may be subject to scrutiny if they do not qualify for an exception or safe harbor. Failure to meet all of the requirements of a particular applicable statutory exception or regulatory safe harbor does not make the conduct per se illegal under the federal Anti-Kickback Statute. Instead, the legality of the arrangement will be evaluated on a case-by-case basis based on a cumulative review of all of its facts and circumstances. Our practices, including our arrangements with physicians, may not in all cases meet all of the criteria for protection under a statutory exception or regulatory safe harbor.

Additionally, the intent standard under the federal Anti-Kickback Statute was amended by the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, or collectively, ACA, to a stricter standard such that a person or entity no longer needs to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation. In addition, the ACA codified case law that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal False Claims Act, or FCA.

The federal false claims and civil monetary penalty laws, including the FCA, which can be enforced by private citizens through civil qui tam actions, prohibit any person or entity from, among other things, knowingly presenting, or causing to be presented, a false or fraudulent claim for payment to, or approval by, the federal healthcare programs, including Medicare and Medicaid, or knowingly making, using, or causing to be made or used a false record or statement material to a false or fraudulent claim to the federal government. A claim includes "any request or demand" for money or property presented to the U.S. government. For instance, historically, pharmaceutical and other healthcare companies have been prosecuted under these laws for allegedly providing free product to customers with the expectation that the customers would bill federal programs for the product. Other companies have been prosecuted for causing false claims to be submitted because of the companies' marketing of the product for unapproved, off-label, and thus generally non-reimbursable, uses.

HIPAA created additional federal criminal statutes that prohibit, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud or to obtain, by means of false or fraudulent pretenses, representations or promises, any money or property owned by, or under the control or custody of, any healthcare benefit program, including private third-party payors, willfully obstructing a criminal investigation of a healthcare offense, and knowingly and willfully falsifying, concealing or covering up by trick, scheme or device, 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. Like the federal Anti-Kickback Statute, the ACA amended the intent standard for certain healthcare fraud statutes under HIPAA such that a person or entity no longer needs to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation.

Also, many states have similar, and typically more prohibitive, fraud and abuse statutes or regulations that apply to items and services reimbursed under Medicaid and other state programs, or, in several states, apply regardless of the payor. Additionally, to the extent that our product is sold in a foreign country, we may be subject to similar foreign laws.

We may be subject to data privacy and security regulations by both the federal government and the states in which we conduct our business. HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act, or HITECH, and their implementing regulations, impose requirements relating to the privacy, security and transmission of individually identifiable health information on certain healthcare providers, healthcare clearinghouses, and health plans, known as covered entities, and independent contractors, or agents of covered entities that receive or obtain individually identifiable health information in connection with providing a service on behalf of a covered entity, known as a business associates, as well as their covered subcontractors. Among other things, HITECH makes HIPAA's privacy and security standards directly applicable to business associates. HITECH also created four new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce HIPAA and seek attorneys' fees and costs associated with pursuing federal civil actions. In addition, many state laws govern the privacy and security of health information in specified circumstances, many of which differ from each other in significant ways, are often not pre-empted by HIPAA, and may have a more prohibitive effect than HIPAA, thus complicating compliance efforts.

In addition, many pharmaceutical manufacturers must calculate and report certain price reporting metrics to the government, such as average sales price and best price. Further, these prices for drugs may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that presently restrict imports of drugs from countries where they may be sold at lower prices than in the United States. It is difficult to predict how Medicare coverage and reimbursement policies will be applied to our products in the future and coverage and reimbursement under different federal healthcare programs are not always consistent. Medicare reimbursement rates may also reflect budgetary constraints placed on the Medicare program.

Additionally, the federal Physician Payments Sunshine Act, or the Sunshine Act, within the ACA, and its implementing regulations, require that certain manufacturers of drugs, devices, biological and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program (with certain exceptions) report annually to CMS information related to certain payments or other transfers of value made or distributed to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors), other health care professionals (such as physician assistants and nurse practitioners), and teaching hospitals, as well as information regarding ownership and investment interests held by physicians and their immediate family members. In addition, many states also govern the reporting of payments or other transfers of value, many of which differ from each other in significant ways, are often not pre-empted, and may have a more prohibitive effect than the Sunshine Act, thus further complicating compliance efforts.

In order to distribute products commercially, we must comply with state laws that require the registration of manufacturers and wholesale distributors of drug and biological products in a state, including, in certain states, manufacturers and distributors who ship products into the state even if such manufacturers or distributors have no place of business within the state. Some states also impose requirements on manufacturers and distributors to establish the pedigree of product in the chain of distribution, including some states that require manufacturers and others to adopt new technology capable of tracking and tracing product as it moves through the distribution chain. Several states have enacted legislation requiring pharmaceutical and biotechnology companies to establish marketing compliance programs, file periodic reports with the state, make periodic public disclosures on sales, marketing, pricing, clinical trials and other activities, and/or register their sales representatives, as well as to prohibit pharmacies and other healthcare entities from providing certain physician prescribing data to pharmaceutical and biotechnology companies for use in sales and marketing, and to prohibit certain other sales and marketing practices. All of our activities are potentially subject to federal and state consumer protection and unfair competition laws.

Ensuring business arrangements with third parties comply with applicable healthcare laws and regulations is a costly endeavor. If our operations are found to be in violation of any of the federal and state healthcare laws described above or any other current or future governmental regulations that apply to us, we may be subject to significant penalties, including without limitation, civil, criminal and/or administrative penalties, damages, fines, disgorgement, individual imprisonment, exclusion from participation in government programs, such as Medicare and Medicaid, injunctions, private "qui tam" actions brought by individual whistleblowers in the name of the government, or refusal to allow us to enter into government contracts, contractual damages, reputational harm, administrative burdens, diminished profits and future earnings, additional reporting obligations and oversight if we

become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with these laws, and the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our results of operations.

***Coverage, Pricing and Reimbursement***

Significant uncertainty exists as to the coverage and reimbursement status of any product candidates for which we may obtain regulatory approval. In the United States and in foreign markets, sales of any products for which we receive regulatory approval for commercial sale will depend, in part, on the extent to which third-party payors provide coverage and establish adequate reimbursement levels for such products. In the United States, third-party payors include federal and state healthcare programs, private managed care providers, health insurers and other organizations. Coverage and adequate reimbursement from governmental healthcare programs, such as Medicare and Medicaid in the United States, and commercial payors are critical to new product acceptance. Similarly, companion diagnostic tests require coverage and reimbursement separate and apart from the coverage and reimbursement for their companion pharmaceutical or biological products.

Third-party payors decide which therapeutics they will pay for and establish reimbursement levels. Coverage and reimbursement by a third-party payor may depend upon a number of factors, including the third-party payor's determination that use of a therapeutic is:

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

We cannot be sure that reimbursement will be available for any product that we commercialize and, if coverage and reimbursement are available, we cannot be sure that the level of reimbursement will be adequate. Coverage may also be more limited than the purposes for which the product is approved by the FDA or comparable foreign regulatory authorities. Limited coverage and less than adequate reimbursement may reduce the demand for, or the price of, any product for which we obtain regulatory approval.

Third-party payors are increasingly challenging the price, examining the medical necessity, and reviewing the cost-effectiveness of medical products, therapies and services, in addition to questioning their safety and efficacy. Obtaining reimbursement for our products may be particularly difficult because of the higher prices often associated with branded drugs and drugs administered under the supervision of a physician. We may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of our products, in addition to the costs required to obtain FDA approvals. Our product candidates may not be considered medically necessary or cost-effective. Obtaining coverage and reimbursement approval of a product from a third-party payor is a time-consuming and costly process that could require us to provide to each payor supporting scientific, clinical and cost-effectiveness data for the use of our product on a payor-by-payor basis, with no assurance that coverage and adequate reimbursement will be obtained. A third-party payor's decision to provide coverage for a product does not imply that an adequate reimbursement rate will be approved. Additionally, in the United States there is no uniform policy among third-party payors for coverage or reimbursement. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own coverage and reimbursement policies, but also have their own methods and approval processes. Therefore, 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. Adequate third-party payor reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in product development. If reimbursement is not available or is available only at limited levels, we may not be able to successfully commercialize any product candidate that we successfully develop.

Certain of our products, once approved, may be administered by a physician. Under currently applicable U.S. law, certain products not usually self-administered (including injectable drugs) may be eligible for coverage under Medicare through Medicare Part B. Medicare Part B is part of original Medicare, the federal health care program

that provides health care benefits to the aged and disabled, and covers outpatient services and supplies, including certain pharmaceutical products, that are medically necessary to treat a beneficiary's health condition. As a condition of receiving Medicare Part B reimbursement for a manufacturer's eligible drugs or biologicals, the manufacturer is required to participate in other government healthcare programs, including the Medicaid Drug Rebate Program and the 340B Drug Pricing Program. The Medicaid Drug Rebate Program requires pharmaceutical manufacturers to enter into and have in effect a national rebate agreement with the Secretary of the HHS as a condition for states to receive federal matching funds for the manufacturer's outpatient drugs furnished to Medicaid patients. Under the 340B Drug Pricing Program, the manufacturer must extend discounts to entities that participate in the program.

Different pricing and reimbursement schemes exist in other countries. In the European Union, governments influence the price of pharmaceutical products through their pricing and reimbursement rules and control of national health care systems that fund a large part of the cost of those products to consumers. Some jurisdictions operate positive and negative list systems under which products may only be marketed once a reimbursement price has been agreed. To obtain reimbursement or pricing approval, some of these countries may require the completion of clinical trials that compare the cost effectiveness of a particular product candidate to currently available therapies. Other member states allow companies to fix their own prices for medicines but monitor and control company profits. The downward pressure on health care costs has become intense. As a result, increasingly high barriers are being erected to the entry of new products. In addition, in some countries, cross-border imports from low-priced markets exert a commercial pressure on pricing within a country.

The marketability of any product candidates for which we receive regulatory approval for commercial sale may suffer if the government and third-party payors fail to provide coverage and adequate reimbursement. In addition, emphasis on managed care, the increasing influence of health maintenance organizations, and additional legislative changes in the United States has increased, and we expect will continue to increase, the pressure on healthcare pricing. The downward pressure on the rise in healthcare costs in general, particularly prescription medicines, medical devices and surgical procedures and other treatments, has become very intense. Coverage policies and third-party reimbursement rates may change at any time. Even if favorable coverage and reimbursement status is attained for one or more products for which we receive regulatory approval, less favorable coverage policies and reimbursement rates may be implemented in the future.

***Healthcare Reform***

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 for which marketing approval is obtained. Among policy makers and payors in the United States and elsewhere, there is significant interest in promoting changes in healthcare systems with the stated goals of containing healthcare costs, improving quality and/or expanding access. In the United States, the pharmaceutical industry has been a particular focus of these efforts and has been significantly affected by major legislative initiatives.

For example, the ACA has substantially changed healthcare financing and delivery by both governmental and private insurers. Among the ACA provisions of importance to the pharmaceutical and biotechnology industries, in addition to those otherwise described above, are the following:

- an annual, nondeductible fee on any entity that manufactures or imports certain specified branded prescription drugs and biologic agents apportioned among these entities according to their market share in some government healthcare programs that began in 2011;
- an increase in the statutory minimum rebates a manufacturer must pay under the Medicaid Drug Rebate Program, retroactive to January 1, 2010, to 23.1% and 13% of the average manufacturer
- price for most branded and generic drugs, respectively, and capped the total rebate amount for innovator drugs at 100% of the average manufacturer price;

- a new Medicare Part D coverage gap discount program, in which manufacturers must agree to offer 50% (and 70% starting on January 1, 2019) point-of-sale discounts off negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period, as a condition for the manufacturers' outpatient drugs to be covered under Medicare Part D;
- extension of manufacturers' Medicaid rebate liability to covered drugs dispensed to individuals who are enrolled in Medicaid managed care organizations;
- expansion of eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to additional individuals and by adding new mandatory eligibility categories for individuals with income at or below 133% of the federal poverty level, thereby potentially increasing manufacturers' Medicaid rebate liability;
- expansion of the entities eligible for discounts under the 340B Drug Discount Program;
- a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research;
- expansion of healthcare fraud and abuse laws, including the FCA and the federal Anti-Kickback Statute, new government investigative powers, and enhanced penalties for noncompliance;
- a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted, or injected;
- requirements to report certain financial arrangements with physicians and teaching hospitals;
- a requirement to annually report certain information regarding drug samples that manufacturers and distributors provide to physicians;
- establishment of a Center for Medicare Innovation at CMS to test innovative payment and service delivery models to lower Medicare and Medicaid spending, potentially including prescription drug spending; and
- a licensure framework for follow on biologic products.

There have been legal and political challenges to certain aspects of the ACA. President Trump signed several executive orders and other directives designed to delay, circumvent, or loosen certain requirements mandated by the ACA. Concurrently, Congress considered legislation that would repeal or repeal and replace all or part of the ACA. While Congress has not passed comprehensive repeal legislation, several bills affecting the implementation of certain taxes under the ACA have been signed into law. In December 2017, the Tax Cuts and Jobs Act of 2017 was enacted which repeals, effective January 1, 2019, the tax penalty for an individual's failure to maintain ACA-mandated health insurance, commonly referred to as the "individual mandate." Additionally, the 2020 federal spending package permanently eliminated, effective January 1, 2020, the Affordable Care Act's mandated "Cadillac" tax on high-cost employer-sponsored health coverage and medical device tax and, effective January 1, 2021, also eliminated the health insurer tax. Further, the Bipartisan Budget Act of 2018, or the BBA, among other things, amends the ACA, effective January 1, 2019, to close the coverage gap in most Medicare drug plans, commonly referred to as the "donut hole."

On June 17, 2021, the U.S. Supreme Court dismissed a challenge on procedural grounds that argued the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress. Thus, the ACA will remain in effect in its current form. Further, prior to the U.S. Supreme Court ruling, on January 28, 2021, President Biden issued an executive order to initiate a special enrollment period for purposes of obtaining health insurance coverage through the ACA marketplace. The executive order also instructs certain governmental agencies to review and reconsider their existing policies and rules that limit access to healthcare, including among others, reexamining Medicaid demonstration projects and waiver programs that include work requirements, and policies that create unnecessary barriers to obtaining access to health insurance coverage through Medicaid or the ACA. It is possible that the ACA will be subject to judicial or Congressional challenges in the future. It is unclear how any such challenges and the healthcare reform measures of the Biden administration will impact the ACA and our business.

Other legislative changes have been proposed and adopted since the ACA was enacted. In August 2011, President Obama signed into law the Budget Control Act of 2011, which, among other things, included aggregate reductions to Medicare payments to providers of up to 2% per fiscal year, which went into effect beginning on April 1, 2013 and, due to subsequent legislative amendments to the statute, including the Infrastructure Investment and Jobs Act, the BBA, and the CARES Act will stay in effect through 2031 unless additional Congressional action is taken. These reductions have been suspended from May 1, 2020 through March 31, 2021 due to the COVID-19 pandemic. Under current legislation, the actual reduction in Medicare payments will vary from 1% in 2022 to up to 3% in the final fiscal year of this sequester. In January 2013, the American Taxpayer Relief Act of 2012 was signed into law, which, among other things, reduced Medicare payments to several providers, including hospitals, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. The expansion of new programs such as Medicare payment for performance initiatives for physicians, also referred to as the Quality Payment Program, under the Medicare Access and CHIP Reauthorization Act of 2015, could also impact our business.

Further, there has been increasing legislative and enforcement interest in the United States with respect to specialty drug pricing practices. Specifically, there have been several recent U.S. Congressional inquiries and proposed and enacted federal and state legislation 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. At the federal level, the Trump administration used several means to propose or implement drug pricing reform, including through federal budget proposals, executive orders and policy initiatives. For example, on July 24, 2020 and September 13, 2020, President Trump announced several executive orders related to prescription drug pricing that attempt to implement several of the Trump administration's proposals. As a result, the FDA concurrently released a final rule and guidance in September 2020, implementing a portion of the importation executive order providing pathways for states to build and submit importation plans for drugs from Canada. Further, on November 20, 2020, HHS finalized a regulation removing safe harbor protection for price reductions from pharmaceutical manufacturers to plan sponsors under Part D, either directly or through pharmacy benefit managers, unless the price reduction is required by law. The implementation of the rule has been delayed by the Biden administration from January 1, 2022 to January 1, 2023 in response to ongoing litigation. The rule also creates a new safe harbor for price reductions reflected at the point-of-sale, as well as a new safe harbor for certain fixed fee arrangements between pharmacy benefit managers and manufacturers, the implementation of which have also been delayed until January 1, 2023. On November 20, 2020, CMS issued an interim final rule implementing President Trump's Most Favored Nation executive order, which would tie Medicare Part B payments for certain physician-administered drugs to the lowest price paid in other economically advanced countries, effective January 1, 2021. As a result of litigation challenging the Most Favored National model, on December 27, 2021 CMS published a final rule that rescinded the Most Favored Nation model interim final rule. In July 2021, the Biden administration released an executive order, "Promoting Competition in the American Economy," with multiple provisions aimed at prescription drugs. In response to Biden's executive order, on September 9, 2021, HHS released a Comprehensive Plan for Addressing High Drug Prices that outlines principles for drug pricing reform and sets out a variety of potential legislative policies that Congress could pursue to advance these principles. No legislation or administrative actions have been finalized to implement these principles. In addition, Congress is considering drug pricing as part of other reform initiatives. At the state level, legislatures have increasingly passed legislation and implemented regulations designed to control pharmaceutical and biological 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, to encourage importation from other countries and bulk purchasing.

Further, it is possible that additional governmental action will be taken in response to the COVID-19 pandemic.

***The Foreign Corrupt Practices Act***

The Foreign Corrupt Practices Act, or the FCPA, prohibits any U.S. individual or business from paying, offering, or authorizing payment or offering of anything of value, directly or indirectly, to any foreign official, political party or candidate for the purpose of influencing any act or decision of the foreign entity in order to assist the individual or business in obtaining or retaining business. The FCPA also obligates companies whose securities are listed in the United States to comply with accounting provisions requiring us to maintain books and records that

accurately and fairly reflect all transactions of the corporation, including international subsidiaries, and to devise and maintain an adequate system of internal accounting controls for international operations.

***Additional Regulation***

In addition to the foregoing, state and federal laws regarding environmental protection and hazardous substances, including the Occupational Safety and Health Act, the Resource Conservancy and Recovery Act and the Toxic Substances Control Act, affect our business. These and other laws govern our use, handling and disposal of various biological, chemical and radioactive substances used in, and wastes generated by, our operations. If our operations result in contamination of the environment or expose individuals to hazardous substances, we could be liable for damages and governmental fines. We believe that we are in material compliance with applicable environmental laws and that continued compliance therewith will not have a material adverse effect on our business. We cannot predict, however, how changes in these laws may affect our future operations.

***Other Regulations***

We are also subject to numerous federal, state and local laws relating to such matters as safe working conditions, manufacturing practices, environmental protection, fire hazard control, and disposal of hazardous or potentially hazardous substances. We may incur significant costs to comply with such laws and regulations now or in the future.

**Employees**

As of December 31, 2022, we had 314 employees, 156 of whom hold advanced degrees, including 79 with a Ph.D. and/or M.D. degree. Of these employees, 266 were engaged in research and development activities and 48 were engaged in general and administrative activities. None of our employees are represented by labor unions or covered by collective bargaining agreements. We consider our relationship with our employees to be good.

**Human Capital Resources**

We have grown to a team of 314 employees as of December 31, 2022, 312 of which are full-time employees. All of our employees were employed in the United States. Our highly qualified and experienced employees which includes scientists, physicians and professionals across research, clinical, manufacturing, regulatory, and general and administrative functions are critical to our success. We also leverage temporary workers to provide flexibility for our business needs. During 2022, we added over 51 employees to our team.

We expect to continue to add additional employees in 2023 with a focus on expanding our expertise and capabilities in clinical and preclinical research and development, including an expansion of our internal manufacturing capacity. Our culture is driven by innovation, nimbleness and passion for the work that we do, the people we work with and the patients we serve. As we grow, we continually evaluate our business needs and opportunities and balance hiring top talent internally and leveraging external expertise. Currently, we remain reliant on third-party contract manufacturers and clinical research organizations for our clinical programs.

**Corporate Information**

We were incorporated in Delaware in December 2014. Our principal executive offices are located at 9390 Towne Centre Drive, Suite 200, San Diego, California 92121, and our telephone number is (858) 779-3100. Our corporate website address is www.poseida.com. Information contained on or accessible through our website is not a part of this Annual Report, and the inclusion of our website address in this report is an inactive textual reference only.

**Emerging Growth Company**

We are an “emerging growth company,” as defined in the Jumpstart Our Business Startups Act of 2012. We will remain an emerging growth company until the earlier of (1) the last day of the fiscal year (a) following the fifth

anniversary of the completion of our initial public offering, or IPO, in July 2020, (b) in which we have total annual gross revenue of at least $1.235 billion, or (c) in which we are deemed to be a large accelerated filer, which means we have been subject to the reporting requirements of the Exchange Act for twelve calendar months and the market value of our common stock that is held by non-affiliates exceeded $700.0 million as of the prior June 30th, and (2) the date on which we have issued more than $1.0 billion in non-convertible debt during the prior three-year period. We refer to the Jumpstart Our Business Startups Act of 2012 in this Annual Report as the "JOBS Act," and references to "emerging growth company" have the meaning associated with it in the JOBS Act.

## Item 1A. Risk Factors.

*An investment in our common stock is speculative and involves a high degree of risk. You should consider carefully the risks described below, together with the other information contained in this Annual Report on Form 10-K, including our consolidated financial statements and the related notes and in the section titled "Management's Discussion and Analysis of Financial Condition and Results of Operations" before deciding whether to purchase, hold or sell shares of our common stock. If any of the following risks occur, our business, financial condition, results of operations and future growth prospects could be materially and adversely affected. In these circumstances, the market price of our common stock could decline, and you may lose all or part of your investment. This Annual Report on Form 10-K also contains forward-looking statements that involve risks and uncertainties. Our actual results could differ materially from those anticipated in the forward-looking statements as a result of a number of factors, including the risks described below. See the section titled "Special Note Regarding Forward-Looking Statements."*

### Risks Related to Our Limited Operating History, Financial Position and Capital Requirements

***We are a clinical-stage cell and gene therapy company with a limited operating history. We have incurred net losses since our inception and anticipate that we will continue to incur significant losses for the foreseeable future. We have never generated any revenue from product sales and may never be profitable.***

We are a clinical-stage cell and gene therapy company with a limited operating history that may make it difficult to evaluate the success of our business to date and to assess our future viability. Our operations to date have been limited to organizing and staffing our company, business planning, raising capital, establishing and protecting our intellectual property portfolio, developing our platform technologies, identifying potential product candidates and undertaking research and development and manufacturing activities, including preclinical studies and clinical trials of our product candidates. All of our product candidates are in early development, and none have been approved for commercial sale. We have never generated any revenue from product sales and have incurred net losses each year since we commenced operations. For the years ended December 31, 2022 and 2021, we have incurred a net loss of $64.0 million and $125.0 million, respectively. As of December 31, 2022, we had an accumulated deficit of $470.9 million. We expect that it will be several years, if ever, before we have a product candidate ready for regulatory approval and commercialization. We expect to incur increasing levels of operating losses over the next several years and for the foreseeable future as we advance our product candidates through clinical development. 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.

To become and remain profitable, we must develop and eventually commercialize a product or products with significant market potential. This will require us to be successful in a range of challenging activities, including completing preclinical studies and clinical trials of our product candidates, obtaining marketing approval for these product candidates, manufacturing, marketing and selling those products for which we may obtain marketing approval and satisfying any post-marketing requirements. We may never succeed in these activities and, even if we succeed in commercializing one or more of our product candidates, we may never generate revenue that is significant or large enough to achieve profitability. In addition, as a young business, we may encounter unforeseen expenses, difficulties, complications, delays and other known and unknown challenges. If we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis and we will continue to incur substantial research and development and other expenditures to develop and market additional product candidates. Our failure to become and remain profitable would decrease the value of our company and could impair our ability to raise capital, maintain our research and development efforts, expand our business or continue our operations. A decline in the value of our company could also cause you to lose all or part of your investment.

***We will need to obtain substantial additional funding to complete the development and any commercialization of our product candidates. If we are unable to raise this capital when needed, we may be forced to delay, reduce or eliminate our product development programs or other operations.***

Since our inception, we have used substantial amounts of cash to fund our operations and expect our expenses to increase substantially during the next few years. The development of biopharmaceutical product candidates is capital intensive. As our product candidates enter and advance through preclinical studies and clinical trials, we will need substantial additional funds to expand our clinical, regulatory, quality and manufacturing capabilities. In

addition, if we obtain marketing approval for any of our product candidates, we expect to incur significant commercialization expenses related to marketing, sales, manufacturing and distribution.

As of December 31, 2022, we had $282.5 million in cash, cash equivalents and short-term investments. Based upon our current operating plan, we believe that our existing cash, cash equivalents and short-term investments will enable us to fund our operations through at least the next 12 months. However, our current cash, cash equivalents and short-term investments will not be sufficient to fund any of our product candidates through regulatory approval, and we will need to raise substantial additional capital to complete the development and commercialization of our product candidates.

Additional capital may be obtained through equity offerings and/or debt financings, or from other potential sources of liquidity, which may include new or existing collaborations, licensing or other commercial agreements for one or more of our research programs or patent portfolios. Adequate funding, if needed, may not be available to us on acceptable terms, or at all. Our ability to obtain additional funds may be adversely impacted by civil and political unrest in certain countries and regions, potential worsening global economic conditions and the disruptions to, and volatility in, the credit and financial markets in the United States and worldwide resulting from the continuing public health concerns regarding the COVID-19 pandemic. If we are unable to raise capital when needed or on attractive terms, we would be forced to delay, reduce, or eliminate our research development programs or other operations. If any of these events occur, our ability to achieve our operational goals would be materially and adversely affected. Our future capital requirements and the adequacy of available funds will depend on many factors, including those described in "Risk Factors." Depending on the severity and direct impact of these factors on us, we may be unable to secure additional financing to meet our operating requirements on terms favorable to us, or at all.

We have based these estimates on assumptions that may prove to be incorrect or require adjustment as a result of business decisions, and we could exhaust our available capital resources sooner than we currently expect. Our future capital requirements will depend on many factors, including:

- scope, progress and results of our ongoing and planned preclinical studies and clinical trials for our product candidates;
- unanticipated serious safety concerns related to the use of our product candidates;
- timing of licensing payments we may be required to make based on the development of our product candidates;
- the number, and development requirements of other product candidates that we may pursue;
- the timing and outcome of regulatory review of our product candidates;
- changes in laws or regulations applicable to our product candidates, including but not limited to clinical trial requirements for approval;
- our decisions to initiate additional clinical trials, not to initiate any clinical trial or to terminate an existing clinical trial;
- the cost of obtaining raw materials and drug product for clinical trials and commercial supply;
- whether we decide to partner any of our additional product candidates with any third parties and the terms of any such partnership or collaboration;
- the cost and timing of operating our pilot manufacturing facility;
- whether we decide to establish a commercial manufacturing facility for supply of our product candidates; and
- additions or departures of key scientific or management personnel.

Because we do not expect to generate revenue from product sales for many years, if at all, we will need to obtain substantial additional funding in connection with our continuing operations and expected increases in expenses. Until such time as we can generate significant revenue from sales of our product candidates, if ever, we

expect to finance our cash needs through equity offerings, debt financings or other capital sources, including potentially grants, collaborations, licenses or other similar arrangements. In addition, we may seek additional capital due to favorable market conditions or strategic considerations, even if we believe we have sufficient funds for our current or future operating plans. Changes in interest rates and economic inflation on capital markets may affect the availability, amount and type of financing available to us in the future. On August 13, 2021, we entered into a Controlled Equity Offering℠ Sales Agreement, or the Sales Agreement, with Cantor Fitzgerald & Co., or Cantor, to sell shares of common stock, from time to time, through an "at the market offering" program having an aggregate offering price of up to $85.0 million through which Cantor would act as sales agent. There can be no assurance that we will continue to meet the requirements to be able to sell securities pursuant to the Sales Agreement, of if we meet the requirements that we will be able to raise sufficient funds on favorable terms. If we are unable to raise capital when needed or on attractive terms, we would be forced to delay, reduce or eliminate our research and development programs or future commercialization efforts.

***The terms of our loan agreement place restrictions on our operating and financial flexibility. If we raise additional capital through debt financing, the terms of any new debt could further restrict our ability to operate our business.***

As of December 31, 2022, we have an outstanding term loan in the principal amount of $60.0 million under our loan and security agreement with Oxford Finance LLC, or Oxford. The loan is secured by a lien covering substantially all of our personal property, rights and assets, excluding intellectual property. The loan agreement contains customary affirmative and negative covenants and events of default applicable to us and any subsidiaries. The affirmative covenants include, among others, covenants requiring us (and us to cause our subsidiaries, if any) to maintain governmental approvals, deliver certain financial reports, maintain insurance coverage, keep inventory, if any, in good and marketable condition and protect material intellectual property. The negative covenants include, among others, restrictions on us and our subsidiaries transferring collateral, incurring additional indebtedness, engaging in mergers or acquisitions, paying cash dividends or making other distributions, making investments, creating liens, selling assets and making any payment on subordinated debt, in each case subject to certain exceptions. The restrictive covenants of the loan agreement could cause us to be unable to pursue business opportunities that we or our stockholders may consider beneficial. In addition, among other default triggers, Oxford could declare a default upon the occurrence of any event that it interprets as a material adverse change as defined under the loan agreement. If we default under the loan agreement, Oxford may accelerate all of our repayment obligations and take control of our pledged assets, potentially requiring us to renegotiate our agreement on terms less favorable to us or to immediately cease operations. Further, if we are liquidated, Oxford's right to repayment would be senior to the rights of the holders of our common stock to receive any proceeds from the liquidation. Any declaration by Oxford of an event of default could significantly harm our business and prospects and could cause the price of our common stock to decline. If we raise any additional debt financing, the terms of such additional debt could further restrict our operating and financial flexibility.

**Risks Related to the Discovery, Development and Regulatory Approval of Our Product Candidates**

***Our product candidates are in the early stages of development and we have a limited history of conducting clinical trials to test our product candidates in humans.***

We are early in our development efforts and most of our operations to date have been limited to developing our platform technologies, establishing manufacturing capabilities and conducting drug discovery and preclinical studies. In November 2021, we made the decision to wind down clinical development of our P-BCMA-101 program, which was the first of our product candidates to have been tested in humans. In November 2022, we announced the decision to wind down clinical development of our P-PSMA-101 program, our first solid tumor clinical trial. We initiated Phase 1 clinical trials for P-BCMA-ALLO1 and P-MUC1C-ALLO1 in late 2021. As a result, we have limited infrastructure, experience conducting clinical trials as a company and regulatory interactions, and cannot be certain that our clinical trials will be completed on time, that our planned clinical trials will be initiated on time, if at all, that our planned development programs would be acceptable to the FDA or other comparable foreign regulatory authorities, or that, if approval is obtained, such product candidates can be successfully commercialized.

Because of the early stage of development of our product candidates, our ability to eventually generate significant revenues from product sales will depend on a number of factors, including:

- successful completion of preclinical studies;
- submission of our INDs or other regulatory applications for our planned clinical trials or future clinical trials and authorizations from regulators to initiate clinical studies;
- successful enrollment in, and completion of, clinical trials and achieving positive results from the trials;
- receipt of marketing approvals from applicable regulatory authorities;
- establishing and maintaining manufacturing capabilities or arrangements with third-party manufacturers for clinical supply and, if and when approved, for commercial supply;
- establishing sales, marketing and distribution capabilities and launching commercial sales of our products, if and when approved, whether alone or in combination with others;
- acceptance of our products, if and when approved, by patients, the medical community and third-party payors;
- effectively competing with other therapies;
- developing and implementing marketing and reimbursement strategies;
- obtaining and maintaining third-party coverage and adequate reimbursement;
- obtaining and maintaining patent, trade secret and other intellectual property protection and regulatory exclusivity for our product candidates;
- the ability to obtain clearance or approval of companion diagnostic tests, if required, on a timely basis, or at all; and
- maintaining a continued acceptable safety profile of any product following approval, if any.

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

***Clinical development is a lengthy, expensive and uncertain process. The results of preclinical studies and early clinical trials are not always predictive of future results. Any product candidate that we advance into clinical trials may not achieve favorable results in later clinical trials, if any, or receive marketing approval.***

The research and development of drugs and biological products is extremely risky. Only a small percentage of product candidates that enter the development process ever receive marketing approval. Before obtaining marketing approval from regulatory authorities for the sale of our product candidates, we must conduct extensive clinical trials to demonstrate the safety and efficacy of the product candidates in humans. Clinical testing is expensive, can take many years to complete and its outcome is uncertain.

The results of preclinical studies and early clinical trials of our product candidates and other products, even those with the same or similar mechanisms of action, may not be predictive of the results of later-stage clinical trials. In particular, it is not uncommon for product candidates to exhibit unforeseen safety or efficacy issues when tested in humans despite promising results in preclinical animal models. In August 2020, we announced the P-PSMA-101 trial was put on clinical hold to assess a patient death. This clinical hold was lifted in November 2020 with the implementation of protocol amendments intended to increase patient compliance and safety that include modified inclusion and exclusion criteria and frequency of monitoring and laboratory testing. In addition, due primarily to the observation of anti-drug antibodies in some patients in our first clinical trial, P-BCMA-101, we explored additional dosing strategies, such as administering the doses in smaller cycles in the first 30 days and adding rituximab to the preconditioning regimen to potentially suppress any antibody response. If these anti-drug antibodies are neutralizing the product candidate, the activity of P-BCMA-101, or any other product candidate in which anti-drug antibodies neutralize the product candidate, may be limited. To the extent that we choose one of these newer dosing strategies for advancement in any of our clinical trials, it may be on the basis of more limited data as compared to the previously evaluated Phase 1 cohorts. Other than P-BCMA-101, P-PSMA-101 and our current clinical trials, none of

our product candidates have ever been tested in humans. We have only recently initiated clinical trials for our first two allogeneic CAR-T product candidates, P-BCMA-ALLO1, and P-MUC1C-ALLO1. While we have applied learnings from our autologous P-BCMA-101 product candidate in our development of P-BCMA-ALLO1, we cannot be certain that these learnings will be applicable to the allogeneic program or that we will not encounter unexpected results dosing P-BCMA-ALLO1 or P-MUC1C-ALLO1 in our clinical trials. Future results of preclinical and clinical testing of our product candidates are also less certain due to the novel and relatively untested nature of our approach to CAR-T and gene therapy development and related platform technologies. In general, clinical trial failure may result from a multitude of factors including flaws in study design, dose selection, patient enrollment criteria and failure to demonstrate favorable safety or efficacy traits. As such, failure in clinical trials can occur at any stage of testing. A number of companies in the biopharmaceutical industry have suffered setbacks in the advancement of clinical trials due to lack of efficacy or adverse safety profiles, notwithstanding promising results in earlier trials.

If the results of our clinical trials are inconclusive or if there are safety concerns or adverse events associated with our product candidates, we may:

- incur unplanned costs;
- be delayed in or prevented from obtaining marketing approval for our product candidates;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- obtain approval with labeling that includes significant use or distribution restrictions or safety warnings including boxed warnings;
- be subject to changes in the way the product is administered;
- be required to perform additional clinical trials to support approval or be subject to additional post-marketing testing requirements;
- have regulatory authorities withdraw their approval of the product or impose restrictions on its distribution in the form of a modified Risk Evaluation and Mitigation Strategy, or REMS;
- be subject to the addition of labeling statements, such as warnings or contraindications;
- be sued; or
- experience damage to our reputation.

Treatment with our oncology product candidates involves chemotherapy and myeloablative treatments, which can cause side effects or adverse events that are unrelated to our product candidate but may still impact the success of our clinical trials. Additionally, our product candidates could potentially cause other adverse events. The inclusion of critically ill patients in our clinical trials may result in deaths or other adverse medical events due to other therapies or medications that such patients may be using. As described above, any of these events could prevent us from obtaining regulatory approval or achieving or maintaining market acceptance of our product candidates and impair our ability to commercialize our products. Because all of our product candidates are derived from our platform technologies, a clinical failure of one of our product candidates may also increase the actual or perceived likelihood that our other product candidates will experience similar failures.

***We may encounter substantial delays in our clinical trials.***

We cannot guarantee that any clinical trials will be conducted as planned or completed on schedule, if at all. For example, we cannot begin our planned Phase 1 clinical trials for our liver directed gene therapy candidates until we or our collaborators complete certain preclinical development and submit and receive authorization to proceed under INDs. While we announced FDA clearance for our IND for P-BCMA-ALLO1 in August 2021 and our IND for P-MUC1C-ALLO1 in December 2021, we are dependent on clinical sites to continue enrolling patients. We announced in August 2020 our P-PSMA-101 trial was put on clinical hold to assess a patient death. In November 2020 we announced that the FDA had lifted the clinical hold based upon our investigation of the event and proposed protocol amendments intended to increase patient compliance and safety. While we were able to resume the trial, a similar hold in other trials could delay the ultimate completion of the trial. Finally, the COVID-19 pandemic has impacted clinical trials broadly, including our own, with some sites pausing enrollment and we have experienced a delay in manufacturing at times due to potential exposure. These impacts have caused us to reevaluate the expected

timing of clinical milestones and we have and continue to experience delays in site initiation and patient enrollment, and could also experience delays in the manufacture of our product candidates for clinical testing and other difficulties in starting or completing our clinical trials. Other events that may prevent successful or timely completion of clinical development include:

- delays in reaching a consensus with regulatory agencies on trial design;
- delays in reaching agreement on acceptable terms with prospective clinical research organizations, or 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;
- delays in obtaining required institutional review board, or IRB, approval at each clinical trial site;
- delays in recruiting suitable patients to participate in our clinical trials;
- imposition of a clinical hold by regulatory agencies, after an inspection of our clinical trial operations or study sites;
- failure by our CROs, other third parties or us to adhere to the trial protocol or the FDA's good clinical practices, or GCPs, or applicable regulatory guidelines in other countries;
- third-party contractors becoming debarred or suspended or otherwise penalized by the FDA or other comparable foreign regulatory authorities for violations of applicable regulatory requirements;
- delays in the testing, validation, manufacturing and delivery of our product candidates to the treatment sites, including due to a facility manufacturing any of our product candidates or any of their components being ordered by the FDA or comparable foreign regulatory authorities to temporarily or permanently shut down due to violations of current good manufacturing practices, or cGMPs, regulations or other applicable requirements, or infections or cross-contaminations of product candidates in the manufacturing process;
- delays in having patients complete participation in a study or return for post-treatment follow-up;
- clinical trial sites or patients dropping out of a study;
- discovering that product candidates have unforeseen safety issues, undesirable side effects or other unexpected characteristics;
- to the extent that we conduct clinical trials in foreign countries, the failure of enrolled patients in foreign countries to adhere to clinical protocol as a result of differences in healthcare services or cultural customs, managing additional administrative burdens associated with foreign regulatory schemes, as well as political and economic risks relevant to such foreign countries;
- receiving untimely or unfavorable feedback from applicable regulatory authorities regarding the trial or requests from regulatory authorities to modify the design of a trial;
- suspensions or terminations by us, the IRBs of the institutions at which such trials are being conducted, by the Data Safety Monitoring Board, for such trial or by regulatory authorities due to a number of factors, including those described above;
- lack of adequate funding; or
- changes in regulatory requirements and guidance that require amending or submitting new clinical protocols.

Any inability to successfully complete preclinical and clinical development could result in additional costs to us or impair our ability to raise capital, generate revenues from product sales and enter into or maintain collaboration arrangements. For example, under certain of our manufacturing agreements for our product candidates we pay a fixed price per month for up to a specified number of manufacturing runs and certain clinical trial services agreements are based on fees that do not vary based on patient enrollment. Therefore, if enrollment in a clinical trial is slowed, certain of our expenses related to the trial would not decrease and therefore the overall costs to complete the trial would increase. In addition, if we make manufacturing changes to our product candidates, we may need to

conduct additional studies to bridge our modified product candidates to earlier versions. Clinical trial delays could also 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, which could impair our ability to successfully commercialize our product candidates and may harm our business and results of operations.

***Our product candidates are based on novel technologies, which make it difficult to predict the timing, results and cost of product candidate development and likelihood of obtaining regulatory approval.***

We have concentrated our research and development efforts on product candidates using our platform technologies, and our future success depends on the successful development of this approach. CAR-T and gene editing in general are newly-emerging fields and our approaches in particular have not been extensively tested over any significant period of time. In particular, while we believe that CAR-T products with higher percentages of $T_{SCM}$ cells may be capable of overcoming certain challenges faced by early-generation CAR-T products, we cannot be certain that increasing the percentage of these cells will result in the intended benefits or will not result in unforeseen negative consequences over time, including due to the potential long-term persistence of the modified cells in the body. We have not yet succeeded and may not succeed in demonstrating efficacy and safety for any product candidates based on our platform technologies in clinical trials or in obtaining marketing approval thereafter, and use of our platform technologies may not ever result in marketable products. We may also experience delays in developing a sustainable, reproducible and scalable manufacturing process or transferring that process to commercial partners or establishing our own commercial manufacturing capabilities, which may prevent us from completing our clinical trials or commercializing any products on a timely or profitable basis, if at all.

In addition, the clinical trial requirements of the FDA, the European Medicines Agency, or EMA, and other regulatory agencies and the criteria these regulators use to determine the safety and efficacy of a product candidate vary substantially according to the type, complexity, novelty and intended use and market of the potential products. The regulatory approval process for novel product candidates such as ours can be more expensive and take longer than for other, better known or extensively studied pharmaceutical or other product candidates. While CAR-T and gene therapy products have made progress in recent years, only a small number of products have been approved in the United States or other markets, which makes it difficult to determine how long it will take or how much it will cost to obtain regulatory approvals for our product candidates.

In addition, the gene-editing industry is rapidly developing, and our competitors may introduce new technologies that render our technologies obsolete or less attractive. New technology could emerge at any point in the development cycle of our product candidates. As competitors use or develop alternative technologies, any failures of such technologies could adversely impact our programs. For example, some studies have suggested that gene editing using the CRISPR-Cas9 method may increase the risk that the edited cells themselves become cancerous, and in October 2021, discovery of a chromosomal abnormality of unknown clinical significance resulted in a full clinical hold on the programs of one of our competitors utilizing the TALEN method. Regardless of our belief that our non-viral Cas-CLOVER approach to gene editing may avoid some of the issues identified in these studies, it is possible that our approach will be associated with similar risks or that issues encountered with other gene editing techniques will create a negative perception of or increase scrutiny for our technologies and product candidates.

Regulatory requirements governing products created with gene editing technology or involving gene therapy treatment have changed frequently and will likely continue to change in the future. Approvals by one regulatory agency may not be indicative of what any other regulatory agency may require for approval, and there is substantial, and sometimes uncoordinated, overlap in those responsible for regulation of gene therapy products and other products created with gene editing technology. For example, under the National Institutes of Health, or NIH, Guidelines for Research Involving Recombinant DNA Molecules, or NIH Guidelines, supervision of human gene transfer trials includes evaluation and assessment by an institutional biosafety committee, or IBC, a local institutional committee that reviews and oversees research utilizing recombinant or synthetic nucleic acid molecules at that institution. The IBC assesses the safety of the research and identifies any potential risk to public health or the environment, and such review may result in some delay before initiation of a clinical trial. While the NIH Guidelines are not mandatory unless the research in question is being conducted at or sponsored by institutions receiving NIH funding of recombinant or synthetic nucleic acid molecule research, many companies and other institutions not otherwise subject to the NIH Guidelines voluntarily follow them. Even though we may not be

required to submit a protocol for our product candidates through the NIH for review, we will still be subject to significant regulatory oversight by the FDA, and in addition to the government regulators, the applicable IBC and IRB of each institution at which we conduct clinical trials of our product candidates, or a central IRB if appropriate, would need to review and approve the proposed clinical trial.

Additionally, adverse developments in clinical trials conducted by others of gene therapy products or products created using genome editing technology, such as products developed through the application of a CRISPR/Cas9 technology, or adverse public perception of the field of gene editing, may cause the FDA and other regulatory bodies to revise the requirements for approval of any product candidates we may develop or limit the use of products utilizing gene editing technologies, either of which could materially harm our business. Furthermore, regulatory action or private litigation could result in expenses, delays or other impediments to our research programs or the development or commercialization of current or future product candidates.

We are also developing allogeneic CAR-T product candidates that are engineered from healthy donor T cells and are intended for use in any patient with certain cancers. Allogeneic versions of CAR-T product candidates is an unproven field of development and is subject to particular risks that are difficult to quantify, including understanding and addressing variability in the quality of a donor's T cells and the patient's potential immune reaction to the foreign donor cells, which could ultimately affect safety, efficacy and our ability to produce product in a reliable and consistent manner. For example, in response to FDA feedback to our IND for P-BCMA-ALLO1, we were required to update certain assay release criteria unique to an allogeneic product candidate. While implementation did not impact our clinical timelines, there can be no assurance that it, or similar regulatory requirements would not do so in the future, and any such delays could materially and adversely affect our business, financial condition, results of operations and future growth prospects.

***Serious adverse events, undesirable side effects or other unexpected properties of our product candidates may be identified during development or after approval, which could lead to the discontinuation of our clinical development programs, refusal by regulatory authorities to approve our product candidates or, if discovered following marketing approval, revocation of marketing authorizations or limitations on the use of our product candidates thereby limiting the commercial potential of such product candidate.***

To date, we have only tested our product candidates in a limited number of patients with cancer and the majority of these clinical trial participants have only been observed for a limited period of time after dosing. As we continue developing our product candidates and initiate clinical trials of our additional product candidates, serious adverse events, or SAEs, undesirable side effects, relapse of disease or unexpected characteristics may emerge causing us to abandon these product candidates or limit their development to more narrow uses or subpopulations in which the SAEs or undesirable side effects or other characteristics are less prevalent, less severe or more acceptable from a risk-benefit perspective or in which efficacy is more pronounced or durable. For example, a significant risk observed in CAR-T product clinical trials is the development of CRS which in some instances resulted in neurotoxicity and patient deaths. While we have observed relatively limited instances of CRS or neurotoxicity in our clinical trials in our allogeneic programs as of the date of this filing, we may observe greater rates of these or other adverse events in higher doses of our existing trials or future CAR-T programs. Should we observe additional or more severe cases of CRS in our clinical trials or identify other undesirable side effects or other unexpected findings depending on their severity, our trials could be delayed or even stopped and our development programs may be halted entirely. In August 2020, we announced our P-PSMA-101 trial was placed on clinical hold to evaluate the death of a patient, which may have been related to treatment with P-PSMA-101. In November 2020 we announced that the FDA had lifted the clinical hold based upon our investigation of the event and proposed protocol amendments intended to increase patient compliance and safety, and we resumed the trial. Despite the clinical hold being lifted, we could observe similar patient deaths or other adverse events that require other trials be suspended or terminated, which could represent a substantial setback to such programs.

Even if our product candidates initially show promise in early clinical trials, the side effects of biological products are frequently only detectable after they are tested in larger, longer and more extensive clinical trials or, in some cases, after they are made available to patients on a commercial scale after approval. Sometimes, it can be difficult to determine if the serious adverse or unexpected side effects were caused by the product candidate or another factor, especially in oncology subjects who may suffer from other medical conditions and be taking other medications. If serious adverse or unexpected side effects are identified during development or after approval and

are determined to be attributed to our product candidate, we may be required to develop a REMS to ensure that the benefits of treatment with such product candidate outweigh the risks for each potential patient, which may include, among other things, a communication plan to health care practitioners, patient education, extensive patient monitoring or distribution systems and processes that are highly controlled, restrictive and more costly than what is typical for the industry. Product-related side effects could also result in potential product liability claims. Any of these occurrences may harm our business, financial condition and prospects significantly.

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

- regulatory authorities may suspend, withdraw or limit approvals of such product, or seek an injunction against its manufacture or distribution;
- regulatory authorities may require additional warnings on the label, including "boxed" warnings, or issue safety alerts, Dear Healthcare Provider letters, press releases or other communications containing warnings or other safety information about the product;
- we may be required to create a medication guide outlining the risks of such side effects for distribution to patients;
- we may be required to change the way a product is administered or conduct additional clinical trials;
- the product may become less competitive;
- we may decide to remove the product from the marketplace; and
- we may be subject to fines, injunctions or the imposition of civil or criminal penalties.

***Interim, topline and preliminary data from our clinical trials 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.***

From time to time, we may publicly disclose preliminary, interim or topline data from our preclinical studies and clinical trials, which is based on a preliminary analysis of then-available data, and the results and related findings and conclusions are subject to change as patient enrollment and treatment continues and more patient data become available. Adverse differences between previous preliminary or interim data and future interim or final data could significantly harm our business prospects. We may also announce topline data following the completion of a preclinical study or clinical trial, which may be subject to change following a more comprehensive review of the data related to the particular study or trial. We also make assumptions, estimations, calculations and conclusions as part of our analyses of data, and we may not have received or had the opportunity to fully and carefully evaluate all data. As a result, the interim, topline or preliminary results that we report may differ from future results of the same studies, or different conclusions or considerations may qualify such results, once additional data have been received and fully evaluated. Topline 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, interim, topline and preliminary data should be viewed with caution until the final data are available.

Further, others, including regulatory agencies, may not accept or agree with our assumptions, estimates, calculations, conclusions or analyses or may interpret or weigh the importance of data differently, which could impact the value of the particular program, the approvability or commercialization of the particular product candidate or product and our company in general. In addition, the information we choose to publicly disclose regarding a particular study or clinical trial is based on what is typically extensive information, and you or others may not agree with what we determine to be material or otherwise appropriate information to include in our disclosure.

***We may not ultimately receive or realize the potential benefits of orphan drug designation for any of our product candidates.***

We may seek orphan drug designation for certain of our product candidates. The FDA grants orphan designation to drugs that are intended to treat rare diseases with fewer than 200,000 patients in the United States or

that affect more than 200,000 persons but where there is no reasonable expectation to recover the costs of developing and marketing a treatment drug in the United States. While we previously received orphan drug designation for P-BCMA-101 for the treatment of relapsed/refractory multiple myeloma, if we apply, we may not receive this designation for P-BCMA-ALLO1 or any other product candidate in the future. In the United States, orphan drug designation entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages, and application fee waivers. After the FDA grants orphan drug designation, the generic identity of the drug and its potential orphan use are disclosed publicly by the FDA. However, orphan drug designation neither shortens the development time nor regulatory review time of a product candidate nor gives the candidate any advantage in the regulatory review or approval process.

In addition, if a product receives the first FDA approval for the indication for which it has orphan designation, the product is entitled to orphan drug exclusivity, which means the FDA may not approve any other application to market the same drug for the same indication for a period of seven years, except in limited circumstances, such as a showing of clinical superiority over the product with orphan exclusivity or where the manufacturer is unable to assure sufficient product quantity for the orphan patient population. Exclusive marketing rights in the United States may also be unavailable if we or our collaborators seek approval for an indication broader than the orphan designated indication and may be lost if the FDA later determines that the request for designation was materially defective. Even if we obtain orphan drug designation, we may not be the first to obtain marketing approval for any particular orphan indication due to the uncertainties associated with developing pharmaceutical products. Further, even if we obtain orphan drug exclusivity for a product candidate, that exclusivity may not effectively protect the product from competition because different drugs can be approved for the same condition.

***We may seek Regenerative Medicine Advanced Therapy, or RMAT, designation for certain of our product candidates; however, even if granted, such designations may not lead to a faster development or regulatory review or approval process and do not increase the likelihood that our product candidates will receive marketing approval.***

In 2017, the FDA established the RMAT designation as part of its implementation of the 21st Century Cures Act. An investigational drug is eligible for RMAT designation if: (1) it meets the definition of a regenerative medicine therapy, which is defined as a cell therapy, therapeutic tissue engineering product, human cell and tissue product, or any combination product using such therapies or products, with limited exceptions; (2) it is intended to treat, modify, reverse, or cure a serious disease or condition; and (3) preliminary clinical evidence indicates that the investigational drug has the potential to address unmet medical needs for such disease or condition. While we previously received RMAT designation for P-BCMA-101 for the treatment of multiple myeloma, if we apply, we may not receive this designation for any other product candidate in the future. RMAT designation provides potential benefits that include more frequent meetings with FDA to discuss the development plan for the product candidate, and eligibility for rolling review of BLAs and priority review. Product candidates granted RMAT designation may also be eligible for accelerated approval on the basis of a surrogate or intermediate endpoint reasonably likely to predict long-term clinical benefit, or reliance upon data obtained from a meaningful number of sites, including through expansion of clinical trials, as appropriate. RMAT-designated product candidates that receive accelerated approval may, as determined by the FDA, fulfill their post-approval requirements through the submission of clinical evidence, clinical studies, patient registries, or other sources of real-world evidence (such as electronic health records), through the collection of larger confirmatory data sets, or via post-approval monitoring of all patients treated with such therapy prior to approval of the therapy.

RMAT designation does not change the standards for product approval, and there is no assurance that such designation or eligibility for such designation will result in expedited review or approval or that the approved indication will not be narrower than the indication covered by the RMAT designation. Additionally, RMAT designation can be revoked if the criteria for eligibility cease to be met as clinical data emerges.

***Our product candidates must meet extensive regulatory requirements before they can be commercialized and any regulatory approval may contain limitations or conditions that require substantial additional development expenses or limit our ability to successfully commercialize the product.***

The clinical development, manufacturing, labeling, storage, record-keeping, advertising, promotion, import, export, marketing and distribution of our product candidates are subject to extensive regulation by the FDA in the

United States and by comparable foreign regulatory authorities in foreign markets. In the United States, we are not permitted to market our product candidates until we receive regulatory approval from the FDA. The process of obtaining regulatory approval is expensive, often takes many years following the commencement of clinical trials and can vary substantially based upon the type, complexity and novelty of the product candidates involved, as well as the target indications and patient population. Despite the time and expense invested in clinical development of product candidates, regulatory approval is never guaranteed.

To date, we have not submitted a BLA or other marketing authorization application to the FDA or similar drug approval submissions to comparable foreign regulatory authorities for any product candidate. Accelerated approval requires the data to indicate the drug candidate has an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit, or an effect on a clinical endpoint that can be measured earlier than an effect on irreversible morbidity or mortality that is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the availability or lack of alternative treatments. In particular, because the FDA has already approved therapies for certain of the indications our product candidates are designed to treat, and because additional drugs may be approved for these indications while we are developing our product candidates, it is difficult to predict whether accelerated approval will be possible for our product candidates at the time we expect to submit a BLA.

Prior to obtaining approval to commercialize a product candidate in the United States or abroad, we or our potential future collaborators must demonstrate with substantial evidence from adequate and well-controlled clinical trials, and to the satisfaction of the FDA or comparable foreign regulatory authorities, that such product candidates are safe and effective for their intended uses. Even if we believe the preclinical or clinical data for our product candidates are promising, such data may not be sufficient to support approval by the FDA and comparable foreign regulatory authorities. In particular, because we are seeking to identify and develop product candidates using new technologies, there is heightened risk that the FDA or other regulatory authorities may impose additional requirements prior to granting marketing approval, including enhanced safety studies or monitoring. Furthermore, as more product candidates within a particular class of products proceed through clinical development to regulatory review and approval, the amount and type of clinical data that may be required by regulatory authorities may increase or change.

The FDA or comparable foreign regulatory authorities can delay, limit or deny approval of a product candidate for many reasons, including:

- such authorities may disagree with the design or implementation of our clinical trials;
- negative or ambiguous results from our clinical trials or results may not meet the level of statistical significance required by the FDA or comparable foreign regulatory agencies for approval;
- serious and unexpected product-related side effects may be experienced by participants in our clinical trials or by individuals using biological products similar to our product candidates;
- the population studied in the clinical trial may not be sufficiently broad or representative to assure safety in the full population for which we seek approval;
- such authorities may not accept clinical data from trials which are conducted at clinical facilities or in countries where the standard of care is potentially different from that of the United States;
- we may be unable to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;
- such authorities may disagree with our interpretation of data from preclinical studies or clinical trials;
- such authorities may not agree that the data collected from clinical trials of our product candidates are acceptable or sufficient to support the submission of an application for regulatory approval or other submissions or to obtain regulatory approval in the United States or elsewhere, including due to clinical trial issues encountered as a result of COVID-19 pandemic, and such authorities may impose requirements for additional preclinical studies or clinical trials;

- such authorities may disagree regarding the formulation, labeling and/or the specifications of our product candidates;
- approval may be granted only for indications that are significantly more limited than what we apply for and/or with other significant restrictions on distribution and use;
- such authorities may fail to approve any required companion diagnostics to be used with our product candidates;
- such authorities may find deficiencies in the manufacturing processes or facilities used by us or our third-party manufacturers with which we or any of our potential future collaborators contract for clinical and commercial supplies; or
- the approval policies or regulations of such authorities may significantly change in a manner rendering our or any of our potential future collaborators' clinical data insufficient for approval.

With respect to foreign markets, approval procedures vary among countries and, in addition to the foregoing risks, may involve additional product testing, administrative review periods and agreements with pricing authorities. In addition, events raising questions about the safety of certain marketed pharmaceuticals may result in increased cautiousness by the FDA and comparable foreign regulatory authorities in reviewing new products based on safety, efficacy or other regulatory considerations and may result in significant delays in obtaining regulatory approvals.

Even if we eventually complete clinical trials and receive approval to commercialize our product candidates, the FDA or comparable foreign regulatory authority may grant approval contingent on the performance of costly additional clinical trials, including Phase 4 clinical trials, and/or the implementation of a REMS. The FDA or the comparable foreign regulatory authority also may approve a product candidate for a more limited indication or patient population than we originally requested or may not approve the labeling that we believe is necessary or desirable for the successful commercialization of a product. Manufacturers of our products and manufacturers' facilities are also required to comply with cGMP regulations, which include requirements related to quality control and quality assurance, as well as the corresponding maintenance of records and documentation. Further, regulatory authorities must approve these manufacturing facilities before they can be used to manufacture our products, and these facilities are subject to continual review and periodic inspections by the FDA and other comparable foreign regulatory authorities for compliance with cGMP regulations.

Any delay in obtaining, or inability to obtain, applicable regulatory approval would delay or prevent commercialization of that product candidate and would materially and adversely impact our business and prospects.

***Even if we receive regulatory approval for any of our product candidates, we will be subject to ongoing obligations and continued regulatory review, which may result in significant additional expense. Additionally, our product candidates, if approved, could be subject to labeling and other restrictions and market withdrawal and we may be subject to penalties if we fail to comply with regulatory requirements or experience unanticipated problems with our products.***

If the FDA, EMA or any other comparable regulatory authority approves any of our product candidates, the manufacturing processes, labeling, packaging, distribution, adverse event reporting, storage, advertising, promotion and recordkeeping for the product will be subject to extensive and ongoing regulatory requirements. These requirements include submissions of safety and other post-marketing information and reports, registration requirements and continued compliance with cGMPs and GCP, for any clinical trials that we conduct post-approval. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with our pilot manufacturing facility, third-party manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may result in, among other things:

- restrictions on the marketing or manufacturing of the product, withdrawal of the product from the market, or voluntary product recalls;
- fines, untitled or warning letters or holds on clinical trials;

- refusal by the FDA, the EMA or any other comparable regulatory authority to approve pending applications or supplements to approved applications filed by us, or suspension or revocation of product approvals;
- product seizure or detention, or refusal to permit the import or export of products; and
- injunctions or the imposition of civil or criminal penalties.

Moreover, if any of our product candidates are approved, our product labeling, advertising and promotion will be subject to regulatory requirements and continuing regulatory review. The FDA strictly regulates the promotional claims that may be made about biopharmaceutical products. In particular, a product may not be promoted for uses that are not approved by the FDA as reflected in the product's approved labeling.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response and could generate negative publicity. The occurrence of any event or penalty described above may inhibit our or our collaborators' ability to commercialize our product candidates, and harm our business, financial condition and results of operations.

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

We also 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. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements, or if we are unable to maintain regulatory compliance, marketing approval that has been obtained may be lost and we may not achieve or sustain profitability.

***Disruptions at the FDA and other government agencies caused by funding shortages or global health concerns could hinder their ability to hire, retain or deploy key leadership and other personnel, or otherwise prevent new or modified products from being developed, or approved or commercialized in a timely manner or at all, 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, statutory, regulatory, and policy changes, the FDA's ability to hire and retain key personnel and accept the payment of user fees, and other events that may otherwise affect the FDA's ability to perform routine functions. Average review times at the agency have fluctuated in recent years as a result. In addition, government funding of other government agencies 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 biologics to be reviewed and/or approved by necessary government agencies, which would adversely affect our business. For example, over the last several years, including for 35 days beginning on December 22, 2018, the U.S. government has shut down several times and certain regulatory agencies, such as the FDA, have had to furlough critical FDA employees and stop critical activities.

Separately, in response to the global COVID-19 pandemic, the FDA postponed most foreign and domestic inspections of manufacturing facilities and products for several months during 2020 and only resumed them on a risk-based basis, incorporating remote monitoring methods as well. Regulatory authorities outside the United States adopted similar restrictions and policy measures in response to the COVID-19 pandemic. If a prolonged government shutdown occurs, or if global health concerns prevent the FDA or other regulatory authorities from conducting their regular inspections, reviews, or other regulatory activities, it could significantly impact the ability of the FDA or other regulatory authorities to timely review and process our regulatory submissions, which could have a material adverse effect on our business.

***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 must prioritize our research programs and will need to focus our discovery and development on select product candidates and indications. Correctly prioritizing our research and development activities is particularly important for us due to the breadth of potential product candidates and indications that we believe could be pursued using our platform technologies. As a result, we may forego or delay pursuit of opportunities with other product candidates or for other indications that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable products. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may also relinquish valuable rights to that product candidate through collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate.

***We may not be successful in our efforts to identify or discover additional product candidates in the future.***

Our research programs may initially show promise in identifying potential product candidates, yet fail to yield product candidates for clinical development for a number of reasons, including:

- our inability to design such product candidates with the properties that we desire; or
- potential product candidates may, on further study, be shown to have harmful side effects or other characteristics that indicate that they are unlikely to be products that will receive marketing approval and achieve market acceptance.

Research programs to identify new product candidates require substantial technical, financial and human resources. If we are unable to identify suitable additional candidates for preclinical and clinical development, our opportunities to successfully develop and commercialize therapeutic products will be limited.

**Risks Related to Manufacturing, Commercialization and Reliance on Third Parties**

***We rely on third parties to conduct our clinical trials and perform some of our research and preclinical studies. If these third parties do not satisfactorily carry out their contractual duties or fail to meet expected deadlines, our development programs may be delayed or subject to increased costs, each of which may have an adverse effect on our business and prospects.***

We do not have the ability to conduct all aspects of our preclinical testing or clinical trials ourselves. As a result, we are and expect to remain dependent on third parties to conduct our ongoing clinical trials and any future clinical trials of our product candidates. Specifically, CROs, clinical investigators, and consultants play a significant role in the conduct of these trials and the subsequent collection and analysis of data. However, we will not be able to control all aspects of their activities. Nevertheless, we are responsible for ensuring that each of our trials is conducted in accordance with the applicable protocol and legal, regulatory and scientific standards, and our reliance on the CROs and other third parties does not relieve us of our regulatory responsibilities. We and our CROs are required to comply with GCP requirements, which are regulations and guidelines enforced by the FDA, the Competent Authorities of the Member States of the European Economic Area, and comparable foreign regulatory authorities for all of our product candidates in clinical development. Regulatory authorities enforce these GCP requirements through periodic inspections of trial sponsors, clinical trial investigators and clinical trial sites. If we or any of our CROs or clinical trial sites fail to comply with applicable GCP requirements, the data generated in our clinical trials may be deemed unreliable, and the FDA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. In addition, our clinical trials must be conducted with product produced under cGMP regulations. Our failure to comply with these regulations may require us to stop and/or repeat clinical trials, which would delay the marketing approval process.

There is no guarantee that any such CROs, clinical trial investigators or other third parties on which we rely will devote adequate time and resources to our development activities or perform as contractually required. These risks are heightened as a result of the efforts of government agencies and the CROs themselves to limit the spread of COVID-19, including quarantines and shelter-in-place orders. If any of these third parties fail to meet expected deadlines, adhere to our clinical protocols or meet regulatory requirements, otherwise performs in a substandard manner, or terminates its engagement with us, the timelines for our development programs may be extended or delayed or our development activities may be suspended or terminated. If any of our clinical trial sites terminates for any reason, we may experience the loss of follow-up information on subjects enrolled in such clinical trials unless we are able to transfer those subjects to another qualified clinical trial site, which may be difficult or impossible. In addition, clinical trial investigators for our clinical trials may serve as scientific advisors or consultants to us from time to time and may receive cash or equity compensation in connection with such services. If these relationships and any related compensation result in perceived or actual conflicts of interest, or the FDA or any comparable foreign regulatory authority concludes that the financial relationship may have affected the interpretation of the trial, the integrity of the data generated at the applicable clinical trial site may be questioned and the utility of the clinical trial itself may be jeopardized, which could result in the delay or rejection of any marketing application we submit by the FDA or any comparable foreign regulatory authority. Any such delay or rejection could prevent us from commercializing our product candidates.

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

***We or the third parties on which we rely for the manufacturing and supply of certain of our product candidates for use in preclinical testing and clinical trials, may not be able to establish or maintain supply of our product candidates that is of satisfactory quality and quantity.***

We produce in our laboratory relatively small quantities of product for evaluation in our research programs. We have relied on, and will continue to rely on, third parties for the manufacture of certain of our product candidates for preclinical and clinical testing and may rely on such third parties for commercial manufacture if any of our product candidates are approved. We currently have limited manufacturing arrangements and expect that each of our product candidates will only be covered by single source suppliers for the foreseeable future. This reliance increases the risk that we will not have sufficient quantities of our product candidates or products, if approved, or such quantities at an acceptable cost or quality, which could delay, prevent or impair our development or commercialization efforts.

Furthermore, all entities involved in the preparation of therapeutics for clinical trials or commercial sale, including ourselves and our existing contract manufacturers for our product candidates, are subject to extensive regulation. Components of a finished therapeutic product approved for commercial sale or used in clinical trials must be manufactured in accordance with cGMP requirements. These regulations govern manufacturing processes and procedures, including record keeping, and the implementation and operation of quality systems to control and assure the quality of investigational products and products approved for sale. Poor control of production processes can lead to the introduction of contaminants, or to inadvertent changes in the properties or stability of our product candidates that may not be detectable in final product testing. We or our contract manufacturers must supply all necessary documentation in support of a BLA on a timely basis and must adhere to the FDA's Good Laboratory Practice regulations and cGMP regulations enforced by the FDA through its facilities inspection program. Comparable foreign regulatory authorities may require compliance with similar requirements. Our facilities and quality systems, and those of our third-party contract manufacturers, must pass a pre-approval inspection for compliance with the applicable regulations as a condition of marketing approval of our product candidates. We do not control the manufacturing activities of, and are completely dependent on, our contract manufacturers for compliance with cGMP regulations.

In the event that any of our manufacturers fails to comply with such requirements or to perform its obligations to us in relation to quality, timing or otherwise, or if our supply of components or other materials becomes limited or interrupted for other reasons, we may be forced to manufacture the materials ourselves, for which we may not have

the capabilities or resources, or enter into an agreement with another third-party, which we may not be able to do on commercially reasonable terms, if at all. In particular, any replacement of our manufacturers could require significant effort and expertise because there may be a limited number of qualified replacements. In some cases, the technical skills or technology required to manufacture our product candidates may be unique or proprietary to the original manufacturer and we may have difficulty transferring such skills or technology to another third-party and a feasible alternative may not exist. In addition, certain of our product candidates and our own proprietary methods have never been produced or implemented outside of our company, and we may therefore experience delays to our development programs if and when we attempt to establish new third-party manufacturing arrangements for these product candidates or methods. These factors would increase our reliance on such manufacturer or require us to obtain a license from such manufacturer in order to have another third-party manufacture our product candidates. If we are required to or voluntarily change manufacturers for any reason, we will be required to verify that the new manufacturer maintains facilities and procedures that comply with quality standards and with all applicable regulations and guidelines. The delays associated with the verification of a new manufacturer could negatively affect our ability to develop product candidates in a timely manner or within budget.

Our or a third-party's failure to execute on our manufacturing requirements, do so on commercially reasonable terms and comply with cGMP could adversely affect our business in a number of ways, including:

- an inability to initiate or continue clinical trials of our product candidates under development;
- delay in submitting regulatory applications, or receiving marketing approvals, for our product candidates;
- loss of the cooperation of future collaborators;
- subjecting third-party manufacturing facilities or our manufacturing facilities to additional inspections by regulatory authorities;
- requirements to cease development or to recall batches of our product candidates; and
- in the event of approval to market and commercialize our product candidates, an inability to meet commercial demands for our product or any other future product candidates.

***We operate a pilot manufacturing facility to develop and manufacture preclinical and clinical materials for all of our CAR-T product candidates which requires significant resources. A failure to successfully operate our pilot facility could lead to substantial delays and adversely affect our research and development efforts, including clinical trials, and the future commercial viability, if approved, of our CAR-T product candidates.***

Our pilot manufacturing facility is validated, qualified and fully operational and we intend to transition manufacturing from external CMOs and will develop and manufacture preclinical and clinical materials for clinical trials for all of our CAR-T product candidates, including P-BCMA-ALLO1 and P-MUC1C-ALLO1 at our pilot manufacturing facility. While we will continue to source raw materials from external CMOs, we expect our pilot manufacturing facility to be the sole source supplier of clinical materials for our clinical trials. This sole source reliance increases the risk that we will not have sufficient quantities of our CAR-T product candidates at an acceptable cost or quality, which could delay, prevent or impair our development or commercialization efforts, if approved. If we are unable to manufacture sufficient preclinical or clinical materials at our pilot manufacturing facility we may be forced to contract with external CMOs, which we may not be able to do on commercially reasonable terms, if at all. Even if commercially reasonable terms are available, any transition of manufacturing from our pilot manufacturing facility to an external CMO could be time-consuming and require significant effort and expertise because there may be a limited number of qualified replacements. In some cases, the technical skills or technology required to manufacture our CAR-T product candidates may be unique or proprietary and we may have difficulty transferring such skills or technology to another CMO and a feasible alternative may not exist. If we fail to manufacture at our pilot manufacturing facility, or obtain from a CMO, a sufficient supply of clinical materials for our clinical trials in accordance with applicable specifications on a timely basis, our research and development efforts, including clinical trials, the future commercial viability, if approved, of our CAR-T product candidates, and our business, financial condition, results of operations and growth prospects could be materially adversely affected.

***Manufacturing genetically engineered products is complex and we or our third-party manufacturers may encounter difficulties in production. If we or any of our third-party manufacturers encounter such difficulties, our ability to provide supply of our product candidates for clinical trials or our products for patients, if approved, could be delayed or prevented.***

Manufacturing genetically engineered products is complex and may require the use of innovative technologies to handle living cells. Manufacturing these products requires facilities specifically designed for and validated for this purpose and sophisticated quality assurance and quality control procedures are necessary. Slight deviations anywhere in the manufacturing process, including filling, labeling, packaging, storage and shipping and quality control and testing, may result in lot failures, product recalls or spoilage. When changes are made to the manufacturing process, we may be required to provide preclinical and clinical data showing the comparable identity, strength, quality, purity or potency of the products before and after such changes. If microbial, viral or other contaminations are discovered at manufacturing facilities, such facilities may need to be closed for an extended period of time to investigate and remedy the contamination, which could delay clinical trials and adversely harm our business. The use of biologically derived ingredients can also lead to allegations of harm, including infections or allergic reactions, or closure of product facilities due to possible contamination.

In addition, there are risks associated with large scale manufacturing for clinical trials or commercial scale including, among others, cost overruns, potential problems with process scale-up, process reproducibility, stability issues, compliance with good manufacturing practices, lot consistency and timely availability of raw materials. Even if we obtain marketing approval for any of our product candidates, there is no assurance that we or our manufacturers will be able to manufacture the approved product to specifications acceptable to the FDA or other comparable foreign regulatory authorities, to produce it in sufficient quantities to meet the requirements for the potential commercial launch of the product or to meet potential future demand. If we or our manufacturers are unable to produce sufficient quantities for clinical trials or for commercialization, our development and commercialization efforts would be impaired, which would have an adverse effect on our business, financial condition, results of operations and growth prospects.

***Changes in methods of product candidate manufacturing may result in additional costs or delays.***

As product candidates progress through preclinical to late-stage clinical trials to marketing approval and commercialization, it is common that various aspects of the development program, such as manufacturing methods, are altered along the way in an effort to optimize yield, manufacturing batch size, minimize costs and achieve consistent quality and results. Such changes carry the risk that they will not achieve these intended objectives. Any of these changes could cause our product candidates to perform differently and affect the results of planned clinical trials or other future clinical trials conducted with the altered materials. This could delay completion of clinical trials, require the conduct of bridging clinical trials or the repetition of one or more clinical trials, increase clinical trial costs, delay approval of our product candidates and jeopardize our ability to commercialize our product candidates and generate revenue.

***Any approved products may fail to achieve the degree of market acceptance by physicians, patients, hospitals, cancer treatment centers, healthcare payors and others in the medical community necessary for commercial success.***

If any of our product candidates receive marketing approval, they may nonetheless fail to gain sufficient market acceptance by physicians, patients, healthcare payors and others in the medical community. For example, current cancer treatments like chemotherapy and radiation therapy are well established in the medical community, and physicians may continue to rely on these treatments. Most of our product candidates target mechanisms for which there are limited or no currently approved products, which may result in slower adoption by physicians, patients and payors. If our product candidates do not achieve an adequate level of acceptance, we may not generate significant product revenue and we may not become profitable. The degree of market acceptance of our product candidates, if approved for commercial sale, will depend on a number of factors, including:

- efficacy and potential advantages compared to alternative treatments;
- our ability to offer our products for sale at competitive prices;

- convenience and ease of administration compared to alternative treatments;
- the willingness of the target patient population to try new therapies and of physicians to prescribe these therapies;
- the availability of coverage and adequate reimbursement from third party payors;
- the strength of marketing and distribution support; and
- the prevalence and severity of any side effects.

***We may not be able to successfully commercialize our product candidates due to unfavorable pricing regulations or third-party coverage and reimbursement policies, which could make it difficult for us to sell our product candidates profitably.***

Obtaining coverage and reimbursement approval for a product from a government or other third-party payor is a time-consuming and costly process, with uncertain results, that could require us to provide supporting scientific, clinical and cost effectiveness data for the use of our products to the payor. There may be significant delays in obtaining such coverage and reimbursement for newly approved products, and coverage may not be available, or may be more limited than the purposes for which the product is approved by the FDA or comparable foreign regulatory authorities. Moreover, eligibility for coverage and reimbursement does not imply that a product will be paid for in all cases or at a rate that covers our costs, including research, development, intellectual property, manufacture, sale and distribution expenses. Interim reimbursement levels for new products, if applicable, may also not be sufficient to cover our costs and may not be made permanent. Reimbursement rates may vary according to the use of the product and the clinical setting in which it is used, may be based on reimbursement levels already set for lower cost products and may be incorporated into existing payments for other services. Net prices for products may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors, by any future laws limiting drug prices and by any future relaxation of laws that presently restrict imports of product from countries where they may be sold at lower prices than in the United States.

There is significant uncertainty related to the insurance coverage and reimbursement of newly approved products. In the United States, there is no uniform policy among third-party payors for coverage and reimbursement. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting reimbursement policies, but also have their own methods and approval process apart from Medicare coverage and reimbursement determinations. Therefore, 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.

Coverage and reimbursement by a third-party payor may depend upon a number of factors, including the third-party payor's determination that use of a product is:

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

We cannot be sure that reimbursement will be available for any product that we commercialize and, if coverage and reimbursement are available, what the level of reimbursement will be. Our inability to promptly obtain coverage and adequate reimbursement rates from both government-funded and private payors for any approved products 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.

Reimbursement may impact the demand for, and the price of, any product for which we obtain marketing approval. Assuming we obtain coverage for a given product by a third-party payor, the resulting reimbursement payment rates may not be adequate or may require co-payments that patients find unacceptably high. Patients who

are prescribed medications for the treatment of their conditions, and their prescribing physicians, generally rely on third-party payors to reimburse all or part of the costs associated with those medications. Patients are unlikely to use our products unless coverage is provided and reimbursement is adequate to cover all or a significant portion of the cost of our products. Therefore, coverage and adequate reimbursement is critical to a new product's acceptance. Coverage decisions may depend upon clinical and economic standards that disfavor new products when more established or lower cost therapeutic alternatives are already available or subsequently become available.

For products administered under the supervision of a physician, obtaining coverage and adequate reimbursement may be particularly difficult because of the higher prices often associated with such drugs. Additionally, separate reimbursement for the product itself may or may not be available. Instead, the hospital or administering physician may be reimbursed only for providing the treatment or procedure in which our product is used. Further, from time to time, the Centers for Medicare & Medicaid Services, or CMS, revises the reimbursement systems used to reimburse health care providers, including the Medicare Physician Fee Schedule and Hospital Outpatient Prospective Payment System, which may result in reduced Medicare payments.

We expect to experience pricing pressures in connection with the sale of any of our product candidates due to the trend toward managed healthcare, the increasing influence of health maintenance organizations, and additional legislative changes. The downward pressure on healthcare costs in general, particularly prescription medicines, medical devices and surgical procedures and other treatments, has become very intense. As a result, increasingly high barriers are being erected to the successful commercialization of new products. Further, the adoption and implementation of any future governmental cost containment or other health reform initiative may result in additional downward pressure on the price that we may receive for any approved product.

Additionally, we or collaborators may develop companion diagnostic tests for use with our product candidates. We, or our collaborators, will be required to obtain coverage and reimbursement for these tests separate and apart from the coverage and reimbursement we may seek for our product candidates. While we have not yet developed any companion diagnostic tests for our product candidates, if we do, there is significant uncertainty regarding our ability to obtain coverage and adequate reimbursement for the same reasons applicable to our product candidates.

Outside of the United States, many countries require approval of the sale price of a product before it can be marketed, and the pricing review period only begins after marketing or product licensing approval is granted. To obtain reimbursement or pricing approval in some of these countries, we may be required to conduct a clinical trial that compares the cost-effectiveness of our product candidate to other available therapies. 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 candidate in a particular country, but then be subject to price regulations that delay our commercial launch of the product, possibly for lengthy time periods, and negatively impact the revenue, if any, 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 such product candidates obtain marketing approval.

***Our product candidates for which we intend to seek approval as biologic products may face competition sooner than anticipated.***

The Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, or collectively, the Affordable Care Act, signed into law on March 23, 2010, includes a subtitle called the Biologics Price Competition and Innovation Act of 2009, or BPCIA, which created an abbreviated approval pathway for biological products that are biosimilar to or interchangeable with an FDA-licensed reference biological product. Under the BPCIA, an application for a biosimilar product may not be submitted to the FDA until four years following the date that the reference product was first licensed by the FDA. In addition, the approval of a biosimilar product may not be made effective by the FDA until 12 years from the date on which the reference product was first licensed. During this 12-year period of exclusivity, another company may still market a competing version of the reference product if the FDA approves a full BLA for the competing product containing the sponsor's own preclinical data and data from adequate and well-controlled clinical trials to demonstrate the safety, purity and potency of their product.

We believe that any of our product candidates approved as a biological product under a BLA should qualify for the 12-year period of exclusivity. However, there is a risk that this exclusivity could be shortened due to congressional action or otherwise, or that the FDA will not consider our product candidates to be reference products for competing products, potentially creating the opportunity for generic competition sooner than anticipated. Other aspects of the BPCIA, some of which may impact the BPCIA exclusivity provisions, have also been the subject of recent litigation. Moreover, the extent to which a biosimilar, once approved, will be substituted for any one of our reference products in a way that is similar to traditional generic substitution for non-biological products is not yet clear, and will depend on a number of marketplace and regulatory factors that are still developing.

If any approved products are subject to biosimilar competition sooner than we expect, we will face significant pricing pressure and our commercial opportunity will be limited.

***If the market opportunities for any of our product candidates are smaller than we believe they are, our revenue may be adversely affected, and our business may suffer.***

We are focused initially on the development of treatments for cancer. Our projections of addressable patient populations that have the potential to benefit from treatment with our product candidates are based on estimates. If any of our estimates are inaccurate, the market opportunities for any of our product candidates could be significantly diminished and have an adverse material impact on our business.

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

Because we rely on third parties to research and develop and to manufacture our product candidates, we must share trade secrets with them. We seek to protect our proprietary technology in part by entering into confidentiality agreements and, if applicable, material transfer agreements, consulting agreements or other similar agreements with our advisors, employees, third-party contractors and consultants prior to beginning research or disclosing proprietary information. These agreements typically limit the rights of the third parties to use or disclose our confidential information, including our trade secrets. Despite the contractual provisions employed when working with third parties, the need to share trade secrets and other confidential information increases the risk that such trade secrets become known by our competitors, are inadvertently incorporated into the technology of others, or are disclosed or used in violation of these agreements. Given that our proprietary position is based, in part, on our know-how and trade secrets, a competitor's independent discovery of our trade secrets or other unauthorized use or disclosure would impair our competitive position and may have a material adverse effect on our business.

In addition, these agreements typically restrict the ability of our advisors, employees, third-party contractors and consultants to publish data potentially relating to our trade secrets, although our agreements may contain certain limited publication rights. For example, any academic institution that we may collaborate with will likely expect to be granted rights to publish data arising out of such collaboration and any joint research and development programs may require us to share trade secrets under the terms of our research and development or similar agreements. Despite our efforts to protect our trade secrets, our competitors may discover our trade secrets, either through breach of our agreements with third parties, independent development or publication of information by any of our third-party collaborators. A competitor's discovery of our trade secrets would impair our competitive position and have an adverse impact on our business.

***If any of our product candidates are approved for marketing and commercialization and we are unable to establish sales and marketing capabilities or enter into agreements with third parties to sell and market our product candidates, we will be unable to successfully commercialize our product candidates if and when they are approved.***

We have no sales, marketing or distribution capabilities or experience. To achieve commercial success for any approved product for which we retain sales and marketing responsibilities, we must either develop a sales and marketing organization, which would be expensive and time consuming, or outsource these functions to other third parties. In the future, we may choose to build a focused sales and marketing infrastructure to sell, or participate in sales activities with our collaborators for, some of our product candidates if and when they are approved.

There are risks involved with both establishing our own sales and marketing capabilities and entering into arrangements with third parties to perform these services. For example, recruiting and training a sales force is expensive and time consuming and could delay any product launch. If the commercial launch of a product candidate for which we recruit a sales force and establish marketing capabilities is delayed or does not occur for any reason, we would have prematurely or unnecessarily incurred these commercialization expenses. This may be costly, and our investment would be lost if we cannot retain or reposition our sales and marketing personnel.

Factors that may inhibit our efforts to commercialize future 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 physicians or educate an adequate numbers of physicians regarding the benefits of any product, once approved;
- 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 portfolios; and
- unforeseen costs and expenses associated with creating an independent sales and marketing organization.

If we enter into arrangements with third parties to perform sales, marketing and distribution services, our product revenue or the profitability of these product revenue to us are likely to be lower than if we were to market and sell any products that we develop ourselves. In addition, we may not be successful in entering into arrangements with third parties to sell and market our product candidates or may be unable to do so on terms that are favorable to us. In entering into third-party marketing or distribution arrangements, any revenue we receive will depend upon the efforts of the third parties and we cannot assure you that such third parties will establish adequate sales and distribution capabilities or devote the necessary resources and attention to sell and market any future 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.

***Even if we obtain FDA approval of any of our product candidates, we may never obtain approval or commercialize such products outside of the United States, which would limit our ability to realize their full market potential.***

In order to market any products outside of the United States, we must establish and comply with numerous and varying regulatory requirements of other countries regarding safety and efficacy. Clinical trials conducted in one country may not be accepted by regulatory authorities in other countries, and regulatory approval in one country does not mean that regulatory approval will be obtained in any other country. Approval procedures vary among countries and can involve additional product testing and validation and additional administrative review periods. Seeking foreign regulatory approvals could result in significant delays, difficulties and costs for us and may require additional preclinical studies or clinical trials which would be costly and time consuming. Regulatory requirements can vary widely from country to country and could delay or prevent the introduction of our products in those countries. Satisfying these and other regulatory requirements is costly, time consuming, uncertain and subject to unanticipated delays. In addition, our failure to obtain regulatory approval in any country may delay or have negative effects on the process for regulatory approval in other countries. We do not have any product candidates approved for sale in any jurisdiction, including international markets, and we do not have experience in obtaining regulatory approval in international markets. If we fail to comply with regulatory requirements in international markets or to obtain and maintain required approvals, our ability to realize the full market potential of our products will be harmed.

**Risks Related to Our In-Licenses and Other Strategic Agreements**

***We are currently party to several in-license agreements under which we acquired rights to use, develop, manufacture and/or commercialize certain of our platform technologies and resulting product candidates. If we breach our obligations under these agreements, we may be required to pay damages, lose our rights to these technologies or both, which would adversely affect our business and prospects.***

We rely, in part, on license and other strategic agreements, which subject us to various obligations, including diligence obligations with respect to development and commercialization activities, payment obligations for achievement of certain milestones and royalties on product sales, negative covenants and other material obligations. For example, with respect to P-BCMA-ALLO1, P-CD19CD20-ALLO1 and P-PSMA-ALLO1, we have licensed heavy-chain-only binders under agreements with TeneoBio, Inc. (a subsidiary of Amgen, Inc.), or TeneoBio, with respect to P-MUC1C-ALLO1, we have licensed a binder under our agreement with Xyone Therapeutics, Inc. (a successor-in-interest to Genus Oncology, LLC), or Xyone, with respect to our additional dual CAR programs and other allogeneic preclinical programs we have licensed and may continue to license binders under our agreements with TeneoBio, and with respect to our Cas-CLOVER gene editing technology, which we use in the manufacture of P-BCMA-ALLO1, P-MUC1C-ALLO1, P-CD19CD20-ALLO1 and future allogeneic products, we have licensed certain intellectual property under an agreement with Helmholtz-Zentrum München—Deutsches Forschungszentrum für Gesundheit und Umwelt GmbH. If we fail to comply with the obligations under our license agreements, including as a result of COVID-19 impacting our operations, or use the intellectual property licensed to us in an unauthorized manner, we may be required to pay damages and our licensors may have the right to terminate the license. If our license agreements are terminated, we may not be able to develop, manufacture, market or sell the products covered by our agreements and those being tested or approved in combination with such products. Such an occurrence could materially adversely affect the value of the product candidates being developed under any such agreement.

In addition, the agreements under which we license intellectual property or technology to or from third parties are complex, and certain provisions in such agreements may be susceptible to multiple interpretations. The resolution of any contract interpretation disagreement that may arise could narrow what we believe to be the scope of our rights to the relevant intellectual property or technology or increase what we believe to be our financial or other obligations under the relevant agreement, either of which could have a material adverse effect on our business, financial condition, results of operations and prospects. Moreover, if disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on commercially acceptable terms, we may be unable to successfully develop and commercialize the affected product candidates.

Our business also would suffer if any current or future licensors fail to abide by the terms of the license, if the licensors fail to enforce licensed patents against infringing third parties, if the licensed patents or other rights are found to be invalid or unenforceable, or if we are unable to enter into necessary licenses on acceptable terms. Moreover, our licensors may own or control intellectual property that has not been licensed to us and, as a result, we may be subject to claims, regardless of their merit, that we are infringing or otherwise violating the licensor's rights.

In addition, while we cannot currently determine the amount of the royalty obligations we would be required to pay on sales of future products, if any, the amounts may be significant. The amount of our future royalty obligations will depend on the technology and intellectual property we use in products that we successfully develop and commercialize, if any. Therefore, even if we successfully develop and commercialize products, we may be unable to achieve or maintain profitability.

If we are unable to successfully obtain rights to required third-party intellectual property rights or maintain the existing intellectual property rights we have, we may have to abandon development of the relevant research programs or product candidates and our business, financial condition, results of operations and prospects could suffer.

***We may not realize the benefits of any acquisitions, in-license or strategic alliances that we enter into or fail to capitalize on programs that may present a greater commercial opportunity or for which there is a greater likelihood of success.***

Our business depends upon our ability to identify, develop and commercialize research programs or product candidates. A key element of our business strategy is to discover and develop additional programs based upon our core proprietary platforms, including our non-viral piggyBac DNA Delivery System, Cas-CLOVER Site-specific Gene Editing System and nanoparticle- and AAV-based gene delivery technologies. In addition to internal research and development efforts, we are also seeking to do so through strategic collaborations, such as our collaborations with Roche and Takeda, and may also explore additional strategic collaborations for the discovery of new programs. We have also entered into in-license agreements with multiple licensors and in the future may seek to enter into acquisitions or additional licensing arrangements with third parties that we believe will complement or augment our existing technologies and product candidates.

These transactions can entail numerous operational and financial risks, including exposure to unknown liabilities, disruption of our business and diversion of our management's time and attention in order to manage a collaboration or develop acquired products, product candidates or technologies, incurrence of substantial debt or dilutive issuances of equity securities to pay transaction consideration or costs, higher than expected development or manufacturing costs, higher than expected personnel and other resource commitments, higher than expected collaboration, acquisition or integration costs, write-downs of assets or goodwill or impairment charges, increased amortization expenses, difficulty and cost in facilitating the collaboration or combining the operations and personnel of any acquired business, impairment of relationships with key suppliers, manufacturers or customers of any acquired business due to changes in management and ownership and the inability to retain key employees of any acquired business. As a result, if we enter into acquisition or in-license agreements or strategic partnerships, we may not be able to realize the benefit of such transactions if we are unable to successfully integrate them with our existing operations and company culture, or if there are materially adverse impacts on our or the counterparty's operations resulting from COVID-19, which could delay our timelines or otherwise adversely affect our business. Further, because we have limited resources, we must choose to pursue and fund the development of specific types of treatment, or treatment for a specific type of cancer, and we may forego or delay pursuit of opportunities with certain programs or products or for indications that later prove to have greater commercial potential. Our estimates regarding the potential market for our program could be inaccurate, and if we do not accurately evaluate the commercial potential for a particular program, we may relinquish valuable rights to that program through a strategic collaboration, licensing or other arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such program. Alternatively, we may allocate internal resources to a program in which it would have been more advantageous to enter into a partnering arrangement. If any of these events occur, we may be forced to abandon or delay our development efforts with respect to a particular product candidate or fail to develop a potentially successful program.

***Our collaborators may not devote sufficient resources to the development or commercialization of our product candidates or may otherwise fail in development or commercialization efforts, which could adversely affect our ability to develop or commercialize certain of our product candidates and our financial condition and operating results.***

We have, with respect to our collaborations with Roche and Takeda, and will likely have, with respect to any additional collaboration arrangements with any third parties, limited control over the amount and timing of resources that our collaborators dedicate to the development or commercialization of our product candidates. For example, while we expect to collaborate with Takeda on the development of up to six *in vivo* gene therapy programs, only two such programs have been designated by Takeda and we cannot guarantee that Takeda will elect to pursue development of additional gene therapy programs under the collaboration. Similarly, while we expect to collaborate with Roche on the development of up to ten allogeneic CAR-T cell therapy programs and have granted to Roche an option to acquire licenses under certain of our intellectual property to develop, manufacture and commercialize products for up to three solid tumor targets, only two such programs have been designated by Roche and we cannot guarantee that Roche will elect to pursue development of additional cell therapy programs under the Roche Collaboration Agreement. In each case, a decision by Roche or Takeda to pursue less than the maximum number of targets or programs available for collaboration under their respective collaboration agreements will limit the potential payments we may receive under such collaboration agreements, delay our development timelines or otherwise adversely affect our business. In general, our ability to generate revenues from these arrangements will

depend on our collaborators' abilities to successfully perform the functions assigned to them in these arrangements and otherwise to comply with their contractual obligations.

Any of our existing or future collaborations may not ultimately be successful, which could have a negative impact on our business, results of operations, financial condition and growth prospects. In addition, the terms of any such collaboration or other arrangement may not prove to be favorable to us or may not be perceived as favorable, which may negatively impact the trading price of our common stock. In some cases, we may be responsible for continuing development or manufacture of a product or product candidate or research program under collaboration and the payment we receive from our partner may be insufficient to cover the cost of this development or manufacture of product. For example, under the Takeda Collaboration Agreement, we are obligated to perform certain platform development activities at our own cost. In addition, under the Roche Collaboration Agreement, while Roche is obligated to reimburse us for a specified percentage of certain costs incurred in performance of development activities relating to P-BCMA-ALLO1 and P-CD19CD20-ALLO1, we will be responsible for the balance and the amount Roche is obligated to reimburse us is subject to a maximum cap.

Conflicts may arise between us and our collaborators, such as conflicts concerning the interpretation of clinical data, the achievement of milestones, the division of development responsibilities or expenses, development plans, the interpretation of financial provisions, or the ownership of intellectual property developed during the collaboration. If any such conflicts arise, a collaborator could act in its own self-interest, which may be adverse to our best interests. Any such disagreement between us and a collaborator could delay or prevent the development or commercialization of our product candidates.

Further, we are subject to the following additional risks associated with our current and any future collaborations with third parties, the occurrence of which could cause our collaboration arrangements to fail:

- 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 collaborator's strategic focus or available funding or external factors such as an acquisition that diverts resources or creates competing priorities;
- collaborators may enter into arrangements with our competitors and may prioritize their own programs or those of third parties, over ours;
- collaborators may not always be cooperative or responsive in providing their services in clinical trials, may fail in their development or commercialization efforts with our product candidate, in which event the development and commercialization of such product candidate could be delayed or terminated;
- collaborators may delay clinical trials, insufficiently fund a clinical trial program, stop a clinical trial, abandon a product candidate, repeat or conduct new clinical trials, or require a new formulation of a product candidate for clinical testing;
- collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our products or product candidates if the collaborators believe that competitive products are more likely to be successfully developed or can be commercialized under terms that are more economically attractive than ours;
- collaborators may fail to successfully design or implement clinical trials and may collect and publish clinical trial data that are inconsistent with, or contradictory to, our clinical trial results;
- collaborators may not properly enforce, 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 proprietary information or expose us to potential litigation;
- collaborators may own or co-own intellectual property covering our programs or future products that results from our collaboration with them, and in such cases, we would not have the exclusive right over such intellectual property;
- collaborators may deviate from established guidelines, instructions, or best practices for product handling and storage, which may compromise the safety, purity, potency, and effectiveness of our

products and potentially result in the occurrence of serious adverse events in patients using our products;

- 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;
- we could experience reductions in the payments we believe are due to us pursuant to the applicable collaboration arrangement;
- collaborators could take actions inside or outside our collaboration that could negatively impact our rights or benefits under the applicable collaboration; or
- our collaborators may be unwilling to keep us informed regarding the progress of their development and commercialization activities or to permit public disclosure of their progress.

***We may wish to form additional collaborations in the future with respect to our product candidates, but may not be able to do so or to realize the potential benefits of such transactions, which may cause us to alter or delay our development and commercialization plans.***

The development and potential commercialization of our product candidates will require substantial additional capital to fund expenses. We may, in the future, decide to collaborate with other biopharmaceutical companies for the development and potential commercialization of certain product candidates, including in territories outside the United States or for certain indications. We will face significant competition in seeking appropriate collaborators. We may not be successful in our efforts to establish a strategic partnership or other alternative arrangements for our product candidates because they may be deemed to be at too early of a stage of development for collaborative effort and third parties may not view our product candidates as having the requisite potential to demonstrate safety and efficacy. Third party collaborations generally require us to relinquish some or all of the control over the future success of the applicable product candidates to the third-party. Our ability to 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 our technologies, product candidates and market opportunities. The collaborator may also consider alternative product candidates or technologies for similar indications that may be available to collaborate on and whether such a collaboration could be more attractive than the one with us for our product candidate. We may also be restricted under any license agreements from entering into agreements on certain terms or at all with potential collaborators.

Collaborations are complex and time-consuming to negotiate and document. 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 and changes to the strategies of the combined company. As a result, we may not be able to negotiate collaborations on a timely basis, on acceptable terms, or at all. If we are unable to do so, we may have to curtail the development of certain product candidates, reduce or delay one or more of our other development programs, delay the potential commercialization or reduce the scope of any planned sales or marketing activities for certain product candidates, or increase our expenditures and undertake development, manufacturing or commercialization activities at our own expense. If we elect to increase our expenditures to fund development, manufacturing or commercialization activities on our own, we may need to obtain additional capital, which may not be available to us on acceptable terms or at all. If we do not have sufficient funds, we may not be able to further develop our product candidates or bring them to market and generate product revenue.

Our product candidates may also require specific components to work effectively and efficiently, and rights to those components may be held by others. We may be unable to in-license any compositions, methods of use, processes or other third party intellectual property rights from third parties that we identify. We may fail to obtain any of these licenses at a reasonable cost or on reasonable terms, which would harm our business. Even if we are able to obtain a license, it may be non-exclusive, thereby giving our competitors access to the same technologies licensed to us. In that event, we may be required to expend significant time and resources to develop or license replacement technology.

**Risks Related to Our Industry and Business Operations**

***The COVID-19 pandemic continues to adversely impact our business, including our clinical trials, supply chain and business development activities.***

In March 2020, the World Health Organization made the assessment that a novel strain of coronavirus, SARS-CoV-2, a novel strain of coronavirus, commonly referred to as COVID-19 had become a global pandemic. In March 2020, the United States declared the COVID-19 pandemic a national emergency and many states and municipalities in the Unites States have taken aggressive actions to reduce the spread and ameliorate the impact of the disease, including limiting non-essential gatherings of people and non-essential travel, ordering certain businesses and government agencies to cease non-essential operations at physical locations and issuing "shelter-in-place" orders which direct individuals to shelter at their places of residence (subject to limited exceptions) and have also implemented multi-step policies with the goal of re-opening such states and municipalities. As a result of these actions and in an effort to ensure the safety of employees during the pandemic, a majority of our employees are at least partially currently telecommuting, which has impacted certain of our operations and may continue to do so over the long term. We may experience further limitations on employee resources in the future, including because of sickness of employees or their families. The effects of government actions and our own policies and those of third parties to reduce the spread of COVID-19 continues to have the potential negatively impact productivity and slow down or delay our ongoing and future clinical trials, preclinical studies and research and development activities, and may cause disruptions to our supply chain and impair our ability to execute our business development strategy. In the event that government authorities were to enhance current restrictions, our employees who currently are not telecommuting may no longer be able to access our facilities, and our operations may be further limited or curtailed.

As COVID-19 continues to spread and new variants emerge, we expect to experience ongoing disruptions that could severely impact our business, preclinical studies and clinical trials, including:

- delays in receiving approval from local regulatory authorities to initiate our planned clinical trials;
- delays or difficulties in enrolling and maintaining patients in our clinical trials;
- delays or difficulties in clinical site initiation, including difficulties in recruiting clinical site investigators and clinical site staff;
- delays in clinical sites receiving the supplies and materials needed to conduct our clinical trials, including interruption in global shipping that may affect the transport of clinical trial materials;
- changes in local regulations as part of a response to the COVID-19 outbreak which may require us to change the ways in which our clinical trials are conducted, which may result in unexpected costs, or to discontinue the clinical trials altogether;
- diversion of healthcare resources away from the conduct of clinical trials, including the diversion of hospitals serving as our clinical trial sites and hospital staff supporting the conduct of our clinical trials;
- interruption of key clinical trial activities, such as clinical trial site monitoring, due to limitations on travel imposed or recommended by federal or state governments, employers and others, or interruption of clinical trial subject visits and study procedures, the occurrence of which could affect the integrity of clinical trial data;
- interruption or delays in the operations of the FDA or other regulatory authorities, which may impact review and approval timelines;
- risk that participants enrolled in our clinical trials will acquire COVID-19 while the clinical trial is ongoing, which could impact the results of the clinical trial, including by increasing the number of observed adverse events; and
- refusal of the FDA to accept data from clinical trials.

These and other disruptions in our operations and the global economy could negatively impact our business, operating results and financial condition.

***We face potential product liability, and, if successful claims are brought against us, we may incur substantial liability and costs. If the use of our product candidates harms patients or is perceived to harm patients even when such harm is unrelated to our product candidates, our regulatory approvals could be revoked or otherwise negatively impacted and we could be subject to costly and damaging product liability claims.***

The use of our product candidates in clinical trials and the sale of any products for which we obtain marketing approval exposes us to the risk of product liability claims. Product liability claims might be brought against us by consumers, healthcare providers, pharmaceutical companies or others selling or otherwise coming into contact with our products. There is a risk that our product candidates may induce adverse events. If we cannot successfully defend against product liability claims, we could incur substantial liability and costs. In addition, regardless of merit or eventual outcome, product liability claims may result in:

- impairment of our business reputation;
- withdrawal of clinical trial participants;
- costs due to related litigation;
- distraction of management's attention from our primary business;
- substantial monetary awards to patients or other claimants;
- the inability to commercialize our product candidates; and
- decreased demand for our product candidates, if approved for commercial sale.

We carry product liability insurance of $10.0 million per occurrence and $10.0 million aggregate limit. We believe our product liability insurance coverage is sufficient in light of our current clinical programs; however, we may not be able to maintain insurance coverage at a reasonable cost or in sufficient amounts to protect us against losses due to liability. If and when we obtain marketing approval for product candidates, we intend to expand our insurance coverage to include the sale of commercial products; however, we may be unable to obtain product liability insurance on commercially reasonable terms or in adequate amounts. On occasion, large judgments have been awarded in class action lawsuits based on drugs or medical treatments that had unanticipated adverse effects. A successful product liability claims, or series of claims brought against us could cause our stock price to decline and, if judgments exceed our insurance coverage, could adversely affect our results of operations and business.

Patients with cancer and other diseases targeted by our product candidates are often already in severe and advanced stages of disease and have both known and unknown significant pre-existing and potentially life-threatening health risks. During the course of treatment, patients may suffer adverse events, including death, for reasons that may be related to our product candidates, such as the patient death that occurred in our Phase 1 P-PSMA-101 trial. Such events could subject us to costly litigation, require us to pay substantial amounts of money to injured patients, delay, negatively impact or end our opportunity to receive or maintain regulatory approval to market our products, or require us to suspend or abandon our commercialization efforts. Even in a circumstance in which we do not believe that an adverse event is related to our products, the investigation into the circumstance may be time-consuming or inconclusive. These investigations may interrupt our sales efforts, delay our regulatory approval process in other countries, or impact and limit the type of regulatory approvals our product candidates receive or maintain. As a result of these factors, a product liability claim, even if successfully defended, could have a material adverse effect on our business, financial condition or results of operations.

***We are highly dependent on our key personnel, and if we are not successful in attracting and retaining highly qualified personnel, we may not be able to successfully implement our business strategy.***

Our ability to compete in the highly competitive biotechnology and pharmaceutical industries depends upon our ability to attract and retain highly qualified managerial, scientific and medical personnel. We are highly dependent on our management, scientific and medical personnel. The loss of the services of any of our executive officers, other key employees, and other scientific and medical advisors, and our inability to find suitable replacements could result in delays in product development and harm our business.

We conduct substantially all of our operations at our facilities in San Diego. This region is headquarters to many other biopharmaceutical companies and many academic and research institutions. Competition for skilled personnel in our market is intense and may limit our ability to hire and retain highly qualified personnel on acceptable terms or at all.

To induce valuable employees to remain at our company, in addition to salary and cash incentives, we have provided stock options and RSUs that vest over time. The value to employees of stock options and RSUs that vest over time may be significantly affected by movements in our stock price that are beyond our control and may at any time be insufficient to counteract more lucrative offers from other companies. Despite our efforts to retain valuable employees, members of our management, scientific and development teams may terminate their employment with us on short notice. For example, in 2022, two of our executive officers provided notice of their resignation and retirement. Although we have employment agreements with certain of our key employees, these employment agreements provide for at-will employment, which means that any of our employees could leave our employment at any time, with or without notice. We do not maintain "key person" insurance policies on the lives of any of our executive officers. Our success also depends on our ability to continue to attract, retain and motivate highly skilled junior, mid-level and senior managers as well as junior, mid-level and senior scientific and medical personnel. We have experienced higher than normal turnover in the past year, due to the increasingly competitive hiring market in the biotechnology industry and if we cannot retain our existing employees and hire new employees to combat the impact of attrition, our operations may be adversely affected.

***We expect to expand our development, regulatory and operational capabilities and, as a result, we may encounter difficulties in managing our growth, which could disrupt our operations.***

As of December 31, 2022, we had 314 employees. As we advance our research and development programs, we may be required to further increase the number of our employees and the scope of our operations, particularly in the areas of clinical development, manufacturing, quality, regulatory affairs and, if any of our product candidates receives marketing approval, sales, marketing and distribution. To manage any future growth, we must:

- identify, recruit integrate, maintain and motivate additional qualified personnel;
- manage our development efforts effectively, including the initiation and conduct of clinical trials for our product candidates, both as monotherapy and in combination with other intra-portfolio product candidates; and
- improve our operational, financial and management controls, reporting systems and procedures.

Our future financial performance and our ability to develop, manufacture and commercialize our product candidates will depend, in part, on our ability to effectively manage any future growth, and our management may also have to divert financial and other resources, and a disproportionate amount of its attention away from day-to-day activities in order to devote a substantial amount of time, to managing these growth activities.

If we are not able to effectively expand our organization by hiring new employees and expanding our groups of consultants and contractors, we may not be able to successfully implement the tasks necessary to further develop and commercialize our product candidates and, accordingly, may not achieve our research, development and commercialization goals.

***We face substantial competition, which may result in others discovering, developing or commercializing products more quickly or marketing them more successfully than us.***

The development and commercialization of new products is highly competitive. We compete in the segments of the pharmaceutical, biotechnology and other related markets that develop immunotherapies for the treatment of cancer and gene therapies for inherited genetic disorders. Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer, more effective, have fewer or less severe side effects, are more convenient, or are less expensive than any products that we may develop or that would render any products that we may develop obsolete or non-competitive. Our competitors also may obtain marketing approval for their products more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the market. Moreover, with the proliferation of new

drugs and therapies into oncology and genetic disorders, we expect to face increasingly intense competition as new technologies become available. If we fail to stay at the forefront of technological change, we may be unable to compete effectively. Any product candidates that we successfully develop and commercialize will compete with existing therapies and new therapies that may become available in the future. The highly competitive nature of and rapid technological changes in the biotechnology and pharmaceutical industries could render our product candidates or our technology obsolete, less competitive or uneconomical.

Other products in the same class as some of our product candidates have already been approved or are further along in development. As more product candidates within a particular class of biopharmaceutical products proceed through clinical development to regulatory review and approval, the amount and type of clinical data that may be required by regulatory authorities may increase or change. Consequently, the results of our clinical trials for product candidates in this class will likely need to show a risk benefit profile that is competitive with or more favorable than those products and product candidates in order to obtain marketing approval or, if approved, a product label that is favorable for commercialization. If the risk benefit profile is not competitive with those products or product candidates, we may have developed a product that is not commercially viable, that we are not able to sell profitably or that is unable to achieve favorable pricing or reimbursement. In such circumstances, our future product revenue and financial condition would be materially and adversely affected.

Specifically, there are many companies pursuing a variety of approaches to CAR-T therapies, including Adaptimmune Therapeutics plc, Allogene, Inc., Arcellx, Inc., Astellas Pharma, Inc., Autolus Ltd., Bristol-Meyers Squibb Company, Cellectis S.A., Janssen Pharmaceuticals Inc., Juno Therapeutics, Inc. (acquired by Celgene Corporation, now a Bristol-Meyers Squibb company), Gracell Biotechnologies Inc., Kite Pharma, Inc. (a Gilead Sciences, Inc. company), Legend Biotech Corporation, Novartis AG and Takeda. Immunotherapy and gene therapy approaches are further being pursued by many smaller biotechnology companies as well as larger pharmaceutical companies. We also face competition from non-cell-based or other gene therapy treatments offered by companies such as Amgen Inc., AstraZeneca plc, Beam Therapeutics, Inc, Bristol-Myers Squibb Company, F. Hoffman-La Roche AG, Generation Bio, Inc., GlaxoSmithKline plc, Merck & Co., Inc. PassageBio, Inc. and Pfizer Inc. Many of our competitors, either alone or with their collaboration partners, have substantially greater financial, technical and other resources, such as larger research and development staff and/or greater expertise in research and development, manufacturing, preclinical testing and conducting clinical trials.

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 subject enrollment for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs.

The key competitive factors affecting the success of all of our programs are likely to be their efficacy, safety, convenience, and availability of reimbursement. If we are not successful in developing, commercializing and achieving higher levels of reimbursement than our competitors, we will not be able to compete against them and our business would be materially harmed.

***We or the third parties upon whom we depend may be adversely affected by earthquakes, fires or other natural disasters.***

Our headquarters, main research facility and pilot manufacturing facility are located in San Diego, California, which in the past has experienced severe earthquakes and fires. If these earthquakes, fires, other natural disasters, terrorism and similar unforeseen events beyond our control prevented us from using all or a significant portion of our headquarters or research facility, it may be difficult or, in certain cases, impossible for us to continue our business for a substantial period of time. We do not have a disaster recovery or business continuity plan in place and may incur substantial expenses as a result of the absence or limited nature of our internal or third-party service providers' disaster recovery and business continuity plans, which could have a material adverse effect on our business. Furthermore, integral parties in our supply chain are operating from single sites, increasing their vulnerability to natural disasters or other sudden, unforeseen and severe adverse events. If such an event were to

affect our supply chain, it could have a material adverse effect on our ability to conduct our clinical trials, our development plans, business, financial condition or results of operations.

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

We have incurred substantial losses during our history and do not expect to become profitable in the near future, and we may never achieve profitability. Unused U.S. federal net operating losses, or NOLs, for taxable years beginning before January 1, 2018, may be carried forward to offset future taxable income, if any, until such unused NOLs expire. Under current law, U.S. federal NOLs incurred in taxable years beginning after December 31, 2017, can be carried forward indefinitely, but the deductibility of such U.S. federal NOLs in taxable years beginning after December 31, 2020, is limited to 80% of taxable income. It is uncertain if and to what extent various states will conform to the federal tax laws.

As of December 31, 2022, we had $295.0 million of U.S. federal NOLs that can be carried forward indefinitely under current law. As of December 31, 2022, we also had aggregate U.S. federal orphan drug credits and research and development, or R&D, credits of approximately $38.6 million. Our NOL carryforwards and R&D credits are subject to review and possible adjustment by the U.S. and state tax authorities.

In addition, under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, or the Code, and corresponding provisions of state law, if a corporation undergoes an "ownership change," which is generally defined as a greater than 50 percentage point change (by value) in its equity ownership over a three-year period, the corporation's ability to use its pre-change NOL carryforwards, R&D credits and certain other tax attributes to offset its post-change income or taxes may be limited. This could limit the amount of NOLs, R&D credit carryforwards or other applicable tax attributes that we can utilize annually to offset future taxable income or tax liabilities. Subsequent ownership changes and changes to the U.S. tax rules in respect of the utilization of NOLs, R&D credits and other applicable tax attributes carried forward may further affect the limitation in future years. In addition, at the state level, there may be periods during which the use of NOLs is suspended or otherwise limited, which could accelerate or permanently increase state taxes owed. As a result, if we earn net taxable income, we may be unable to use all or a material portion of our net operating loss carryforwards and other tax attributes, which could potentially result in increased future tax liability to us and adversely affect our future cash flows.

***Changes in healthcare law and implementing regulations, as well as changes in healthcare policy, may impact our business in ways that we cannot currently predict, and may have a significant adverse effect on our business and results of operations.***

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 our product candidates, restrict or regulate post-approval activities, and affect our ability to profitably sell any product candidates for which we obtain marketing approval. Among policy makers and payors in the United States and elsewhere, including in the EU, there is significant interest in promoting changes in healthcare systems with the stated goals of containing healthcare costs, improving quality and/or expanding access. In the United States, the pharmaceutical industry has been a particular focus of these efforts and has been significantly affected by major legislative initiatives.

The Affordable Care Act, substantially changed the way healthcare is financed by both the government and private insurers, and significantly impacts the U.S. pharmaceutical industry. The Affordable Care Act, among other things: (1) introduced a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for certain drugs and biologics that are inhaled, infused, instilled, implanted or injected and not generally dispensed through retail community pharmacies; (2) increased the minimum Medicaid rebates owed by manufacturers under the Medicaid Drug Rebate Program; (3) established a branded prescription drug fee that pharmaceutical manufacturers of branded prescription drugs must pay to the federal government; (4) expanded the list of covered entities eligible to participate in the 340B drug pricing program by adding new entities to the program; (5) established a new Medicare Part D coverage gap discount program, in which manufacturers must now agree to offer 70% point-of-sale discounts off negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period, as a condition for the manufacturer's outpatient drugs to be covered under Medicare Part D; (6) extended manufacturers' Medicaid rebate liability to covered drugs dispensed to

individuals who are enrolled in Medicaid managed care organizations; (7) expanded eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to additional individuals and by adding new mandatory eligibility categories for individuals with income at or below 133% of the federal poverty level, thereby potentially increasing manufacturers' Medicaid rebate liability; (8) created a licensure framework for follow on biologic products; (9) established a Center for Medicare and Medicaid Innovation at CMS, to test innovative payment and service delivery models to lower Medicare and Medicaid spending, potentially including prescription drug spending; and (10) created a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research.

There have been executive, judicial and Congressional challenges to certain aspects of the Affordable Care Act. For example, on June 17, 2021, the U.S. Supreme Court dismissed a challenge on procedural grounds that argued the Affordable Care Act is unconstitutional in its entirety because the "individual mandate" was repealed by Congress. Further, prior to the U.S. Supreme Court ruling on January 28, 2021, President Biden issued an executive order that initiated a special enrollment period for purposes of obtaining health insurance coverage through the Affordable Care Act marketplace. The executive order also instructed certain governmental agencies to review and reconsider their existing policies and rules that limit access to healthcare, including among others, reexamining Medicaid demonstration projects and waiver programs that include work requirements, and policies that create unnecessary barriers to obtaining access to health insurance coverage through Medicaid or the Affordable Care Act. It is possible that the Affordable Care Act will be subject to judicial or Congressional challenges in the future. On August 16, 2022, President Biden signed the Inflation Reduction Act of 2022, or IRA, into law, which, among other things, extends enhanced subsidies for individuals purchasing health insurance coverage in Affordable Care Act marketplaces through plan year 2025. The IRA also eliminates the "donut hole" under the Medicare Part D program beginning in 2025 by significantly lowering the beneficiary maximum out-of-pocket cost and through a newly established manufacturer discount program. It is unclear how any additional healthcare reform measures of the Biden administration will impact the Affordable Care Act and our business or financial condition.

Other legislative changes have been proposed and adopted since the Affordable Care Act was enacted. These changes include aggregate reductions to Medicare payments to providers of 2% per fiscal year pursuant to the Budget Control Act of 2011, which began in 2013 and, due to legislative amendments to the statute including the Infrastructure Investment and Jobs Act, the BBA and the Coronavirus Aid, Relief, and Economic Security Act, will remain in effect through 2031 unless additional Congressional action is taken. These reductions were suspended from May 1, 2020 through March 31, 2022 due to the COVID-19 pandemic. Under current legislation, the actual reduction in Medicare payments will vary from 1% in 2022 to up to 4% in the final fiscal year of this sequester. In January 2013, the American Taxpayer Relief Act of 2012 was signed into law, which, among other things, reduced Medicare payments to several providers, including hospitals, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. Additional changes that may affect our business include the expansion of new programs such as Medicare payment for performance initiatives for physicians, also referred to as the Quality Payment Program, under the Medicare Access and CHIP Reauthorization Act of 2015. In November 2019, CMS issued a final rule finalizing the changes to the Quality Payment Program. At this time, it is unclear how the introduction of the Quality Payment Program will impact overall physician reimbursement under the Medicare Program. Any reduction in reimbursement from Medicare or other government programs may result in a similar reduction in payments from private payors. In addition, new laws may result in additional reductions in Medicare and other healthcare funding, which may materially adversely affect customer demand and affordability for our products and, accordingly, the results of our financial operations.

Also, there has been heightened governmental scrutiny recently over the manner in which drug manufacturers set prices for their marketed products, which have 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. At the federal level, the Trump administration used several means to propose or implement drug pricing reform, including through federal budget proposals, executive orders and policy initiatives. In July 2021, the Biden administration released an executive order, "Promoting Competition in the American Economy," with multiple provisions aimed at prescription drugs. In response to Biden's executive order, on September 9, 2021, the Department of Health and Human Services, or HHS released a Comprehensive Plan for Addressing High Drug Prices that outlines principles for drug pricing reform and sets out a variety of potential legislative policies that Congress could pursue to advance these principles. In addition, the IRA, among other things,

(i) directs HHS to negotiate the price of certain high-expenditure, single-source drugs and biologics covered under Medicare, and subject drug manufacturers to civil monetary penalties and a potential excise tax by offering a price that is not equal to or less than the negotiated "maximum fair price" for such drugs and biologics under the law, and (ii) imposes rebates with respect to certain drugs and biologics covered under Medicare Part B or Medicare Part D to penalize price increases that outpace inflation. The IRA permits HHS to implement many of these provisions through guidance, as opposed to regulation, for the initial years. These provisions will take effect progressively starting in fiscal year 2023, although they may be subject to legal challenges. It is currently unclear how the IRA will be implemented but is likely to have a significant impact on the pharmaceutical industry. Further, the Biden administration released an additional executive order on October 14, 2022, directing HHS to submit a report on how the Center for Medicare and Medicaid Innovation can be further leveraged to test new models for lowering drug costs for Medicare and Medicaid beneficiaries. No legislation or administrative actions have been finalized to implement these principles. It is unclear whether these this executive order or similar policy initiatives will be implemented in the future.

At the state level, legislatures have increasingly passed legislation and implemented regulations designed to control pharmaceutical and biological 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.

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

Further, it is possible that additional governmental action will be taken in response to the COVID-19 pandemic.

In the European Union, coverage and reimbursement status of any product candidates for which we obtain regulatory approval are provided for by the national laws of EU Member States. The requirements may differ across the EU Member States. Also, at national level, actions have been taken to enact transparency laws regarding payments between pharmaceutical companies and health care professionals.

***We are subject to applicable fraud and abuse, transparency, government price reporting, and other healthcare laws and regulations. If we are unable to comply, or have not fully complied, with such laws, we could face substantial penalties.***

Healthcare providers and third-party payors will play a primary role in the recommendation and prescription of any future product candidates we may develop and any product candidates for which we obtain marketing approval. Our current and future arrangements with clinical investigators, third-party payors, healthcare provider and customers expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may affect the business or financial arrangements and relationships through which we research, market, sell and distribute our products. The laws that may affect our ability to operate include, but are not limited to:

- the federal Anti-Kickback Statute, which prohibits any person or entity from, among other things, knowingly and willfully soliciting, receiving, offering or paying any remuneration, directly or indirectly, overtly or covertly, in cash or in kind, to induce or reward either the referral of an individual for, or the purchase, order or recommendation of an item or service reimbursable, in whole or in part, under a federal healthcare program, such as the Medicare and Medicaid programs. The term "remuneration" has been broadly interpreted to include anything of value. The federal Anti-Kickback Statute has also been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand and prescribers, and purchasers, on the other the other hand. There are a number of statutory exceptions and regulatory safe harbors protecting some common activities from prosecution, but these exceptions and safe harbors are narrowly drawn. Practices that are alleged to be intended to induce prescribing,

purchases or recommendations, or include any payments of more than fair market value, may be subject to scrutiny if they do not qualify for an exception or safe harbor;

- federal civil and criminal false claims laws, such as the civil False Claims Act, or FCA, which can be enforced by private citizens through civil qui tam actions, and the Civil Monetary Penalties Law prohibits individuals or entities from, among other things, knowingly presenting, or causing to be presented, false, fictitious or fraudulent claims for payment of federal funds, and knowingly making, using or causing to be made or used a false record or statement material to a false or fraudulent claim to avoid, decrease or conceal an obligation to pay money to the federal government. For example, pharmaceutical companies have been prosecuted under the FCA in connection with, among other things their alleged off-label promotion of drugs, engaging in improper consulting arrangements with physicians, concealing price concessions in the pricing information submitted to the government for government price reporting purposes, and providing free product to customers with the expectation that the customers would bill federal health care programs for the product. In addition, a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the FCA. As a result of a modification made by the Fraud Enforcement and Recovery Act of 2009, a claim includes "any request or demand" for money or property presented to the U.S. government. In addition, manufacturers can be held liable under the FCA even when they do not submit claims directly to government payors if they are deemed to "cause" the submission of false or fraudulent claims;

- The Health Insurance Portability and Accountability Act of 1996, or HIPAA, which, among other things, imposes criminal liability for 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 creates federal criminal laws that prohibit knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false, fictitious or fraudulent statement or representation, or making or using any false writing or document knowing the same to contain any materially false, fictitious or fraudulent statement or entry in connection with the delivery of or payment for healthcare benefits, items or services;

- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their implementing regulations, which imposes privacy, security and breach reporting obligations with respect to individually identifiable health information upon covered entities, including certain healthcare providers, health plans, and healthcare clearinghouses, as well as their respective business associates that create, receive, maintain or transmit individually identifiable health information for or on behalf of a covered entity, and their subcontractors that use, disclose or otherwise process individually identifiable health information. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in U.S. federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions;

- the federal transparency requirements under the Physician Payments Sunshine Act, created under the Affordable Care Act, which requires, among other things, certain manufacturers of drugs, devices, biologics and medical supplies reimbursed under Medicare, Medicaid, or the Children's Health Insurance Program to report to CMS information related to payments and other transfers of value provided to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors), other health care professionals (such as physician assistants and nurse practitioners), and teaching hospitals, as well as information regarding ownership and investment interests held by physicians and their immediate family members;

- analogous state, local and foreign laws and regulations, such as anti-kickback and false claims laws, that may impose similar or more prohibitive restrictions, and may apply to items or services reimbursed by any non-governmental third-party payors, including private insurers; and

- state and foreign laws that require pharmaceutical companies to implement compliance programs, comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant

compliance guidance promulgated by the federal government, or to track and report gifts, compensation and other remuneration provided to physicians and other health care providers, state and local laws that require the registration of pharmaceutical sales representatives, and other federal, state and foreign laws that govern the privacy and security of health information or personally identifiable information in certain circumstances, including state health information privacy and data breach notification laws which govern the collection, use, disclosure, and protection of health-related and other personal information, many of which differ from each other in significant ways and often are not pre-empted by HIPAA, thus requiring additional compliance efforts.

We may also be subject to federal and state consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers. We have entered into consulting and scientific advisory board arrangements with physicians and other healthcare providers, some of which include provisions of stock options, including some who could influence the use of our product candidates, if approved. Because of the complex and far-reaching nature of these laws, regulatory agencies may view these transactions as prohibited arrangements that must be restructured, or discontinued, or for which we could be subject to other significant penalties. We could be adversely affected if regulatory agencies interpret our financial relationships with providers who may influence the ordering of and use our product candidates, if approved, to be in violation of applicable laws.

Federal and state enforcement bodies have continued their scrutiny of interactions between healthcare companies and healthcare providers, which has led to significant investigations, prosecutions, convictions and settlements in the healthcare industry. Responding to investigations can be time-and resource-consuming and can divert management's attention from the business. Any such investigation or settlement could increase our costs or otherwise have an adverse effect on our business.

Ensuring that our business arrangements with third parties comply with applicable healthcare laws and regulations will likely be costly. If our operations are found to be in violation of any of these laws or any other current or future governmental laws and regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, disgorgement, imprisonment, exclusion from government funded healthcare programs, such as Medicare and Medicaid, contractual damages, reputational harm, diminished profits and future earnings, additional reporting obligations and oversight if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with these laws, and the curtailment or restructuring of our operations, any of which could substantially disrupt our operations. If any of the physicians or other healthcare providers or entities with whom we expect to do business is found to be not in compliance with applicable laws, they may be subject to significant criminal, civil or administrative sanctions, including exclusions from government funded healthcare programs.

**Risks Related to Our Intellectual Property**

***If we are unable to obtain and maintain sufficient intellectual property protection for our platform technologies and product candidates, or if the scope of the intellectual property protection is not sufficiently broad, our competitors could develop and commercialize products similar or identical to ours, and our ability to successfully commercialize our products 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 platform technologies and product candidates. We seek to protect our proprietary position by filing patent applications in the United States and abroad related to our novel discoveries and technologies that are important to our business. Our pending and future patent applications may not result in patents being issued which protect our product candidates or their intended uses or which effectively prevent others from commercializing competitive technologies, products or product candidates.

Obtaining and enforcing patents is expensive and time-consuming, and we may not be able to file and prosecute all necessary or desirable patent applications or maintain and/or enforce patents that may issue based on our patent applications, at a reasonable cost or in a timely manner, including as a result of the COVID-19 pandemic impacting our or our licensors' operations. It is also possible that we will fail to identify patentable aspects of our research and development results before it is too late to obtain patent protection. Although we enter into non-

disclosure and confidentiality agreements with parties who have access to patentable aspects of our research and development output, such as our employees, corporate collaborators, outside scientific collaborators, contract research organizations, contract manufacturers, consultants, advisors and other third parties, any of these parties may breach these agreements and disclose such results before a patent application is filed, thereby jeopardizing our ability to seek patent protection.

Composition of matter patents for biological and pharmaceutical products such as CAR-based product candidates often provide a strong form of intellectual property protection for those types of products, as such patents provide protection without regard to any method of use. We cannot be certain that the claims in our pending patent applications covering composition of matter of our product candidates will be considered patentable by the United States Patent and Trademark Office, or USPTO, or by patent offices in foreign countries, or that the claims in any of our issued patents will be considered valid and enforceable by courts in the United States or foreign countries. Method of use patents protect the use of a product for the specified method. This type of patent does not prevent a competitor from making and marketing a product that is identical to our product for an indication that is outside the scope of the patented method. Moreover, even if competitors do not actively promote their product for our targeted indications, physicians may prescribe these products "off-label." Although off-label prescriptions may infringe or contribute to the infringement of method of use patents, the practice is common and such infringement is difficult to prevent or prosecute.

The patent position of biopharmaceutical companies generally is highly uncertain, involves complex legal and factual questions and has in recent years been the subject of much litigation, resulting in court decisions, including Supreme Court decisions, which have increased uncertainties as to the ability to enforce patent rights in the future. In addition, the laws of foreign countries may not protect our rights to the same extent as the laws of the United States, or vice versa.

Further, we may not be aware of all third-party intellectual property rights potentially relating to our product candidates or their intended uses, and as a result the impact of such third-party intellectual property rights upon the patentability of our own patents and patent applications, as well as the impact of such third-party intellectual property upon our freedom to operate, is highly uncertain. 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 know with certainty whether 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, the issuance, scope, validity, enforceability and commercial value of our patent rights are highly uncertain. Our patents or pending patent applications may be challenged in the courts or patent offices in the United States and abroad. For example, we may be subject to a third-party pre-issuance submission of prior art to the USPTO or become involved in post-grant review procedures, oppositions, derivations, reexaminations, or *inter partes* review proceedings, in the United States or elsewhere, challenging our patent rights or the patent rights of others. An adverse determination in any such challenges may result in loss of exclusivity 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. Any failure to obtain or maintain patent protection with respect to our product candidates could have a material adverse effect on our business, financial condition, results of operations and prospects.

***We may not identify relevant third-party patents or may incorrectly interpret the relevance, scope or expiration of a third-party patent, which might adversely affect our ability to develop and market our products.***

We cannot guarantee that any of our patent searches or analyses, including the identification of relevant patents, the scope of patent claims or the expiration of relevant patents, are complete or thorough, nor can we be certain that we have identified each and every third-party patent and pending application in the United States and abroad that is relevant to or necessary for the commercialization of our product candidates in any jurisdiction.

The scope of a patent claim is determined by an interpretation of the law, the written disclosure in a patent and the patent's prosecution history. Our interpretation of the relevance or the scope of a patent or a pending application may be incorrect, which may negatively impact our ability to market our products. We may incorrectly determine

that our products are not covered by a third-party patent or may incorrectly predict whether a third-party's pending application will issue with claims of relevant scope. Our determination of the expiration date of any patent in the United States or abroad that we consider relevant may be incorrect, which may negatively impact our ability to develop and market our product candidates. Our failure to identify and correctly interpret relevant patents may negatively impact our ability to develop and market our products.

***If we fail to comply with our obligations in the agreements under which we license intellectual property rights from third parties or otherwise experience disruptions to our business relationships with our licensors, we could lose license rights that are important to our business.***

We are a party to a number of intellectual property license agreements that are important to our business and expect to enter into additional license agreements in the future. Our existing license agreements impose, and we expect that future license agreements will impose, various diligence, milestone payment, royalty and other obligations on us. If we fail to comply with our obligations under these agreements, including due to the impact of the COVID-19 pandemic on our business operations, or we are subject to a bankruptcy, the licensor may have the right to terminate the license, in which event we would not be able to market products covered by the license.

We may need to obtain licenses from third parties to advance our research or allow commercialization of our product candidates, and we have done so from time to time. We may fail to obtain any of these licenses at a reasonable cost or on reasonable terms, if at all. In that event, we may be required to expend considerable time and resources to develop or license replacement technology. If we are unable to do so, we may be unable to develop or commercialize the affected product candidates, which could harm our business significantly. We cannot provide any assurances that third-party patents do not exist which might be enforced against our current product candidates or future products, resulting in either an injunction prohibiting our sales, or, with respect to our sales, an obligation on our part to pay royalties and/or other forms of compensation to third parties.

In many cases, patent prosecution of our licensed technology is controlled solely by the licensor. If our licensors fail to obtain and maintain patent or other protection for the proprietary intellectual property we license from them, including due to the impact of the COVID-19 pandemic on our licensors' business operations, we could lose our rights to the intellectual property or our exclusivity with respect to those rights, these patents and applications may not be prosecuted and enforced in a manner consistent with the best interests of our business and our competitors could market competing products using the intellectual property. In certain cases, we control the prosecution of patents resulting from licensed technology. In the event we breach any of our obligations related to such prosecution, we may incur significant liability to our licensing partners. Licensing of intellectual property is of critical importance to our business and involves complex legal, business and scientific issues and is complicated by the rapid pace of scientific discovery in our industry. Disputes may arise regarding intellectual property subject to a licensing agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- the extent to which our technology and processes infringe on intellectual property of the licensor that is not subject to the licensing agreement;
- the sublicensing of patent and other rights under our collaborative development relationships;
- our diligence obligations under the license agreement and what activities satisfy those diligence obligations;
- the ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and us and our partners; and
- the priority of invention of patented technology.

If disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on acceptable terms, we may be unable to successfully develop and commercialize the affected product candidates. We are generally also subject to all of the same risks with respect to protection of intellectual property that we license as we are for intellectual property that we own, which are described herein. If

we or our licensor fail to adequately protect this intellectual property, our ability to commercialize products could suffer.

***In the future, we may need to obtain additional licenses of third-party technology that may not be available to us or are available only on commercially unreasonable terms, and which may cause us to operate our business in a more costly or otherwise adverse manner that was not anticipated.***

We currently have rights to intellectual property covering our product candidates and other proprietary technologies. Other pharmaceutical companies and academic institutions may also have filed or are planning to file patent applications potentially relevant to our business. From time to time, in order to avoid infringing these third-party patents, we may be required to license technology from additional third parties to further develop or commercialize our product candidates. Should we be required to obtain licenses to any third-party technology, including any such patents required to manufacture, use or sell our product candidates, such licenses may not be available to us on commercially reasonable terms, or at all. The inability to obtain any third-party license required to develop or commercialize any of our product candidates could cause us to abandon any related efforts, which could seriously harm our business and operations.

The licensing or acquisition of third-party intellectual property rights is a competitive area, and several more established companies may pursue strategies to license or acquire third-party intellectual property rights we may consider attractive or necessary. These established companies may have a competitive advantage over us due to their size, capital resources and greater clinical development and commercialization capabilities. In addition, companies that perceive us to be a competitor may be unwilling to assign or license rights to us.

Moreover, some of our owned and in-licensed patents or patent applications or future patents are or may be co-owned with third parties. If we are unable to obtain an exclusive license to any such third-party co-owners' interest in such patents or patent applications, such co-owners may be able to license their rights to other third parties, including our competitors, and our competitors could market competing products and technology. In addition, we may need the cooperation of any such co-owners of our patents in order to enforce such patents against third parties, and such cooperation may not be provided to us. Furthermore, our owned and in-licensed patents may be subject to a reservation of rights by one or more third parties. Any of the foregoing could have a material adverse effect on our competitive position, business, financial conditions, results of operations and prospects.

***We cannot ensure that patent rights relating to inventions described and claimed in our pending patent applications will issue or that patents based on our patent applications will not be challenged and rendered invalid and/or unenforceable.***

We have pending U.S. and foreign patent applications in our portfolio; however, we cannot predict:

- if and when patents may issue based on our patent applications;
- the scope of protection of any patent issuing based on our patent applications;
- whether the claims of any patent issuing based on our patent applications will provide protection against competitors;
- whether or not third parties will find ways to invalidate or circumvent our patent rights;
- whether or not others will obtain patents claiming aspects similar to those covered by our patents and patent applications;
- whether we will need to initiate litigation or administrative proceedings to enforce and/or defend our patent rights which will be costly whether we win or lose; and/or
- whether the patent applications that we own, or in-license will result in issued patents with claims that cover our product candidates or uses thereof in the United States or in other foreign countries.

We cannot be certain that the claims in our pending patent applications directed to our product candidates and/or technologies will be considered patentable by the USPTO or by patent offices in foreign countries. There can be no assurance that any such patent applications will issue as granted patents. One aspect of the determination of

patentability of our inventions depends on the scope and content of the "prior art," information that was or is deemed available to a person of skill in the relevant art prior to the priority date of the claimed invention. There may be prior art of which we are not aware that may affect the patentability of our patent claims or, if issued, affect the validity or enforceability of a patent claim. Even if the patents do issue based on our patent applications, third parties may challenge the validity, enforceability or scope thereof, which may result in such patents being narrowed, invalidated or held unenforceable. Furthermore, even if they are unchallenged, patents in our portfolio may not adequately exclude third parties from practicing relevant technology or prevent others from designing around our claims. If the breadth or strength of our intellectual property position with respect to our product candidates is threatened, it could dissuade companies from collaborating with us to develop and threaten our ability to commercialize our product candidates. In the event of litigation or administrative proceedings, we cannot be certain that the claims in any of our issued patents will be considered valid by courts in the United States or foreign countries.

***Intellectual property rights do not necessarily address all potential threats to our competitive advantage.***

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

- others may be able to make product candidates that are similar to ours but that are not covered by the claims of the patents that we own or have exclusively licensed;
- we or our licensors or future collaborators might not have been the first to make the inventions covered by the issued patent or pending patent application that we own or have exclusively licensed;
- we or our licensors or future collaborators might not have been the first to file patent applications covering certain of our inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights;
- it is possible that our pending patent applications will not lead to issued patents;
- issued patents that we own or have exclusively licensed may be held invalid or unenforceable, as a result of legal challenges by our competitors;
- our competitors might conduct research and development activities in countries where we do not have patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets;
- we may not develop additional proprietary technologies that are patentable;
- we cannot predict the scope of protection of any patent issuing based on our patent applications, including whether the patent applications that we own or in-license will result in issued patents with claims that cover our product candidates or uses thereof in the United States or in other foreign countries;
- the claims of any patent issuing based on our patent applications may not provide protection against competitors or any competitive advantages, or may be challenged by third parties;
- if enforced, a court may not hold that our patents are valid, enforceable and infringed;
- we may need to initiate litigation or administrative proceedings to enforce and/or defend our patent rights which will be costly whether we win or lose;
- we may choose not to file a patent in order to maintain certain trade secrets or know-how, and a third party may subsequently file a patent covering such intellectual property;
- we may fail to adequately protect and police our trademarks and trade secrets; and
- the patents of others may have an adverse effect on our business, including if others obtain patents claiming subject matter similar to or improving that covered by our patents and patent applications.

Should any of these events occur, they could significantly harm our business, results of operations and prospects.

***If we are sued for infringing intellectual property rights of third parties, 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 without infringing the intellectual property and other proprietary rights of third parties. Third parties may allege that we have infringed or misappropriated their intellectual property. For example, in early 2019, we received a letter from a third party alleging that we have used materials received from the third party in an unauthorized manner and stating a belief that we will infringe certain patents relating to the use of a safety switch in our CAR-T products. While we have denied that we used any of the third party's materials in an unauthorized manner and believe that the patents will not be infringed, are invalid, or both, we cannot predict whether the third party will persist in its allegations or whether litigation will ensue. Litigation or other legal proceedings relating to intellectual property claims, with or without merit, is unpredictable and generally expensive and time consuming and, even if resolved in our favor, is likely to divert significant resources from our core business, including distracting our technical and management personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the market price of our common stock. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing or distribution activities. We may not have sufficient financial or other resources to adequately conduct such litigation or proceedings. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace.

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 product candidates. We cannot assure you that our product candidates and other proprietary technologies we may develop will not infringe existing or future patents owned by third parties. Third parties may assert infringement claims against us based on existing or future intellectual property rights. We may not be aware of patents that have already been issued and that a third party, for example, a competitor in the fields in which we are developing our product candidates, might assert are infringed by our current or future product candidates, including claims to compositions, formulations, methods of manufacture or methods of use or treatment that cover our product candidates. It is also possible that patents owned by third parties of which we are aware, but which we do not believe are relevant to our product candidates and other proprietary technologies we may develop, could be found to be infringed by our product candidate. In addition, because patent applications can take many years to issue, there may be currently pending patent applications that may later result in issued patents that our product candidates may infringe. Our competitors in both the United States and abroad, many of which have substantially greater resources and have made substantial investments in patent portfolios and competing technologies, may have applied for or obtained or may in the future apply for and obtain, patents that will prevent, limit or otherwise interfere with our ability to make, use and sell our product candidates. The pharmaceutical and biotechnology industries have produced a considerable number of patents, and it may not always be clear to industry participants, including us, which patents cover various types of products or methods of use. The coverage of patents is subject to interpretation by the courts, and the interpretation is not always uniform. If we were sued for patent infringement, we would need to demonstrate that our product candidates, products or methods either do not infringe the patent claims of the relevant patent or that the patent claims are invalid or unenforceable, and we may not be able to do this. Proving invalidity may be difficult. For example, in the United States, proving invalidity in court requires a showing of clear and convincing evidence to overcome the presumption of validity enjoyed by issued patents, and there is no assurance that a court of competent jurisdiction would invalidate the claims of any such U.S. patent. Even if we are successful in these proceedings, we may incur substantial costs and the time and attention of our management and scientific personnel could be diverted in pursuing these proceedings, which could have a material adverse effect on our business and operations. In addition, we may not have sufficient resources to bring these actions to a successful conclusion.

If we are found to infringe a third-party's intellectual property rights, we could be forced, including by court order, to cease developing, manufacturing or commercializing the infringing product candidate or product. Alternatively, we 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 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, and could divert the time and attention of our technical personnel and management, cause development delays, and/or require us to develop non-infringing technology, which may not be possible on a cost-effective basis, any of which could materially harm our business. In the event of a successful claim of infringement against us, we may have to pay substantial monetary damages, including treble damages and attorneys' fees for willful infringement, pay royalties and other fees, redesign our infringing drug or obtain one or more licenses from third parties, which may be impossible or require substantial time and monetary expenditure. Claims that we have misappropriated the confidential information or trade secrets of third parties could have a similar negative impact on our business.

***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 or other third parties may infringe our patents, trademarks, copyrights or other intellectual property. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time consuming and divert the time and attention of our management and scientific personnel. Our pending patent applications cannot be enforced against third parties practicing the technology claimed in such applications unless and until a patent issues from such applications. Any claims we assert against perceived infringers could provoke these parties to assert counterclaims against us alleging that we infringe their patents, in addition to counterclaims asserting that our patents are invalid or unenforceable, or both. In patent litigation in the United States, defendant counterclaims alleging invalidity and/or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, including lack of novelty, obviousness, non-enablement or insufficient written description. Grounds for an unenforceability assertion could be an allegation that someone connected with prosecution of the patent withheld relevant information from the USPTO or made a misleading statement during prosecution. The outcome following legal assertions of invalidity and unenforceability is unpredictable. In any 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 patent claims do not cover the invention, or decide that the other party's use of our patented technology falls under the safe harbor to patent infringement under 35 U.S.C. §271(e)(1). 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.

Even if we establish infringement, the court may decide not to grant an injunction against further infringing activity and instead award only monetary damages, which may or may not be an adequate remedy. 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. There could also be public announcements of the results of hearings, motions or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a material adverse effect on the price of shares of our common stock. Moreover, we cannot assure you 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.

***Because of the expense and uncertainty of litigation, we may not be in a position to enforce our intellectual property rights against third parties.***

Because of the expense and uncertainty of litigation, we may conclude that even if a third-party is infringing our issued patent, any patents that may be issued as a result of our pending or future patent applications or other intellectual property rights, the risk-adjusted cost of bringing and enforcing such a claim or action may be too high or not in the best interest of our company or our stockholders, or it may be otherwise impractical or undesirable to enforce our intellectual property against some third parties. Our competitors or other third parties may be able to sustain the costs of complex patent litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios. In such cases, we may decide that the more prudent course of action is to simply monitor the situation or initiate or seek some other non-litigious action or solution. In addition, the uncertainties associated with litigation could compromise our ability to raise the funds necessary to continue our clinical trials, continue our internal research programs, in-license needed technology or other product candidates, or enter into development partnerships that would help us bring our product candidates to market.

***We may be subject to claims that our employees, consultants or independent contractors have wrongfully used or disclosed confidential information of third parties.***

We could in the future be subject to claims that we or our employees have inadvertently or otherwise used or disclosed alleged trade secrets or other confidential information of former employers or competitors. Although we try to ensure that our employees and consultants do not use the intellectual property, proprietary information, know-how or trade secrets of others in their work for us, we may become subject to claims that we caused an employee to breach the terms of their non-competition or non-solicitation agreement, or that we or these individuals have, inadvertently or otherwise, used or disclosed the alleged trade secrets or other proprietary information of a former employer or competitor.

While we may litigate to defend ourselves against these claims, even if we are successful, litigation could result in substantial costs and could be a distraction to management. If our defenses to these claims fail, in addition to requiring us to pay monetary damages, a court could prohibit us from using technologies or features that are essential to our product candidates, if such technologies or features are found to incorporate or be derived from the trade secrets or other proprietary information of the former employers. Moreover, any such litigation or the threat thereof may adversely affect our reputation, our ability to form strategic alliances or sublicense our rights to collaborators, engage with scientific advisors or hire employees or consultants, each of which would have an adverse effect on our business, results of operations and financial condition. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management.

***We may not be able to protect our intellectual property rights throughout the world.***

Patents are of national or regional effect, and filing, prosecuting and defending patents on all of our product candidates throughout the world would be prohibitively expensive. As such, our intellectual property rights in some countries outside the United States can be less extensive than those in the United States and we may not be able to prevent third parties from practicing our inventions in all countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products or technology and may export otherwise infringing products or technology to territories where we have patent protection, but enforcement rights are not as strong as those in the United States. These products may compete with our products, and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing. Further, the legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property protection, particularly those relating to pharmaceuticals or biologics, which could make it difficult for us to stop the infringement of our patents or marketing of competing products in violation of our proprietary rights generally. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business, could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing and could provoke third parties to assert claims against us. We may not prevail in any such lawsuits that we initiate and the damages and other remedies awarded, if any, may not be commercially meaningful.

Similarly, if our trade secrets are disclosed in a foreign jurisdiction, competitors worldwide could have access to our proprietary information and we may be without satisfactory recourse. Such disclosure could have a material adverse effect on our business. Moreover, our ability to protect and enforce our intellectual property rights may be adversely affected by unforeseen changes in foreign intellectual property laws. In addition, certain developing countries, including China and India, have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In those countries, we and our licensors may have limited remedies if patents are infringed or if we or our licensors are compelled to grant a license to a third-party, which could materially diminish the value of those patents. In addition, many countries limit the enforceability of patents against government agencies or government contractors. This could limit our potential revenue opportunities. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

***Changes in patent law in the United States and other jurisdictions could diminish the value of patents in general, thereby impairing our ability to protect our product candidates.***

As is the case with other biopharmaceutical companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biopharmaceutical industry involves both technological and legal complexity and is therefore costly, time consuming and inherently uncertain. Changes in either the patent laws or interpretation of the patent laws in the United States could increase the uncertainties and costs, and may diminish our ability to protect our inventions, obtain, maintain, and enforce our intellectual property rights and, more generally, could affect the value of our intellectual property or narrow the scope of our owned and licensed patents. Recent patent reform legislation in the United States and other countries, including the Leahy-Smith America Invents Act, or the Leahy-Smith Act, signed into law on September 16, 2011, could increase those uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents. The Leahy-Smith Act includes a number of significant changes to U.S. patent law. These include provisions that affect the way patent applications are prosecuted, redefine prior art and provide more efficient and cost-effective avenues for competitors to challenge the validity of patents. These include allowing third-party submission of prior art to the USPTO during patent prosecution and additional procedures to attack the validity of a patent by USPTO administered post-grant proceedings, including post-grant review, *inter partes* review, and derivation proceedings. After March 2013, under the Leahy-Smith Act, the United States transitioned to a first inventor to file system in which, assuming that the other statutory requirements are met, the first inventor to file a patent application will be entitled to the patent on an invention regardless of whether a third-party was the first to invent the claimed invention. A third party that files a patent application in the USPTO after March 2013, but before we file an application covering the same invention, could therefore be awarded a patent covering an invention of ours even if we had made the invention before it was made by such third party. This will require us to be cognizant going forward of the time from invention to filing of a patent application. Since patent applications in the United States and most other countries are confidential for a period of time after filing or until issuance, we cannot be certain that we or our licensors were the first to either (1) file any patent application related to our product candidates and other proprietary technologies we may develop or (2) invent any of the inventions claimed in our or our licensor's patents or patent applications. Even where we have a valid and enforceable patent, we may not be able to exclude others from practicing the claimed invention where the other party can show that they used the invention in commerce before our filing date or the other party benefits from a compulsory license. However, the Leahy-Smith Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents, all of which could have a material adverse effect on our business, financial condition, results of operations and prospects.

In addition, the patent positions of companies in the development and commercialization of pharmaceuticals are particularly uncertain. The U.S. Supreme Court has ruled on several patent cases in recent years, either narrowing the scope of patent protection available in certain circumstances or weakening the rights of patent owners in certain situations. Depending on future actions by the U.S. Congress, the U.S. courts, the USPTO and the relevant law-making bodies in other countries, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future. For example, in the 2013 case *Assoc. for Molecular Pathology v. Myriad Genetics, Inc.*, the U.S. Supreme Court held that certain claims to DNA molecules are not patentable. While we do not believe that any of the patents owned or licensed by us will be found invalid based on this decision, we cannot predict how future decisions by the courts, the U.S. Congress or the USPTO may impact the value of our patents.

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

Periodic maintenance fees, renewal fees, annuities fees and various other governmental fees on patents and/or patent applications are due to be paid to the USPTO and foreign patent agencies in several stages over the lifetime of the patent and/or patent application. The USPTO and various foreign governmental patent agencies also require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process. While an inadvertent lapse, including due to the effect of the COVID-19 pandemic on us or our patent maintenance vendors, can in many cases be cured by payment of a late fee or by other means in accordance with the applicable rules, there are situations in which noncompliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. Non-compliance events that could result in abandonment or lapse of a patent or patent application include, but are not limited to, failure to respond to official actions within prescribed time limits, non-payment of fees and failure to properly legalize and submit formal documents. If we fail to maintain the patents and patent applications covering our product candidates, our competitive position would be adversely affected.

***We may rely on trade secret and proprietary know-how which can be difficult to trace and enforce and, if we are unable to protect the confidentiality of our trade secrets, our business and competitive position would be harmed.***

In addition to seeking patents for some of our technology and product candidates, we may also rely on trade secrets, including unpatented know-how, technology and other proprietary information, to maintain our competitive position. Elements of our product candidate, including processes for their preparation and manufacture, may involve proprietary know-how, information, or technology that is not covered by patents, and thus for these aspects we may consider trade secrets and know-how to be our primary intellectual property. Any disclosure, either intentional or unintentional, by our employees, the employees of third parties with whom we share our facilities or third-party consultants and vendors that we engage to perform research, clinical trials or manufacturing activities, or misappropriation by third parties (such as through a cybersecurity breach) of our trade secrets or proprietary information could enable competitors to duplicate or surpass our technological achievements, thus eroding our competitive position in our market. Because we expect to rely on third parties in the development and manufacture of our product candidates, we must, at times, share trade secrets with them. Our reliance on third parties requires us to share our trade secrets, which increases the possibility that a competitor will discover them or that our trade secrets will be misappropriated or disclosed.

Trade secrets and know-how can be difficult to protect. We require our employees to enter into written employment agreements containing provisions of confidentiality and obligations to assign to us any inventions generated in the course of their employment. We and any third parties with whom we share facilities enter into written agreements that include confidentiality and intellectual property obligations to protect each party's property, potential trade secrets, proprietary know-how, and information. We further seek to protect our potential trade secrets, proprietary know-how, and information in part, by entering into non-disclosure and confidentiality agreements with parties who are given access to them, such as our corporate collaborators, outside scientific collaborators, contract research organizations, contract manufacturers, consultants, advisors and other third parties. With our consultants, contractors, and outside scientific collaborators, these agreements typically include invention assignment obligations. We cannot guarantee that we have entered into such agreements with each party that may have or has had access to our trade secrets or proprietary technology and processes. We cannot be certain that our trade secrets and other confidential proprietary information will not be disclosed or that competitors will not otherwise gain access to our trade secrets or independently develop substantially equivalent information and techniques. Despite these efforts, any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret is difficult, expensive and time-consuming, and the outcome is unpredictable. In addition, some courts inside and outside the United States are less willing or unwilling to protect trade secrets. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor or other third-party, we would have no right to prevent them 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 or other third-party, our competitive position would be harmed.

***We may become subject to claims challenging the inventorship or ownership of our patents and other intellectual property.***

We may be subject to claims that former employees, collaborators or other third parties have an interest in our patents or other intellectual property as an inventor or co-inventor. The failure to name the proper inventors on a patent application can result in the patents issuing thereon being unenforceable. Inventorship disputes may arise from conflicting views regarding the contributions of different individuals named as inventors, the effects of foreign laws where foreign nationals are involved in the development of the subject matter of the patent, conflicting obligations of third parties involved in developing our product candidates or as a result of questions regarding co-ownership of potential joint inventions. Litigation may be necessary to resolve these and other claims challenging inventorship and/or ownership. Alternatively, or additionally, we may enter into agreements to clarify the scope of our rights in such intellectual property. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, valuable intellectual property. Such an outcome could have a material adverse effect on our business. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees.

Our licensors may have relied on third-party consultants or collaborators or on funds from third parties, such as the U.S. government, such that our licensors are not the sole and exclusive owners of the patents we in-licensed. If other third parties have ownership rights or other rights to our in-licensed patents, they may be able to license such patents to our competitors, and our competitors could market competing products and technology. This could have a material adverse effect on our competitive position, business, financial conditions, results of operations, and prospects.

In addition, while it is our policy to require our employees and contractors who may be involved in the conception or 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, conceives or develops intellectual property that we regard as our own. The assignment of intellectual property rights may not be self-executing, or the assignment agreements may be breached, and we may be forced to bring claims against third parties, or defend claims that they may bring against us, to determine the ownership of what we regard as our intellectual property. Such claims could have a material adverse effect on our business, financial condition, results of operations, and prospects.

***Patent terms may be inadequate to protect our competitive position on our product candidates for an adequate amount of time.***

Patent rights are of limited duration. In the United States, if all maintenance fees are paid timely, the natural expiration of a patent is generally 20 years after its first effective filing date. 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 product candidates are commercialized. Even if patents covering our product candidates are obtained, once the patent life has expired for a product, we may be open to competition from biosimilar or generic products. As a result, our patent portfolio may not provide us with sufficient rights to exclude others from commercializing product candidates similar or identical to ours. Upon issuance in the United States, a patent's life can be increased based on certain delays caused by the USPTO, but this increase can be reduced or eliminated based on certain delays caused by the patent applicant during patent prosecution. A patent term extension based on regulatory delay may be available in the United States. However, only a single patent can be extended for each marketing approval, and any patent can be extended only once, for a single product. Moreover, the scope of protection during the period of the patent term extension does not extend to the full scope of the claim, but instead only to the scope of the product as approved. Laws governing analogous patent term extensions in foreign jurisdictions vary widely, as do laws governing the ability to obtain multiple patents from a single patent family. Additionally, we may not receive an extension if we fail to exercise due diligence during the testing phase or regulatory review process, apply within applicable deadlines, fail to apply prior to expiration of relevant patents or otherwise fail to satisfy applicable requirements. If we are unable to obtain patent term extension or restoration, or the term of any such extension is less than we request, the period during which we will have the right to exclusively market our product will be shortened and our competitors may obtain approval of competing products following our patent expiration and may take advantage of our investment in development and clinical trials by referencing our

clinical and preclinical data to launch their product earlier than might otherwise be the case, and our revenue could be reduced, possibly materially.

***If our trademarks and trade names are not adequately protected, then we may not be able to build name recognition in our markets of interest and our business may be adversely affected.***

Our current or future trademarks or trade names may be challenged, infringed, circumvented or declared generic or descriptive, or determined to be infringing on other marks. We may not be able to protect our rights to these trademarks and trade names or may be forced to stop using these names, which we need for name recognition by potential partners or customers in our markets of interest. During trademark registration proceedings, we may receive rejections of our applications by the USPTO or in other foreign jurisdictions. Although we would be given an opportunity to respond to those rejections, we may be unable to overcome such rejections. In addition, in the USPTO 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. If we are unable to establish name recognition based on our trademarks and trade names, we may not be able to compete effectively and our business may be adversely affected. We may license our trademarks and trade names to third parties, such as distributors. Though these license agreements may provide guidelines for how our trademarks and trade names may be used, a breach of these agreements or misuse of our trademarks and tradenames by our licensees may jeopardize our rights in or diminish the goodwill associated with our trademarks and trade names.

Moreover, any name we have proposed to use with our 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. Similar requirements exist in Europe. The FDA typically conducts a review of proposed product names, including an evaluation of potential for confusion with other product names. If the FDA (or an equivalent administrative body in a foreign jurisdiction) objects to any of our proposed proprietary product names, it may be required to expend significant additional resources in an effort to identify a suitable substitute name that would qualify under applicable trademark laws, not infringe the existing rights of third parties and be acceptable to the FDA. Furthermore, in many countries, owning and maintaining a trademark registration may not provide an adequate defense against a subsequent infringement claim asserted by the owner of a senior trademark. At times, competitors or other third parties may adopt trade names or trademarks similar to ours, thereby impeding our ability to build brand identity and possibly leading to market confusion. In addition, there could be potential trade name or trademark infringement claims brought by owners of other registered trademarks or trademarks that incorporate variations of our registered or unregistered trademarks or trade names. 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.

**Risks Related to Our Common Stock**

***The market price of our common stock has been and may continue to be volatile or may decline regardless of our operating performance and you could lose all or part of your investment.***

The market price of our common stock may fluctuate significantly in response to numerous factors, many of which are beyond our control, including:

- overall performance of the equity markets;
- our operating performance and the performance of other similar companies;
- the published opinions and third-party valuations by banking and market analysts;
- results from our ongoing clinical trials and future clinical trials with our current and future product candidates or of our competitors;
- changes in our projected operating results that we provide to the public, our failure to meet these projections or changes in recommendations by securities analysts that elect to follow our common stock;
- regulatory or legal developments in the United States and other countries;

- changes in the structure of healthcare payment systems;
- the level of expenses related to future product candidates or clinical development programs;
- our failure to achieve product development goals in the timeframe we announce;
- announcements of acquisitions, strategic alliances or significant agreements by us or by our competitors;
- recruitment or departure of key personnel;
- the economy as a whole and market conditions in our industry;
- the expiration of market standoff or contractual lock-up agreements;
- the size of our market float;
- the ongoing and future impact of the COVID-19 pandemic and actions taken to slow its spread; and
- any other factors discussed in this Annual Report on Form 10-K.

In addition, the stock markets in general, and the Nasdaq Global Market in particular, have experienced extreme price and volume fluctuations that have affected and continue to affect the market prices of equity securities of many immuno-oncology and gene therapy companies. Stock prices of many of these companies have fluctuated in a manner unrelated or disproportionate to their operating performance, and we have in the past experienced volatility that has been unrelated or disproportionate to our operating performance. From January 1, 2022 through March 3, 2023, the closing price of our common stock has ranged between $1.87 and $8.73 per share. In the past, stockholders have filed securities class action litigation following periods of market volatility. If we were to become involved in securities litigation, it could subject us to substantial costs, divert resources and the attention of management from our business and adversely affect our business.

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

As of March 3, 2023, our executive officers, directors, five percent stockholders and their affiliates beneficially owned approximately 52% of our voting stock. Therefore, these stockholders have the ability to influence us through their ownership positions. These stockholders may be able to determine all matters requiring stockholder approval. For example, these stockholders, acting together, may be able to control elections of directors, amendments of our organizational documents, or approval of any merger, sale of assets, or other major corporate transaction. This may prevent or discourage unsolicited acquisition proposals or offers for our common stock that you may believe are in your best interest as one of our stockholders.

***If we fail to maintain an effective system of internal controls in the future, we may not be able to accurately or timely report our financial condition or results of operations, which may adversely affect investor confidence in us and, as a result, the value of our common stock.***

We are subject to the reporting requirements of the Exchange Act, the Sarbanes-Oxley Act and the rules and regulations of the Nasdaq Stock Market. The Sarbanes-Oxley Act requires, among other things, that we maintain effective disclosure controls and procedures and internal controls over financial reporting.

A material weakness is a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of our annual or interim consolidated financial statements will not be prevented or detected on a timely basis. We may discover material weaknesses in our system of internal financial and accounting controls and procedures in the future that could result in a material misstatement of our consolidated financial statements. Our internal control over financial reporting will not prevent or detect all errors and all fraud. A control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud will be detected.

If we are not able to comply with the requirements of Section 404 of the Sarbanes-Oxley Act in a timely manner, or if we are unable to maintain proper and effective internal controls over financial reporting, we may not be able to produce timely and accurate financial statements. If that were to happen, our investors could lose confidence in our reported financial information, the market price of our stock could decline, and we could be subject to sanctions or investigations by the SEC or other regulatory authorities.

**General Risk Factors**

***We will continue to incur significantly increased costs as a result of operating as a public company, and our management will be required to devote substantial time to new compliance initiatives.***

As a public company, we have incurred and will continue to incur significant legal, accounting and other expenses that we did not incur as a private company. In addition, we are subject to the Sarbanes-Oxley Act, as well as rules subsequently implemented by the SEC, and various requirements the Nasdaq Global Select Market have imposed on public companies. In July 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act, or the Dodd-Frank Act, was enacted. There are significant corporate governance and executive compensation related provisions in the Dodd-Frank Act that require the SEC to adopt additional rules and regulations in these areas such as "say on pay" and proxy access. Recent legislation permits smaller "emerging growth companies" to implement many of these requirements over a longer period and up to five years from the completion of our IPO. We intend to continue to take advantage of this new legislation but cannot guarantee that we will not be required to implement these requirements sooner than budgeted or planned and thereby incur unexpected expenses. Stockholder activism, the current political environment and the current high level of government intervention and regulatory reform may lead to substantial new regulations and disclosure obligations, which may lead to additional compliance costs and impact the manner in which we operate our business in ways we cannot currently anticipate. Our management and other personnel will need to devote a substantial amount of time to these compliance initiatives. Moreover, these rules and regulations will increase our legal and financial compliance costs and will make some activities more time-consuming and costlier. For example, we expect these rules and regulations to make it more difficult and more expensive for us to obtain director and officer liability insurance and we may be required to incur substantial costs to maintain our current levels of such coverage. We estimate that we annually incur approximately $4.0 million to $5.0 million in additional expenses to comply with the requirements imposed on us as a public company.

***Our employees, principal investigators, consultants and commercial partners may engage in misconduct or other improper activities, including non-compliance with regulatory standards and requirements and insider trading.***

We are exposed to the risk of fraud or other misconduct by our employees, principal investigators, consultants and commercial partners. Misconduct by these parties could include intentional failures to comply with the regulations of the FDA and non-U.S. regulators, provide accurate information to the FDA and non-U.S. regulators, comply with healthcare fraud and abuse laws and regulations in the United States and abroad, report financial information or data accurately or disclose unauthorized activities to us. In particular, sales, marketing and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, misconduct, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Such misconduct could also involve the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions and cause serious harm to our reputation. It is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to comply with these laws or regulations. If any such actions are instituted against us those actions could have a significant impact on our business, including the imposition of significant civil, criminal and administrative penalties, damages, fines, disgorgement, imprisonment, exclusion from government funded healthcare programs, such as Medicare and Medicaid, contractual damages, reputational harm, diminished profits and future earnings, additional reporting obligations and oversight if subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with these laws, and the curtailment or restructuring of our operations.

***If our information technology systems or data, or those of third parties upon which we rely, are or were compromised, we could experience adverse consequences resulting from such compromise, including but not limited to regulatory investigations or actions; litigation; fines and penalties; disruptions of our business operations; a material disruption of our product candidates' development programs; reputational harm; loss of revenue or profits; loss of customers or sales; and other adverse consequences.***

We are increasingly dependent upon information technology systems, infrastructure and data to operate our business. In the ordinary course of business, we collect, receive, store, process, generate, use, transfer, disclose, make accessible, protect, secure, dispose of, transmit, and share (collectively, "process") proprietary, confidential, and sensitive data, including personal data (such as health-related data), intellectual property, and trade secrets (collectively, "sensitive information"). It is critical that we do so in a secure manner to maintain the confidentiality and integrity of such confidential information. We also have outsourced elements of our operations to third parties, and as a result we manage a number of third-party contractors who have access to our confidential information. Our ability to monitor these third parties' cybersecurity practices is limited, and these third parties may not have adequate information security measures in place.

Cyberattacks, malicious internet-based activity, and online and offline fraud and other similar activities threaten the confidentiality, integrity, and availability of our sensitive information and information technology systems, and those of the third parties upon which we rely. These threats are prevalent, continue to increase, and are becoming increasingly difficult to detect. These threats come from a variety of sources. In addition to traditional computer "hackers," threat actors, personnel (such as through theft or misuse), sophisticated nation-states, and nation-state-supported actors now engage in attacks. Some threat actors now engage and are expected to continue to engage in cyber-attacks, including without limitation nation-state actors for geopolitical reasons and in conjunction with military conflicts and defense activities. During times of war and other major conflicts, we and the third parties upon which we rely may be vulnerable to a heightened risk of these attacks, including retaliatory cyber-attacks, that could materially disrupt our systems and operations.

We and the third parties upon which we rely may be subject to a variety of evolving threats, including but not limited to social-engineering attacks (including through phishing attacks), malicious code (such as viruses and worms), malware (including as a result of advanced persistent threat intrusions), denial-of-service attacks (such as credential stuffing), personnel misconduct or error, ransomware attacks, supply-chain attacks, software bugs, server malfunctions, software or hardware failures, loss of data or other information technology assets, adware, telecommunications failures, earthquakes, fires, floods, and other similar threats. Ransomware attacks, including those perpetrated by organized criminal threat actors, nation-states, and nation-state-supported actors, are becoming increasingly prevalent and severe and can lead to significant interruptions in our operations, loss of data and income, reputational harm, and diversion of funds. Extortion payments may alleviate the negative impact of a ransomware attack, but we may be unwilling or unable to make such payments due to, for example, applicable laws or regulations prohibiting such payments. Similarly, supply-chain attacks have increased in frequency and severity, and we cannot guarantee that third parties and infrastructure in our supply chain or our third-party partners' supply chains have not been compromised or that they do not contain exploitable defects or bugs that could result in a breach of or disruption to our information technology systems or the third-party information technology systems that support us and our services. Future or past business transactions (such as acquisitions or integrations) could expose us to additional cybersecurity risks and vulnerabilities, as our systems could be negatively affected by vulnerabilities present in acquired or integrated entities' systems and technologies. Furthermore, we may discover security issues that were not found during due diligence of such acquired or integrated entities, and it may be difficult to integrate companies into our information technology environment and security program.

Any of the previously identified or similar threats could cause a security incident or other interruption. A security incident or other interruption could result in unauthorized, unlawful, or accidental acquisition, modification, destruction, loss, alteration, encryption, disclosure of, or access to data or could disrupt our ability (and that of third parties upon whom we rely) to provide our services. If such an event were to occur, or was perceived to have occurred, it could result in a material disruption of our product development programs and our business operations. These threats pose a risk to the security of our systems, the confidentiality and the availability and integrity of our data, and these risks apply both to us, and to third parties on whose systems we rely for the conduct of our business. If our third-party service providers experience a security incident or other interruption, we could also experience adverse consequences. While we may be entitled to damages if our third-party service providers fail to satisfy their

privacy or security-related obligations to us, any award may be insufficient to cover our damages, or we may be unable to recover such award.

We may expend significant resources or modify our business activities (including our clinical trial activities) in an effort to protect against security incidents. Certain data privacy and security obligations may require us to implement and maintain specific security measures, industry-standard or reasonable security measures to protect our information technology systems and data. Despite the implementation of security measures, given their size and complexity and the increasing amounts of confidential information that we and the third parties upon who we rely maintain, there can be no assurance that these measures will be effective. We take steps to detect and remediate vulnerabilities, but may be unable to detect and remediate all vulnerabilities in our information technology systems because such threats and techniques used to exploit vulnerabilities change frequently and are often sophisticated in nature. Therefore, such vulnerabilities may not be detected until after a security incident has occurred. Despite our efforts to identify and remediate vulnerabilities, if any, in our information technology systems, our efforts may not be successful. Further, we may experience delays in developing and deploying remedial measures designed to address any such identified vulnerabilities. These vulnerabilities pose material risks to our business.

We cannot be certain that our data protection efforts and our investment in information technology will prevent a security incident from occurring. If we suffer such an incident, applicable data privacy and security obligations may require us to notify relevant stakeholders of security incidents. Such disclosures are costly, and the disclosures or the failure to comply with such requirements could lead to adverse consequences. If we (or a third party upon whom we rely) experience a security incident or are perceived to have experienced a security incident, we may experience adverse consequences such as government enforcement actions (for example, investigations, fines, penalties, audits, and inspections); additional reporting requirements and/or oversight; restrictions on processing data (including personal data); litigation (including class claims); indemnification obligations; negative publicity; reputational harm; monetary expenditures; interruptions in our operations (including availability of data); financial loss; and other similar harms. Security incidents and attendant consequences may cause delays in the development of our product candidates, cause customers to stop using our products or services, deter new customers from using our products or services, and negatively impact our ability to grow and operate our business.

Our contracts may not contain limitations of liability, and even where they do, there can be no assurance that limitations of liability in our contracts are sufficient to protect us from liabilities, damages, or claims related to our data privacy and security obligations. We cannot be sure that our insurance coverage will be adequate or sufficient of protect us from or to mitigate liabilities arising out of our privacy and security practices, that such coverage will continue to be available on commercially reasonable terms or at all, or that such coverage will pay future claims. Our risks are likely to increase as we continue to expand our business, grow our customer base, and process, store, and transmit increasingly large amounts of proprietary and sensitive data.

***Changes in tax laws or regulations that are applied adversely to us or our customers may have a material adverse effect on our business, cash flow, financial condition or results of operations.***

New income, sales, use or other tax laws, statutes, rules, regulations or ordinances could be enacted at any time, which could adversely affect our business operations and financial performance. Further, existing tax laws, statutes, rules, regulations or ordinances could be interpreted, changed, modified or applied adversely to us. For example, the Biden administration and Congress have proposed various U.S. federal tax law changes, which if enacted could have a material impact on our business, cash flows, financial condition or results of operations. In addition, it is uncertain if and to what extent various states will conform to federal tax laws. Future tax reform legislation could have a material impact on the value of our deferred tax assets, could result in significant one-time charges, and could increase our future U.S. tax expense.

***We are subject to stringent and evolving U.S. and foreign laws, regulations, rules, contractual obligations, policies and other obligations related to data privacy and security. Our actual or perceived failure to comply with health and data protection laws and regulations could lead to government enforcement actions (which could include civil or criminal penalties), private litigation, fines and penalties, disruptions of our business operations, reputational harm, loss of revenue or profits, and/or adverse publicity and could negatively affect our operating results and business.***

We process personal data and other sensitive data (including health data we collect about trial participants in connection with clinical trials); proprietary and confidential business data; trade secrets; intellectual property; and sensitive third-party data. Our data processing activities subject us to numerous data privacy and security obligations. Accordingly, we and any potential collaborators may be subject to numerous federal, state, and foreign data privacy and protection obligations, such as various laws, regulations, guidance, industry standards, external and internal privacy and security policies, contracts, and other obligations that govern the processing of personal data by us and on our behalf.

Data privacy and information security have become significant issues in the United States, countries in Europe, and in other countries in which we operate. The legal and regulatory framework for privacy and security issues is rapidly evolving, and is expected to increase our compliance costs and exposure to liability. In the United States, there are numerous federal and state laws and regulations, including federal health information privacy laws, state data breach notification laws, state health information privacy laws, federal and state consumer protection laws (e.g., Section 5 of the Federal Trade Commission Act), and other similar laws (e.g., wiretapping and recording laws) that govern the collection, use, disclosure, and protection of health-related and other personal information could apply to our operations or the operations of our collaborators. For example, the California Consumer Privacy Act of 2018, or CCPA, applies to personal information of consumers, business representatives and employees and imposes obligations on businesses to provide specific disclosures in privacy notices and affording California residents certain rights related to their personal data. The CCPA provides for civil penalties of up to $7,500 per violation and allows private litigants affected by certain data breaches to recover significant statutory damages. In addition, the California Privacy Rights Act of 2020, or CPRA, expands the CCPA's requirements, including by adding a new right for individuals to correct their personal information and establishing a new California Privacy Protection Agency to implement and enforce the CCPA. Other states have enacted data privacy laws. For example, other states, including Colorado, Connecticut, Utah and Virginia, have passed privacy laws which differ from the CPRA and all of which become effective in 2023. In addition, data privacy and security laws have been proposed at the federal, state, and local levels in recent years, which further complicate compliance efforts and increase legal risk and compliance costs for us and the third parties upon whom we rely. If we are or become subject to these laws and/or new or amended data privacy laws, the risk of enforcement actions against us could increase because we may be subject to obligations under applicable regulatory frameworks and the number of individuals or entities that could initiate actions against us may increase (including individuals via a private right of action), in addition to further complicating our compliance efforts. In addition, we may obtain health information from third parties (including research institutions from which we obtain clinical trial data) that are subject to privacy and security requirements under HIPAA, as amended by HITECH, which imposes specific requirements relating to the privacy, security, and transmission of individually identifiable health information. If we violate HIPAA, we may be subject to significant penalties. Further, privacy advocates and industry groups have proposed, and may propose in the future, standards with which we are legally or contractually bound to comply.

Outside of the United States, virtually every jurisdiction in which we operate has established its own data security and privacy legal framework that may also apply to health-related and other personal information. For example, the European Union's General Data Protection Regulation ("EU GDPR") and the United Kingdom's GDPR ("UK GDPR") impose strict requirements for processing the personal data of individuals. For example, under the EU GDPR, government regulators may impose temporary or definitive bans on data processing, as well as fines of up to 20 million euros or 4% of annual global revenue, whichever is greater or private litigation related to processing of personal data brought by classes of data subjects or consumer protection organizations authorized at law to represent their interests. The unstable nature of European Union's data protection landscape may result in possible significant operational costs for internal compliance and risk to our business.

In the ordinary course of business, we may transfer personal data from Europe and other jurisdictions to the United States or other countries. Certain jurisdictions have enacted data localization laws and cross-border personal

data transfer laws. For example, Europe and other jurisdictions have enacted laws requiring data to be localized or limiting the transfer of personal data to other countries. In particular, the European Economic Area (EEA) and the United Kingdom (UK) have significantly restricted the transfer of personal data to the United States and other countries whose privacy laws it believes are inadequate. Other jurisdictions may adopt similarly stringent interpretations of their data localization and cross-border data transfer laws. Although there are currently various mechanisms that may be used to transfer personal data from the EEA and UK to the United States in compliance with law, such as the EEA and UK's standard contractual clauses, these mechanisms are subject to legal challenges, and there is no assurance that we can satisfy or rely on these measures to lawfully transfer personal data to the United States. If there is no lawful manner for us to transfer personal data from the EEA, the UK or other jurisdictions to the United States, or if the requirements for a legally-compliant transfer are too onerous, we could face significant adverse consequences, including the interruption or degradation of our operations, the need to relocate part of or all of our business or data processing activities to other jurisdictions at significant expense, increased exposure to regulatory actions, substantial fines and penalties, the inability to transfer data and work with partners, vendors and other third parties, and injunctions against our processing or transferring of personal data necessary to operate our business. Additionally, companies that transfer personal data out of the EEA and UK to other jurisdictions, particularly to the United States, are subject to increased scrutiny from regulators, individual litigants, and activist groups. Some European regulators have ordered certain companies to suspend or permanently cease transfers out of Europe for allegedly violating the GDPR's cross-border data transfer limitations.

We are also bound by contractual obligations related to data privacy and security, and our efforts to comply with such obligations may not be successful. For example, certain privacy laws, such as the GDPR and the CCPA, require our customers to impose specific contractual restrictions on their service providers. We publish privacy policies, marketing materials and other statements, such as compliance with certain certifications or self-regulatory principles, regarding data privacy and security. If these policies, materials or statements are found to be deficient, lacking in transparency, deceptive, unfair, or misrepresentative of our practices, we may be subject to investigation, enforcement actions by regulators or other adverse consequences.

Obligations related to data privacy and security are quickly changing, becoming increasingly stringent, and creating regulatory uncertainty. Additionally, these obligations may be subject to differing applications and interpretations, which may be inconsistent or conflict among jurisdictions. Preparing for and complying with these obligations requires us to devote significant resources, which may necessitate changes to our services, information technologies, systems, and practices and to those of any third parties that process personal data on our behalf. Although we endeavor to comply with all applicable data privacy and security obligations, we may at times fail (or be perceived to have failed) to do so. Moreover, despite our efforts, our personnel or third parties upon whom we rely may fail to comply with such obligations which could impact our compliance posture. For example, any failure by a third-party processor to comply with applicable law, regulations, or contractual obligations could result in adverse effects, including inability to operate our business and proceedings against us by governmental entities or others. Failure to comply, or any perceived failure to comply, with U.S. and international data protection laws and regulations could result in government enforcement actions (which could include civil or criminal penalties investigations, fines, audits, and inspections), private litigation (including class-related claims), breach reporting requirements, additional reporting requirements and/or oversight, bans on processing personal data, orders to destroy or not use personal data, and/or adverse publicity and could negatively affect our operating results and business. Moreover, clinical trial subjects about whom we or our potential collaborators obtain information, as well as the providers who share this information with us, may contractually limit our ability to use and disclose the information. Claims that we have violated individuals' privacy rights, failed to comply with data protection laws, or breached our contractual obligations, even if we are not found liable, could be expensive and time-consuming to defend and could result in adverse publicity that could harm our business. Any of these events could have a material adverse effect on our reputation, business, or financial condition, including but not limited to: loss of customers, interruptions or stoppages in our business operations (including, as relevant, clinical trials), inability to process personal data or to operate in certain jurisdictions, expenditure of time and resources to defend any claim or inquiry, or substantial changes to our business model or operations.

***We are subject to certain U.S. and foreign anti-corruption, anti-money laundering, export control, sanctions, and other trade laws and regulations. We can face serious consequences for violations.***

U.S. and foreign anti-corruption, anti-money laundering, export control, sanctions, and other trade laws and regulations, or collectively, Trade Laws, prohibit, among other things, companies and their employees, agents, CROs, legal counsel, accountants, consultants, contractors, and other partners from authorizing, promising, offering, providing, soliciting, or receiving directly or indirectly, corrupt or improper payments or anything else of value to or from recipients in the public or private sector. Violations of Trade Laws can result in substantial criminal fines and civil penalties, imprisonment, the loss of trade privileges, debarment, tax reassessments, breach of contract and fraud litigation, reputational harm, and other consequences. We have direct or indirect interactions with officials and employees of government agencies or government-affiliated hospitals, universities, and other organizations. We also expect our non-U.S. activities to increase over time. We expect to rely on third parties for research, preclinical studies, and clinical trials and/or to obtain necessary permits, licenses, patent registrations, and other marketing approvals. We can be held liable for the corrupt or other illegal activities of our personnel, agents, or partners, even if we do not explicitly authorize or have prior knowledge of such activities.

***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 the success of our business.***

We, and the third parties with whom we share our facilities, 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. Each of our operations involve the use of hazardous and flammable materials, including chemicals and biological and radioactive materials. Each of our operations also produce hazardous waste products. We generally contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials. We could be held liable for any resulting damages in the event of contamination or injury resulting from the use of hazardous materials by us or the third parties with whom we share our facilities, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties.

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

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

***Unstable market and economic conditions may have serious adverse consequences on our business, financial condition and stock price.***

As a result of the COVID-19 pandemic and actions taken to slow its spread, the global credit and financial markets have recently experienced extreme volatility and disruptions, including severely diminished liquidity and credit availability, declines in consumer confidence, declines in economic growth, increases in unemployment rates and uncertainty about economic stability. There can be no assurance that further deterioration in credit and financial markets and confidence in economic conditions will not occur. Our general business strategy has been and may continue to be adversely affected by any such economic downturn, volatile business environment or continued unpredictable and unstable market conditions. If the current equity and credit markets deteriorate, it may make any necessary debt or equity financing more difficult, more costly and more dilutive. Failure to secure any necessary financing in a timely manner and on favorable terms could have a material adverse effect on our growth strategy, financial performance and stock price and could require us to delay or abandon clinical development plans. In addition, there is a risk that one or more of our current service providers, manufacturers and other partners may not survive an economic downturn, which could directly affect our ability to attain our operating goals on schedule and on budget.

***Future sales and issuances of our common stock or rights to purchase common stock, including pursuant to our equity incentive plans, could result in dilution of the percentage ownership of our stockholders and could cause our stock price to fall.***

Additional capital will be needed in the future to continue our planned operations. To the extent we raise additional capital by issuing equity securities, our stockholders may experience substantial dilution. We may sell common stock, convertible securities or other equity securities in one or more transactions at prices and in a manner, we determine from time to time. If we sell common stock, convertible securities or other equity securities in more than one transaction, investors may be materially diluted by subsequent sales. These sales may also result in material dilution to our existing stockholders, and new investors could gain rights superior to our existing stockholders.

Pursuant to our 2020 Equity Incentive Plan, or the 2020 Plan, our management is authorized to grant stock options and other equity-based awards to our employees, directors and consultants. The number of shares of our common stock reserved for issuance under our 2020 Plan will automatically increase on January 1 of each calendar year, starting on January 1, 2021 through January 1, 2030, in an amount equal to the lesser of (i) 5% of the total number of shares of our common stock outstanding on the last day of the calendar month before the date of each automatic increase, or (ii) a lesser number of shares determined by our board of directors prior to the applicable January 1st. If our board of directors elects to increase the number of shares available for future grant by the maximum amount each year, our stockholders may experience additional dilution, which could cause our stock price to fall.

***We could be subject to securities class action litigation.***

In the past, securities class action litigation has often been brought against a company following a decline in the market price of its securities. This risk is especially relevant for us because pharmaceutical companies have experienced significant stock price volatility in recent years. If we face such litigation, it could result in substantial costs and a diversion of management's attention and resources, which could harm our business.

***If securities or industry analysts issue an adverse or misleading opinion regarding our stock, our stock price and trading volume could decline.***

The trading market for our common stock could be influenced by the research and reports that industry or securities analysts publish about us or our business. If any of the analysts who cover us issue an adverse or misleading opinion regarding us, our business model, our intellectual property or our stock performance, or if the clinical trials and operating results fail to meet the expectations of analysts, the trading price for our common stock would be negatively affected. If one or more of these analysts cease coverage of us or fail to publish reports on us regularly, demand for our common stock could decrease, which might cause our common stock price and trading volume to decline.

***Our disclosure controls and procedures may not prevent or detect all errors or acts of fraud.***

We are subject to the periodic reporting requirements of the Exchange Act. We designed our disclosure controls and procedures to reasonably assure that information we must disclose in reports we file or submit under the Exchange Act is accumulated and communicated to management, and recorded, processed, summarized and reported within the time periods specified in the rules and forms of the SEC. We believe that any disclosure controls and procedures or internal controls and procedures, no matter how well-conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met.

These inherent limitations include the realities that judgments in decision-making can be faulty, and that breakdowns can occur because of simple error or mistake. For example, our directors or executive officers could inadvertently fail to disclose a new relationship or arrangement causing us to fail to make any related party transaction disclosures. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people or by an unauthorized override of the controls. Accordingly, because of the inherent limitations in our control system, misstatements due to error or fraud may occur and not be detected.

***Future changes in financial accounting standards or practices may cause adverse and unexpected revenue fluctuations and adversely affect our reported results of operations.***

Future changes in financial accounting standards may cause adverse, unexpected revenue fluctuations and affect our reported financial position or results of operations. Financial accounting standards in the United States are constantly under review and new pronouncements and varying interpretations of pronouncements have occurred with frequency in the past and are expected to occur again in the future. As a result, we may be required to make changes in our accounting policies. Those changes could affect our financial condition and results of operations or the way in which such financial condition and results of operations are reported. We intend to invest resources to comply with evolving standards, and this investment may result in increased general and administrative expenses and a diversion of management time and attention from business activities to compliance activities.

***We are an "emerging growth company," and we cannot be certain if the reduced reporting requirements applicable to emerging growth companies will make our common stock less attractive to investors.***

We are an "emerging growth company" as defined in the JOBS Act, and we intend to take advantage of some of the exemptions from reporting requirements that are applicable to other public companies that are not emerging growth companies, including:

- being permitted to provide only two years of audited financial statements, in addition to any required unaudited interim financial statements, with correspondingly reduced "Management's Discussion and Analysis of Financial Condition and Results of Operations" disclosure;
- not being required to comply with the auditor attestation requirements in the assessment of our internal control over financial reporting;
- not being required to comply with any requirement that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation or a supplement to the auditor's report providing additional information about the audit and the financial statements;
- reduced disclosure obligations regarding executive compensation; and
- not being required to hold a non-binding advisory vote on executive compensation or obtain stockholder approval of any golden parachute payments not previously approved.

In addition, as an "emerging growth company" the JOBS Act allows us to delay adoption of new or revised accounting pronouncements applicable to public companies until such pronouncements are made applicable to private companies, unless we later irrevocably elect not to avail ourselves of this exemption. We have elected to use this extended transition period under the JOBS Act. As a result, our consolidated financial statements may not be comparable to the financial statements of issuers who are required to comply with the effective dates for new or revised accounting standards that are applicable to public companies, which may make comparison of our financials to those of other public companies more difficult.

We cannot predict if investors will find our common stock less attractive because we will rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our stock price may be more volatile. We may take advantage of these reporting exemptions until we are no longer an emerging growth company. We will remain an emerging growth company until the earlier of (1) the last day of the fiscal year (a) following the fifth anniversary of the completion of our IPO, (b) in which we have total annual gross revenue of at least $1.235 billion or (c) in which we are deemed to be a large accelerated filer, which means the market value of our common stock that is held by non-affiliates exceeds $700 million as of the prior June 30 and (2) the date on which we have issued more than $1.0 billion in non-convertible debt during the prior three-year period.

***Delaware law and provisions in our amended and restated certificate of incorporation and amended and restated bylaws could make a merger, tender offer or proxy contest difficult, thereby depressing the trading price of our common stock.***

Our status as a Delaware corporation and the anti-takeover provisions of the Delaware General Corporation Law may discourage, delay or prevent a change in control by prohibiting us from engaging in a business

combination with an interested stockholder for a period of three years after the person becomes an interested stockholder, even if a change of control would be beneficial to our existing stockholders. In addition, our amended and restated certificate of incorporation and amended and restated bylaws contain provisions that may make the acquisition of our company more difficult, including the following:

- a classified board of directors with three-year staggered terms, which could delay the ability of stockholders to change the membership of a majority of our board of directors;
- the ability of our board of directors to issue shares of preferred stock and to determine the price and other terms of those shares, including preferences and voting rights, without stockholder approval, which could be used to significantly dilute the ownership of a hostile acquirer;
- the exclusive right of our board of directors to elect a director to fill a vacancy created by the expansion of our board of directors or the resignation, death or removal of a director, which prevents stockholders from being able to fill vacancies on our board of directors;
- a prohibition on stockholder action by written consent, which forces stockholder action to be taken at an annual or special meeting of our stockholders;
- the requirement that a special meeting of stockholders may be called only by a majority vote of our entire board of directors, the chairman of our board of directors or our Chief Executive Officer, which could delay the ability of our stockholders to force consideration of a proposal or to take action, including the removal of directors;
- the requirement for the affirmative vote of holders of at least 66-2/3% of the voting power of all of the then-outstanding shares of the voting stock, voting together as a single class, to amend the provisions of our amended and restated certificate of incorporation relating to the management of our business or our amended and restated bylaws, which may inhibit the ability of an acquirer to affect such amendments to facilitate an unsolicited takeover attempt; and
- advance notice procedures with which stockholders must comply to nominate candidates to our board of directors or to propose matters to be acted upon at a stockholders' meeting, which may discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer's own slate of directors or otherwise attempting to obtain control of us.

In addition, as a Delaware corporation, we are subject to Section 203 of the Delaware General Corporation Law. These provisions may prohibit large stockholders, in particular those owning 15% or more of our outstanding voting stock, from merging or combining with us for a certain period of time. A Delaware corporation may opt out of this provision by express provision in its original certificate of incorporation or by amendment to its certificate of incorporation or bylaws approved by its stockholders. However, we have not opted out of this provision.

These and other provisions in our amended and restated certificate of incorporation, amended and restated bylaws and Delaware law could make it more difficult for stockholders or potential acquirors to obtain control of our board of directors or initiate actions that are opposed by our then-current board of directors, including delay or impede a merger, tender offer or proxy contest involving our company. The existence of these provisions could negatively affect the price of our common stock and limit opportunities for you to realize value in a corporate transaction.

***Our amended and restated certificate of incorporation designates the state courts in the State of Delaware or, if no state court located within the State of Delaware has jurisdiction, the federal court for the District of Delaware, as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could discourage lawsuits against our company and our directors, officers and employees.***

Our amended and restated certificate of incorporation provides that, to the fullest extent permitted by law, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware (or, if the Court of Chancery does not have jurisdiction, the federal district court for the District of Delaware) will be the sole and exclusive forum for the following types of actions or proceedings under Delaware statutory or common law: (1) any derivative action or proceeding brought on our behalf; (2) any action or proceeding asserting a claim of breach of a fiduciary duty owed by any of our current or former directors, officers or other employees to us or our

stockholders; (3) any action or proceeding asserting a claim against us or any of our current or former directors, officers or other employees, arising out of or pursuant to any provision of the Delaware General Corporation Law, our amended and restated certificate of incorporation or our amended and restated bylaws; (4) any action or proceeding to interpret, apply, enforce or determine the validity of our amended and restated certificate of incorporation or our amended and restated bylaws; (5) any action or proceeding as to which the Delaware General Corporation Law confers jurisdiction to the Court of Chancery of the State of Delaware; and (6) any action asserting a claim against us or any of our directors, officers or other employees, governed by the internal affairs doctrine.

This provision would not apply to suits brought to enforce a duty or liability created by the Exchange Act. Furthermore, Section 22 of the Securities Act creates concurrent jurisdiction for federal and state courts over all such Securities Act actions. Accordingly, both state and federal courts have jurisdiction to entertain such claims. To prevent having to litigate claims in multiple jurisdictions and the threat of inconsistent or contrary rulings by different courts, among other considerations, our amended and restated certificate of incorporation further provides that the federal district courts of the United States of America will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act. While the Delaware courts have determined that such choice of forum provisions are facially valid, a stockholder may nevertheless seek to bring a claim in a venue other than those designated in the exclusive forum provisions. In such instance, we would expect to vigorously assert the validity and enforceability of the exclusive forum provisions of our amended and restated certificate of incorporation. This may require significant additional costs associated with resolving such action in other jurisdictions and there can be no assurance that the provisions will be enforced by a court in those other jurisdictions.

These exclusive forum provisions may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers, or other employees, which may discourage lawsuits against us and our directors, officers and other employees. If a court were to find either exclusive forum provision in our amended and restated certificate of incorporation to be inapplicable or unenforceable in an action, we may incur further significant additional costs associated with resolving the dispute in other jurisdictions, all of which could seriously harm our business.

**Item 1B. Unresolved Staff Comments.**

None.

**Item 2. Properties.**

We currently lease approximately 110,000 square feet of manufacturing, office, and laboratory space in San Diego, California, of which 87,000 square feet is under a lease that expires on December 31, 2029 and includes a pilot manufacturing facility adjacent to our office and laboratory space. The remaining 23,000 square feet of office and laboratory space is under a sublease that expires on December 31, 2025. We believe our existing leased space is sufficient to meet our facilities needs for the foreseeable future and that any additional space we may require will be available on commercially reasonable terms.

**Item 3. Legal Proceedings.**

We are not currently a party to any material legal proceedings. From time to time, we may become involved in legal proceedings arising in the ordinary course of our business. Regardless of outcome, litigation can have an adverse impact on us due to defense and settlement costs, diversion of management resources, negative publicity, reputational harm and other factors.

**Item 4. Mine Safety Disclosures.**

Not applicable.

## PART II

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

#### Market Information

Our common stock, par value $0.0001 per share, is traded on The Nasdaq Global Select Market under the symbol "PSTX."

#### Holders of Record

As of March 3, 2023, there were approximately 74 stockholders of record of our common stock. Certain shares are held in "street" name and accordingly, the number of beneficial owners of such shares is not known or included in the foregoing number.

#### Dividend Policy

We have never declared or paid any dividends on our common stock. We currently intend to retain all available funds and any future earnings, if any, to fund the development and expansion of our business and we do not anticipate paying any cash dividends in the foreseeable future. Any future determination to pay dividends will be made at the discretion of our board of directors, subject to applicable laws and will depend upon, among other factors, our results of operations, financial condition, contractual restrictions and capital requirements. In addition, our loan agreement with Oxford governing our indebtedness contains restrictions on our ability to declare and pay cash dividends on our capital stock.

#### Securities Authorized for Issuance under Equity Compensation Plans

The information called for by this item is incorporated by reference to our definitive proxy statement for the 2023 Annual Meeting of Stockholders. See Part III, Item 12 "Security Ownership of Certain Beneficial Owners and Management."

#### Recent Sales of Unregistered Securities

None.

#### Use of Proceeds

We completed our IPO pursuant to a Registration Statement on Form S-1 (File No. 333-239321) that was declared effective on July 9, 2020 and registered an aggregate of 16,100,000 shares of our common stock. On July 14, 2020, we sold 14,000,000 shares of our common stock at a public offering price of $16.00 per share for an aggregate gross offering price of $224.0 million.

The net proceeds to us after deducting underwriting discounts and commissions of $15.7 million and net offering expenses of $2.6 million were $205.7 million. No offering expenses were paid directly or indirectly to any of our directors or officers (or their associates) or persons owning ten percent or more of any class of our equity securities or to any other affiliates.

Upon receipt, the net proceeds from our IPO were held in cash and cash equivalents and short-term investments, primarily bank money market accounts. As of December 31, 2022, we have used all of the net proceeds from our IPO.

#### Purchases of Equity Securities by the Issuer and Affiliated Purchasers

None.

### Item 6. [Reserved]

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

*The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our consolidated financial statements and related notes appearing elsewhere in this Annual Report on Form 10-K. This discussion, particularly information with respect to our future results of operations or financial condition, business strategy and plans and objectives of management for future operations, includes forward-looking statements that involve risks and uncertainties as described under the heading "Forward-Looking Statements" in this Annual Report on Form 10-K. You should review the disclosure under the heading "Risk Factors" in this Annual Report on Form 10-K for a discussion of important factors that could cause our actual results to differ materially from those anticipated in these forward-looking statements.*

**Overview**

We are a clinical-stage cell and gene therapy company advancing a new class of treatments for patients with cancer and rare diseases. We were incorporated in December 2014 and subsequently spun out from Transposagen, a company that has been developing gene engineering technologies since 2003. Since our inception, our operations have focused on organizing and staffing our company, business planning, raising capital, in-licensing, developing and acquiring intellectual property rights and establishing and protecting our intellectual property portfolio, developing our gene engineering technologies, identifying potential product candidates and undertaking research and development and manufacturing activities, including preclinical studies and clinical trials of our product candidates, and engaging in strategic transactions. We do not have any product candidates approved for sale and have not generated any revenue from product sales.

We have funded our operations primarily through the sale of equity, debt financings and strategic collaborations. Since our inception, we have raised $304.5 million of gross proceeds from the sale of our common stock in our public offerings, $334.3 million of gross proceeds from the sale of shares of our redeemable convertible preferred stock, received $60.0 million of gross proceeds from borrowings under our loan agreement and received an aggregate of $23.8 million in grant funding from the California Institute of Regenerative Medicine, or CIRM. In the fourth quarter of 2021, we entered into a collaboration agreement with Takeda and received an upfront payment of $45.0 million. In the third quarter of 2022, we entered into a collaboration agreement with Roche and received an upfront payment of $110.0 million. As of December 31, 2022, we had cash, cash equivalents and short-term investments of $282.5 million. We do not have any product candidates approved for sale and have not generated any revenue from product sales. Since our inception, we have incurred significant operating losses and expect to continue to incur significant operating losses for the foreseeable future. Our net losses were $64.0 million and $125.0 million for the years ended December 31, 2022 and 2021, respectively. As of December 31, 2022, we had an accumulated deficit of $470.9 million.

We have discovered and are developing a broad portfolio of product candidates in a variety of indications based on our core proprietary platforms, including our non-viral piggyBac DNA Delivery System, Cas-CLOVER Site-specific Gene Editing System and nanoparticle and AAV-based gene delivery technologies. Our core platform technologies have utility, either alone or in combination, across many cell and gene therapeutic modalities and enable us to engineer our portfolio of product candidates that are designed to overcome the primary limitations of current generation cell and gene therapeutics.

Within cell therapy, we believe our technologies allow us to create product candidates with engineered cells that engraft in the patient's body and drive lasting durable responses that may have the capacity to result in single treatment cures. Our CAR-T therapy portfolio consists of allogeneic, or off-the-shelf, product candidates. We are advancing a broad pipeline and have multiple CAR-T product candidates in the clinical phase in both solid tumor and hematological oncology indications. Within gene therapy, we believe our technologies have the potential to create next-generation therapies that can deliver long-term, stable gene expression that does not diminish over time and that may have the capacity to result in single treatment cures.

The following chart summarizes our current product candidate portfolio for cell therapy:


We manufacture these product candidates using our non-viral piggyBac DNA Delivery System. Our fully allogeneic CAR-T product candidates are developed using well-characterized cells derived from a healthy donor as starting material with the goal of enabling treatment of potentially hundreds of patients from a single manufacturing run. Doses are cryopreserved and stored at treatment centers for future off-the-shelf use. In addition, our allogeneic product candidates use our proprietary Cas-CLOVER site-Specific Gene Editing System to reduce or eliminate alloreactivity, as well as our booster molecule technology for manufacturing scalability.

Our most advanced internal solid tumor programs are:

- **P-MUC1C-ALLO1**, which is a fully allogeneic CAR-T product candidate for multiple solid tumor indications. We believe P-MUC1C-ALLO1 has the potential to treat a wide range of solid tumors derived from epithelial cells, such as breast, colorectal, lung, ovarian, pancreatic and renal cancers, as well as other cancers expressing a cancer-specific form of the Mucin 1 protein, or MUC1-C. P-MUC1C-ALLO1 is the first program for which clinical product will be sourced from our internal pilot manufacturing facility. We are currently evaluating P-BCMA-ALLO1 in a Phase 1 clinical trial and we shared an initial clinical data update at the European Society for Medical Oncology Immuno-Oncology 2022 Annual Congress, or ESMO I-O, in December 2022. We anticipate a clinical data update on this program at a medical meeting in 2023.
- **P-PSMA-ALLO1**, which is a fully allogeneic CAR-T product candidate targeting prostate-specific membrane antigen, or PSMA, being developed to treat patients with metastatic castrate-resistant prostate cancer, or mCRPC. We previously evaluated P-PSMA-101, a first generation autologous program, in a Phase 1 trial, however we made the strategic decision to stop further enrollment on that program and using findings from the clinical trial to inform the next generation allogeneic version.

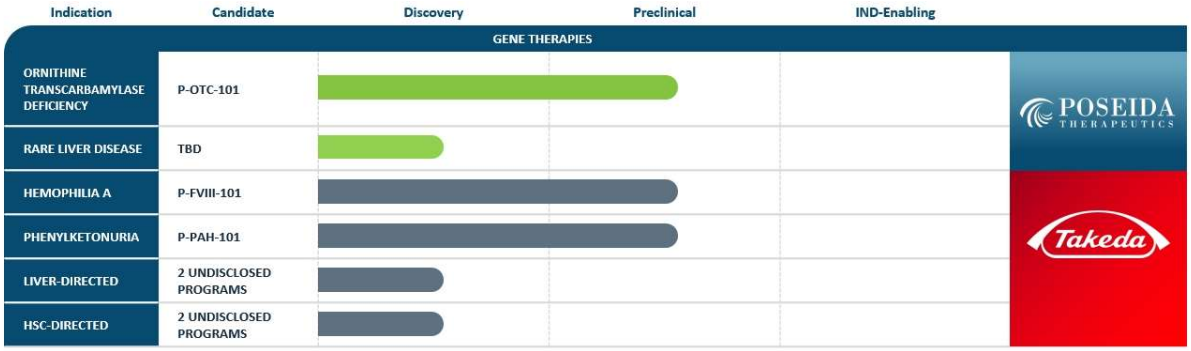
Our most advanced hematological programs, partnered with Roche, are:

- **P-BCMA-ALLO1**, which is a fully allogeneic CAR-T product candidate targeting BCMA, being developed to treat relapsed/refractory multiple myeloma patients. We are currently evaluating P-BCMA-ALLO1 in a Phase 1 clinical trial and we shared an initial clinical data update at the European Society for Medical Oncology Immuno-Oncology 2022 Annual Congress, or ESMO I-O, in December 2022. While P-BCMA-ALLO1 has been manufactured at a contract manufacturing organization, or CMO, we successfully added the ability to manufacture this product at our internal pilot manufacturing plant. In July 2022, we entered into a collaboration and license agreement, or the Roche Collaboration Agreement, with F. Hoffmann-La Roche Ltd and Hoffmann-La Roche Inc., or, collectively Roche, pursuant to which P-BCMA-ALLO1 was exclusively licensed to Roche. Roche will be responsible for a majority of future development costs for P-BCMA-ALLO1 and will assume future development

activities following the completion of the Phase 1 clinical trial. We anticipate a clinical data update on this program at a medical meeting in 2023, subject to clearance with Roche.

- **P-CD19CD20-ALLO1**, which is a fully allogeneic CAR-T product candidate for B-cell hematological indications. This is our first Dual CAR program, which contains two fully functional CAR molecules to target cells that express at least one of the two intended targets. We believe that our ability to include two fully functional CAR molecules into a T cell could provide a competitive advantage compared to current therapies. We anticipate an IND filing and initiation of a Phase 1 clinical trial in mid-2023. P-CD19CD20-ALLO1 was exclusively licensed to Roche pursuant to the Roche Collaboration Agreement and Roche will be responsible for a majority of future development costs for P-CD19CD20-ALLO1 and will assume future development activities following the completion of the Phase 1 clinical trial.

The following chart summarizes our current product candidate portfolio in gene therapy:




Our gene therapy product candidates have been developed by utilizing our piggyBac technology together with AAV to overcome the major limitations of traditional AAV gene therapy. We believe that our approach can result in integration and long-term stable expression at potentially much lower doses than AAV technology alone, thus also conferring cost and tolerability benefits. Our next generation programs completely replace AAV with our nanoparticle technology, freeing future product development in gene therapy of AAV limitations.

Our most advanced internal gene therapy program is:

- **P-OTC-101**, which is a liver-directed gene therapy combining piggyBac technology with AAV and nanoparticles for the *in vivo* treatment of Ornithine Transcarbamylase Deficiency, or OTCD. OTCD is an often fatal or morbid urea cycle disease caused by congenital mutations in the OTC gene with a high unmet medical need. We are developing the P-OTC-101 program utilizing a hybrid of non-viral nanoparticle delivery system to deliver RNA and AAV to deliver DNA and are working on an updated timeline for the program.

Our most advanced gene therapy programs partnered with Takeda are:

- **P-FVIII-101**, which is a liver-directed gene therapy combining piggyBac technology with our nanoparticle delivery technology for the *in vivo* treatment of Hemophilia A. Hemophilia A is a bleeding disorder caused by a deficiency in Factor VIII production with a high unmet need. Our P-FVIII-101 program is included in the collaboration and license agreement, or the Takeda Collaboration Agreement, with Takeda Pharmaceuticals USA, Inc., or Takeda, and Takeda will be responsible for all future development costs. We shared preclinical data from this program at the 64th American Society of Hematology (ASH) Annual Meeting and Exposition being held in New Orleans, Louisiana and online in December 2022.
- **P-PAH-101**, which is a liver-directed gene therapy to treat Phenylketonuria (PKU), an inherited genetic disorder caused due to mutations in the PAH (phenylalanine hydroxylase) gene resulting in buildup of phenylalanine in the body. If left untreated, PKU can affect a person's cognitive development. P-PAH-101 utilizes piggyBac technology combined with a hybrid AAV and nanoparticle delivery system. Our preclinical data has demonstrated the potential to resolve phenylalanine to normal levels following a

single treatment in juvenile and adult mice. P-PAH-101 is a partnered program with Takeda, currently in preclinical development.

We expect our expenses and losses to increase substantially for the foreseeable future as we continue our development of, and seek regulatory approvals for, our product candidates, including P-MUC1C-ALLO1, and begin to commercialize any approved products. We anticipate an overall increase in development costs as we continue to expand the number of product candidates in our pipeline and pursue clinical development of those candidates. To offset some of these increased development costs, the collaborations with Roche and Takeda each include program reimbursements. We anticipate that our general and administrative expenses will increase as we increase our research and development activities, increase headcount, maintain compliance with Nasdaq listing rules and SEC requirements and continue to operate as a public company. Our net losses may fluctuate significantly from quarter-to-quarter and year-to-year, depending on the timing of our clinical trials and our expenditures on other research and development activities.

The manufacturing process for our allogeneic product candidates is nearly identical to the process for our autologous product candidates, except for the gene editing and related steps. We currently source our product candidates from our internal pilot GMP manufacturing facility. We also work with a variety of suppliers to provide our manufacturing raw materials including media, DNA and RNA components. In the future, we may also build one or more commercial manufacturing facilities for any FDA approved product candidates.

**Collaboration Agreements**

*Roche Collaboration Agreement*

In July 2022, we entered the Roche Collaboration Agreement with Roche, pursuant to which we granted to Roche: (i) an exclusive, worldwide license under certain of our intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from each of our existing P-BCMA-ALLO1 and P-CD19CD20-ALLO1 programs, or each, a Tier 1 Program; (ii) an exclusive option to acquire an exclusive, worldwide license under certain of our intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from our existing P-BCMACD19-ALLO1 and P-CD70-ALLO1 programs, or each, a Tier 2 Program; (iii) an exclusive license under certain of our intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from the up to six Collaboration Programs, as defined below, designated by Roche; (iv) an option for a non-exclusive, commercial license under certain limited intellectual property to develop, manufacture and commercialize certain Roche proprietary cell therapy products for up to three solid tumor targets to be identified by Roche, or Licensed Products; and (v) the right of first offer for two of our early-stage existing programs within hematologic malignancies.

For each Tier 1 Program, we will perform development activities through a Phase 1 dose escalation clinical trial, and Roche is obligated to reimburse a specified percentage of certain costs incurred by us in our performance of such activities, up to a specified reimbursement cap for each Tier 1 Program. For each Tier 2 Program, we will perform research and development activities either through selection of a development candidate for IND-enabling studies or, subject to Roche's election and payment of an option maintenance fee, through completion of a Phase 1 dose escalation clinical trial. In addition, for each Tier 2 Program for which Roche exercises its option for an exclusive license, Roche is obligated to pay us an option exercise fee. For each Tier 1 Program and Tier 2 Program, we will perform manufacturing activities until the completion of a technology transfer to Roche.

The parties will conduct an initial two-year research program to explore and preclinically test a specified number of agreed-upon next generation therapeutic concepts relating to allogeneic CAR-T cell therapies. Subject to Roche's election and payment of a fee, the parties would subsequently conduct a second research program of 18 months under which the parties would explore and preclinically test a specified number of additional agreed-upon next generation therapeutic concepts relating to allogeneic CAR-T therapies. Roche may designate up to six heme malignancy-directed, allogeneic CAR-T programs from the two research programs, for each of which we will perform research and development activities through selection of a development candidate for IND-enabling activities, or each, a Collaboration Program. Upon its designation of each Collaboration Program, Roche is obligated to pay a designation fee. After we complete lead optimization activities for a Collaboration Program, Roche may elect to transition such program to Roche with a payment to us or terminate it. Alternatively, Roche may elect, for a

limited number of Collaboration Programs, to have us conduct certain additional development and manufacturing activities through the completion of a Phase 1 dose escalation clinical trial, in which case Roche will pay certain milestones and reimburse a specified percentage of our costs incurred in connection with such development and manufacturing activities. For each Collaboration Program, we will perform manufacturing activities until the completion of a technology transfer to Roche.

Under the Roche Collaboration Agreement, Roche paid an upfront payment to us of $110.0 million. Subject to Roche exercising its Tier 2 Program options, designating Collaboration Programs, and exercising its option for the Licensed Products commercial license and contingent on, among other things, the products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs achieving specified development, regulatory, and net sales milestone events, we are eligible to receive certain reimbursements, fees and milestone payments, including the near-term fees and milestone payments described above, in the aggregate up to $6.0 billion, comprised of (i) $1.5 billion for the Tier 1 Programs; (ii) $1.1 billion for the Tier 2 Programs, (iii) $2.9 billion for the Collaboration Programs; and (iv) $415.0 million for the Licensed Products.

We are further entitled to receive, on a product-by-product basis, tiered royalty payments in the mid-single to low double digits on net sales of products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs and in the low to mid-single digits for Licensed Products, in each case, subject to certain customary reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country or ten years from first commercial sale of such product in such country.

The Roche Collaboration Agreement became effective in September 2022 upon the expiration or termination of the applicable waiting period under the Hart-Scott-Rodino Antitrust Improvements Act of 1976, as amended, and will continue on a product-by-product and country-to-country basis until there is no remaining royalty or other payment obligations. The Roche Collaboration Agreement includes standard termination provisions, including for material breach or insolvency and for Roche's convenience. Certain of these termination rights can be exercised with respect to a particular product or license, as well as with respect to the entire Roche Collaboration Agreement.

*Takeda Collaboration Agreement*

In October 2021, we entered into the Takeda Collaboration Agreement, pursuant to which we granted to Takeda a worldwide exclusive license under our piggyBac, Cas-CLOVER, biodegradable DNA and RNA nanoparticle delivery technology and other proprietary genetic engineering platforms to research, develop, manufacture and commercialize gene therapy products for certain indications, including Hemophilia A. We will collaborate with Takeda to initially develop up to six *in vivo* gene therapy programs and Takeda also has an option to add two additional programs to the collaboration. We are obligated to lead research activities up to candidate selection, after which Takeda is obligated to assume responsibility for further development, manufacturing and commercialization of each program.

Under the Takeda Collaboration Agreement, Takeda made an upfront payment to us of $45.0 million. Takeda is also obligated to provide funding for all collaboration program development costs including our P-FVIII-101 and P-PAH-101 programs; provided that we are obligated to perform certain platform development activities at our own cost. Timelines for P-FVIII-101, P-PAH-101 and other programs subject to the Takeda Collaboration Agreement will be driven by Takeda. Under the Takeda Collaboration Agreement, we are eligible to receive preclinical milestone payments that could potentially exceed $82.5 million in the aggregate if preclinical milestones for all six programs are achieved. We are also eligible to receive future clinical development, regulatory and commercial milestone payments of $435.0 million in the aggregate per target, with a total potential deal value over the course of the collaboration of up to $2.7 billion, if milestones for all six programs are achieved and up to $3.6 billion if the milestones related to the two optional programs are also achieved. We are entitled to receive tiered royalty payments on net sales in the mid-single to low double digits, subject to certain standard reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country, ten years from first commercial sale of such product in such country, or expiration of regulatory exclusivity for such product in such country.

**In-License Agreements**

Below is a summary of our key license agreements. For a more detailed description of these and our other license agreements, see the section titled "Business—In-License Agreements" and Note 11 to our consolidated financial statements included in this Annual Report.

- *2017 Commercial License Agreement with TeneoBio, Inc.* (a subsidiary of Amgen Inc.), or the 2017 TeneoBio Agreement, pursuant to which we obtained exclusive worldwide rights to use and develop pharmaceutical products comprising allogeneic T-cells expressing a CAR molecule containing certain heavy chain sequences provided by TeneoBio for the treatment of human disease. We use this heavy-chain-only binder in our P-BCMA-ALLO1 product candidate.
- *2018 Commercial License Agreement with TeneoBio, Inc.* (a subsidiary of Amgen Inc.), or the 2018 TeneoBio Agreement, for the development and use of TeneoBio's human heavy-chain-only antibodies in CAR-T cell therapies. Under the terms of the 2018 TeneoBio Agreement, we have the option to obtain exclusive rights to research, develop and commercialize up to a certain number of targets, including but not limited to the binders used in our P-CD19CD20-ALLO1 and P-PSMA-ALLO1 product candidates.
- *License Agreement with Xyone Therapeutics, Inc.* (as successor-in-interest to Genus Oncology, LLC), or the Xyone Agreement, pursuant to which we obtained an exclusive worldwide license under certain patents and a non-exclusive worldwide license under certain know-how controlled by Xyone to research, develop and commercialize pharmaceutical products incorporating CAR cells expressing antibodies and derivatives thereof targeting MUC1-C, or a Xyone licensed product, and a non-exclusive worldwide license under certain patents and know-how controlled by Xyone to research, develop and commercialize companion diagnostics for the treatment, prevention and palliation of human diseases and conditions. We use a Xyone antibody or derivative thereof targeting MUC1-C as a binder in our P-MUC1C-ALLO1 product candidate.
- *Amended and Restated License Agreement with HMGU,* or the HMGU License Agreement, pursuant to which we obtained exclusive worldwide rights to research, develop, manufacture and commercialize products and services claimed by certain patent applications and patents owned by HMGU covering the nuclease Clo051 in certain fields of use, including human pharmaceutical products. We utilize these license rights in our Cas-CLOVER gene editing technology including P-BCMA-ALLO1, P-MUC1C-ALLLO1 and our other planned allogeneic programs.

**CIRM Grant Funding**

In 2017, we were granted an award in the amount of $19.8 million from California Institute of Regenerative Medicine, or CIRM, to support our clinical trial for P-BCMA-101. Through December 31, 2022, we have received all proceeds from this grant. In 2018, we were granted an additional award in the amount of $4.0 million from CIRM to support our preclinical studies for P-PSMA-101, of which we have received all proceeds from this grant. The terms of these awards include an option to repay the grant or convert it to a royalty obligation upon commercialization of the program. Based upon the terms of the grant agreements, for active programs we recorded proceeds as a liability when received. In the fourth quarter of 2021, we made the decision to wind down clinical development of the P-BCMA-101 program, however given there is no longer any intention to repay the amounts associated with the P-BCMA-101 program, we derecognized the respective liability and recorded such amount in other income during the year ended December 31, 2021.

**Components of Our Results of Operations**

***Revenues***

*Collaboration Revenue*

Collaboration revenue consists of revenue recognized from our collaboration and license agreements with Roche and Takeda and reflects the timing and pattern in which we deliver the contractual deliverables to such partners.

***Operating Expenses***

*Research and Development*

Research and development expenses consist primarily of external and internal costs incurred for our research and development activities, including development of our platform technologies, our drug discovery efforts and the development of our product candidates.

External costs include:

- expenses incurred in connection with the preclinical and clinical development of our product candidates and research programs, including under agreements with third parties, such as consultants, contractors and contract research organizations, or CROs;
- the cost of developing and scaling our manufacturing process and manufacturing drug products for use in our preclinical studies and clinical trials, including under agreements with third parties, such as consultants, contractors and contract manufacturing organizations, or CMOs;
- payments made under third-party licensing agreements;
- the cost of manufacturing clinical materials for use in our preclinical studies and clinical trials; and
- laboratory supplies and research materials.

Internal costs include:

- personnel-related expenses, consisting of employee salaries, related benefits and stock-based compensation expense for employees engaged in research and development functions;
- the cost to develop and maintain manufacturing capabilities at our San Diego facility for manufacturing of cell therapies for use in clinical trials; and
- facilities, depreciation and other expenses, consisting of direct and allocated expenses for rent and maintenance of facilities and insurance.

We expense research and development costs as incurred. External expenses are recognized based on an evaluation of the progress to completion of specific tasks using information provided to us by our service providers or our estimate of the volume of service that has been performed at each reporting date. Upfront payments and milestone payments made for the licensing of technology are related to clinical stage programs and expensed as research and development in the period in which they are incurred. Advance payments that we make for goods or services to be received in the future for use in research and development activities are recorded as prepaid expenses or other long-term assets. These amounts are expensed as the related goods are delivered or the services are performed.

At any one time, we are working on multiple research and development programs. We track external costs by the stage of program, clinical or preclinical. Our internal resources, employees and infrastructure are not directly tied to any one program and are typically deployed across multiple programs. As such, we do not track internal costs on a specific program basis.

Product candidates in later stages of clinical development generally have higher development costs than those in earlier stages of clinical development, primarily due to CRO activity and manufacturing expenses. We expect that our research and development expenses will increase substantially in connection with our planned preclinical and clinical development activities in the near term and in the future, including in connection with our ongoing Phase 1 trial of P-MUCIC-ALLO1 for the treatment of patients with epithelial derived solid tumor cancers, Phase 1 trial of P-BCMA-ALLO1 for the treatment of patients with relapsed/refractory multiple myeloma and anticipated initiation of our Phase 1 trial of P-CD19CD20-ALLO1 for the treatment of patients with B-cell malignancies and additional clinical programs expected to commence as we expand our pipeline of drug candidates. We cannot accurately 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. Our development costs may vary significantly based on factors such as:

- the number and scope of preclinical and IND-enabling studies;
- per patient trial costs;
- the number of trials required for approval;
- the number of sites included in the trials;
- the countries in which the trials are conducted;
- the length of time required to enroll eligible patients;
- the number of patients that participate in the trials;
- the drop-out or discontinuation rates of patients;
- potential additional safety monitoring requested by regulatory agencies;
- the duration of patient participation in the trials and follow-up;
- the cost and timing of manufacturing our product candidates;
- the phase of development of our product candidates;
- the efficacy and safety profile of our product candidates;
- the extent to which we establish additional licensing agreements; and
- whether we choose to partner any additional product candidates and the terms of such partnership.

A change in the outcome of any of these variables with respect to the development of any of our product candidates could significantly change the cost structure and timing associated with the development of respective product candidates. We may never succeed in obtaining regulatory approval for any of our product candidates. We may obtain unexpected results from our clinical trials and preclinical studies.

*General and Administrative*

General and administrative expenses consist primarily of salaries and related costs, including stock-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 anticipate that our general and administrative expenses will increase in the future as we increase our headcount to support our continued research activities and development of our product candidates, including P-MUC1C-ALLO1 and P-BCMA-ALLO1, and begin to commercialize any approved products.

***Other Income (Expense)***

*Interest Expense*

Interest expense consists of interest expense on outstanding borrowings under our loan agreement and amortization of debt discount and debt issuance costs. Given the environment of increasing interest rates, we expect our interest expense to increase incrementally to reflect market rates.

*Other Income (Expense), Net*

Other income (expense), net consists of interest income and miscellaneous income and expense unrelated to our core operations. Interest income is comprised of interest earned on our available-for-sale securities.

**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 (in thousands):

| | Year Ended December 31, | | |
|---|---|---|---|
| | 2022 | 2021 | Change |
| Revenues: | | | |
| Collaboration revenue | $ 130,492 | $ 31,238 | $ 99,254 |
| Total revenue | 130,492 | 31,238 | 99,254 |
| Operating expenses: | | | |
| Research and development | 152,899 | 136,734 | 16,165 |
| General and administrative | 37,539 | 35,915 | 1,624 |
| Total operating expenses | 190,438 | 172,649 | 17,789 |
| Loss from operations | (59,946) | (141,411) | 81,465 |
| Other income (expense): | | | |
| Interest expense | (6,370) | (3,358) | (3,012) |
| Other income, net | 2,858 | 19,795 | (16,937) |
| Net loss before income tax | (63,458) | (124,974) | 61,516 |
| Income tax expense | (544) | — | (544) |
| Net loss | $ (64,002) | $ (124,974) | $ 60,972 |

*Collaboration Revenue*

Collaboration revenue of $130.5 million for the year ended December 31, 2022 represents $121.4 million revenue recognized from the license and research services performed under Roche Collaboration Agreement which became effective in the third quarter of 2022, and $9.1 million revenue recognized from the research services performed under the Takeda Collaboration Agreement that we entered into in the fourth quarter of 2021.

Collaboration revenue of $31.2 million for the year ended December 31, 2021 represents revenue recognized from the Takeda Collaboration Agreement consisting of $30.2 million related to one-time performance obligations delivered upon the inception of the Takeda Collaboration Agreement in the fourth quarter of 2021 and $1.0 million related to the research services we performed for Takeda in the fourth quarter of 2021 pursuant to the terms of the Takeda Collaboration Agreement.

*Research and Development Expenses*

The following table summarizes our research and development expenses for the years ended December 31, 2022 and 2021 (in thousands):

| | Year Ended December 31, | | |
|---|---|---|---|
| | 2022 | 2021 | Change |
| External costs: | | | |
| Clinical stage programs[(1)] | $ 47,012 | $ 47,105 | $ (93) |
| Preclinical stage programs and other unallocated expenses | 29,642 | 32,356 | (2,714) |
| Internal costs: | | | |
| Personnel | 61,341 | 45,720 | 15,621 |
| Facilities and other | 14,904 | 11,553 | 3,351 |
| Total research and development expenses | $ 152,899 | $ 136,734 | $ 16,165 |

(1) Clinical stage programs include costs related to P-BCMA-101 and P-PSMA-101 for the year ended December 31, 2021 and costs related to P-BCMA-ALLO1, P-MUCIC-ALLO1, P-BCMA-101, and P-PSMA-101 for the year ended December 31, 2022.

Research and development expenses were $152.9 million for the year ended December 31, 2022, compared to $136.7 million for the year ended December 31, 2021. The increase in research and development expenses of $16.2 million was primarily related to increases in the following: $15.6 million of personnel expenses, including a $1.5 million increase in stock-based compensation expense, as driven by the increased headcount, $3.4 million of internal costs related to facilities and other expenses primarily due to a sublease agreement commenced in 2022 supporting research and administrative activities, offset by a $2.7 million decrease in preclinical stage programs and other unallocated expenses.

*General and Administrative Expenses*

General and administrative expenses were $37.5 million for the year ended December 31, 2022, compared to $35.9 million for the year ended December 31, 2021. The increase in general and administrative expenses of $1.6 million was primarily related to an increase of $1.3 million of personnel expenses, including a $0.7 million increase in stock-based compensation expense, as driven by the increased headcount, an increase of $0.7 million of professional fees, offset by a decrease of $0.5 million in insurance costs.

*Interest Expense*

Interest expense was $6.4 million for the year ended December 31, 2022, compared to $3.4 million for the year ended December 31, 2021 and consisted of interest on the principal balance outstanding under our term loans with Oxford Finance LLC, or Oxford. The increase in interest expense of $3.0 million was primarily due to an increase in principal outstanding related to the modification of the terms of our loan pursuant to the 2022 Loan Agreement, as defined below, which we entered into in February 2022.

*Other Income (Expense), Net*

Other income was $2.9 million for the year ended December 31, 2022, compared to $19.8 million for the year ended December 31, 2021. This decrease in other income of $16.9 million was primarily due to write off of deferred CIRM grant liability of $19.8 million during the year ended December 31, 2021 related to an amount of grant awards that we no longer intend to repay as a result of our decision to wind down the P-BCMA-101 program.

**Liquidity and Capital Resources**

Since our inception in 2014, we have incurred significant operating losses. Our net losses were $64.0 million and $125.0 million for the years ended December 31, 2022 and 2021, respectively, and negative cash flows from operations of $26.8 million and $102.5 million, respectively. We expect to continue to incur net losses and negative cash flows from operations for at least the next several years. As of December 31, 2022, we had an accumulated deficit of $470.9 million.

Our operations to date have focused on organizing and staffing our company, business planning, raising capital, in-licensing and acquiring intellectual property rights and establishing and protecting our intellectual property portfolio, developing our gene engineering technologies, identifying potential product candidates and undertaking research and development and manufacturing activities, including preclinical studies and clinical trials of our product candidates, and engaging in strategic transactions.

Our primary use of cash is to fund our operating expenses, which consist primarily of research and development expenditures including payroll and external costs associated with our preclinical and clinical stage programs, and to a lesser extent, general and administrative expenditures. Cash used to fund operating expenses is impacted by the timing of when we pay these expenses, as reflected in the change in our outstanding accounts payable and accrued expenses.

We have not yet commercialized any of our product candidates and we do not expect to generate revenue from sales of any product candidates for several years, if at all. We have funded our operations primarily through the sale of equity, debt financings and strategic collaborations. Since our inception, we have raised $304.5 million of gross proceeds from the sale of our common stock in our public offerings, $334.3 million of gross proceeds from the sale

of shares of our redeemable convertible preferred stock, received $60.0 million of gross proceeds from borrowings under our loan agreement and received an aggregate of $23.8 million in grant funding from CIRM. In the fourth quarter of 2021, we entered into a collaboration agreement with Takeda and received an upfront payment of $45.0 million. In the third quarter of 2022, we entered into a collaboration agreement with Roche and received an upfront payment of $110.0 million.

We expect that our cash, cash equivalents and short-term investments as of December 31, 2022 of $282.5 million will be sufficient to fund our operations for at least the next twelve months from the date of issuance of the financial statements included in this Annual Report on Form 10-K. In the long term we will need additional financing to support our continuing operations and pursue our growth strategy.

We do not expect to generate any revenues from product sales unless and until we successfully complete development and obtain regulatory approval for P-MUC1C-ALLO1 or any other product candidates, which will not be for at least the next several years, if ever. If we obtain regulatory approval for any of our product candidates, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution activities. Accordingly, until such time, if ever, as we can generate substantial product revenue, we expect to finance our operations through equity offerings, debt financings or other capital sources, including potential grants, collaborations, licenses or other similar arrangements. However, we may not be able to secure additional financing or enter into such other arrangements in a timely manner or on favorable terms, if at all. Especially in light of the COVID-19 pandemic, as well as recent or anticipated changes in interest rates and economic inflation, there can be no assurances that we will be able to secure such additional sources of funds to support our operations, or, if such funds are available to us, that such additional financing will be sufficient to meet our needs. Our failure to raise capital or enter into such other arrangements when needed would have a negative impact on our financial condition and could force us to delay, reduce or terminate our research and development programs or other operations, or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

***Loan Agreement***

In 2017, we entered into a loan and security agreement with Oxford, as subsequently amended, or Amended Loan Agreement, pursuant to which we drew a Term A loan in the amount of $20.0 million and a Term B loan, in the amount of $10.0 million for a total outstanding balance of $30.0 million.

In February 2022, we entered into a new Loan and Security Agreement, or the 2022 Loan Agreement, with Oxford. Pursuant to the terms of the 2022 Loan Agreement we borrowed $60.0 million in term loans, a portion of which was used to repay the balance outstanding under the Amended Loan Agreement. Under the 2022 Loan Agreement the initial interest-only period is through April 1, 2025, followed by 23 equal monthly payments of principal and applicable interest. In September 2022, a qualifying equity event, as defined in the 2022 Loan Agreement, was achieved which extended the interest-only period through April 1, 2026, followed by 11 equal monthly payments of principal and applicable interest. As a result, all amounts outstanding under the 2022 Loan Agreement will mature on February 1, 2027. The balance outstanding under the 2022 Loan Agreement bears interest at a floating per annum rate equal to 7.83% plus the greater of (a) the 30-day U.S. Dollar (USD) LIBOR rate and (b) 0.11%. As of December 31, 2022, the interest rate applicable to our Term Loans borrowing was 11.97%.

In connection with the repayment of the balance outstanding under the Amended Loan Agreement, we incurred amendment and final payment fees of $1.5 million previously due on the earlier of (i) the maturity date, (ii) acceleration of any Amended Loan Agreement loans, or (iii) the prepayment of any Amended Loan Agreement loans. We have an option to repay the outstanding debt under the 2022 Loan Agreement at any time in increments of $5.0 million, subject to a prepayment fee of 1.0% if the term loans are prepaid on or prior to February 22, 2024, after which no prepayment penalty would be applied. Consistent with the Amended Loan Agreement, there is a 7.5% final payment fee payable on the earlier of (i) the new maturity date, (ii) acceleration of the new loan, or (iii) the prepayment of the new loan.

On November 30, 2020, ICE Benchmark Administration, with the support of the United States Federal Reserve and the FCA, announced plans to consult on ceasing publication of USD LIBOR on December 31, 2021 for only the one week and two month USD LIBOR tenors, and on June 30, 2023 for all other USD LIBOR tenors. Various central bank committees and working groups continue to discuss replacement of benchmark rates, the process for amending existing LIBOR-based contracts, and the potential economic impacts of different alternatives. The Alternative Reference Rates Committee has identified the Secured Overnight Financing Rate, or SOFR, as its preferred alternative rate for USD LIBOR. SOFR is a measure of the cost of borrowing cash overnight, collateralized by U.S. Treasury securities, and is based on directly observable U.S. Treasury-backed repurchase transactions.

***Operating Lease Agreements***

In October 2018, we entered into a lease agreement for a facility in San Diego, California to be used for research and development and administrative activities. The lease term commenced on April 1, 2019 and will expire on December 31, 2029. In October 2019, we entered into a lease amendment to expand the existing premises. The lease term for the additional premises commenced on July 29, 2020 and will expire on December 31, 2029.

In July 2019, we entered into a lease agreement for a facility in San Diego, California that was retrofitted to Good Manufacturing Practice standards and is used for manufacturing in our early-stage clinical trials. The lease term commenced on June 26, 2020 and will expire on December 31, 2029.

In October 2021, we entered into a sublease agreement for a facility in San Diego, California consisting of approximately 23,000 square feet to be used for research and administrative activities. The lease term commenced in March 2022 and will expire on December 31, 2025.

As of December 31, 2022, we had operating leases of approximately 110,000 square feet of manufacturing, laboratory and office space in San Diego, California, of which 87,000 square feet is under a lease that expires on December 31, 2029, and includes a pilot manufacturing facility adjacent to office and laboratory space. The lease agreements include two options to extend the term for a period of 5 years each.

***Contractual Obligations and Commitments***

The following table summarizes our contractual obligations and commitments as of December 31, 2022 (in thousands):

| | Payments Due by Period | | | | |
|---|---|---|---|---|---|
| | Total | Less than 1 Year | 1 to 3 Years | 4 to 5 Years | More than 5 Years |
| Operating lease commitments | $ 39,973 | $ 6,033 | $ 17,681 | $ 10,678 | $ 5,581 |
| Debt obligations | 91,829 | 7,283 | 68,968 | 15,578 | — |
| Total | $ 131,802 | $ 13,316 | $ 86,649 | $ 26,256 | $ 5,581 |

In addition to the contractual obligations and commitments presented in the table above, a significant portion of our cash requirements is associated with personnel expense, including payroll, employment benefits, and hiring, employee retention and training costs. We expect that the amount of our personnel expense will increase in the foreseeable future as we continue to increase our headcount.

Furthermore, we enter into contracts in the normal course of business with contract research organizations, CMOs and other third parties for preclinical research studies, clinical trials and testing and manufacturing services. These contracts do not contain minimum purchase commitments and are cancelable by us upon prior written notice. Payments due upon cancellation consist of payments for services provided or expenses incurred, including noncancelable obligations of our service providers, up to one year after the date of cancellation. These payments are not included in the table above as the amount and timing of such payments are not known.

We have also entered into a several in-license agreements under which we are obligated to make aggregate milestone payments upon the achievement of specified preclinical, clinical and regulatory milestones as well as royalty payments. We have not included future payments under this agreement in the table above since the payment obligations under this agreement are contingent upon future events, such as our achievement of specified milestones or generating product sales. As of December 31, 2022, we were unable to estimate the timing or likelihood of achieving these milestones or generating future product sales. See the subsection titled "—In-License Agreements" above.

***Cash Flows***

The following table sets forth the primary sources and uses of cash and cash equivalents for the years ended December 31, 2022 and 2021 (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Cash used in operating activities | $ (26,772) | $ (102,543) |
| Cash (used in) provided by investing activities | (203,334) | 222,384 |
| Cash provided by financing activities | 105,159 | 2,518 |
| Net (decrease) increase in cash and cash equivalents | $ (124,947) | $ 122,359 |

During the year ended December 31, 2022, operating activities used $26.8 million of cash, primarily resulting from our net loss of $64.0 million, offset by non-cash items of $23.5 million, and net cash provided by changes in our operating assets and liabilities of $13.7 million. Non-cash charges consisted primarily of $18.9 million in stock-based compensation, $5.2 million in depreciation expense, $0.8 million of accretion of discount on issued term debt, offset by $1.8 million of accretion of discounts on investments. Net cash provided by changes in our operating assets and liabilities for the year ended December 31, 2022 consisted primarily of a $27.3 million increase in deferred revenue associated with the upfront payment received pursuant to the Roche Collaboration Agreement, a $4.6 million decrease in operating lease right-of-use assets, a $1.4 million increase in accrued liabilities, a $0.6 million decrease in other long-term assets, and a $0.5 million decrease in prepaid expenses and other current assets, offset in part by a $9.1 million increase in accounts receivable, a $6.7 million decrease in accounts payable, and a $4.9 million decrease in operating lease liabilities.

During the year ended December 31, 2021, operating activities used $102.5 million of cash, primarily resulting from our net loss of $125.0 million, offset by non-cash items of $2.3 million, and net cash provided by changes in our operating assets and liabilities of $20.2 million. Non-cash charges consisted primarily of a $19.8 million write off of the deferred CIRM grant liability, $16.7 million in stock-based compensation, $4.6 million in depreciation expense, and $0.6 million of accretion of discount on issued term debt. Net cash provided by changes in our operating assets and liabilities for the year ended December 31, 2021 consisted primarily of a $13.8 million increase in deferred revenue associated with the upfront payment received pursuant to the Takeda Collaboration Agreement, a $7.8 million increase in accounts payable, a $3.6 million decrease in operating lease right-of-use assets, and a $2.0 million decrease in other long-term assets, offset in part by a $3.1 million decrease in operating lease liabilities, a $2.7 million increase in prepaid expenses and other current assets, and a $1.2 million decrease in accrued liabilities.

*Cash (Used in) Provided by Investing Activities*

During the year ended December 31, 2022, net cash used in investing activities was $203.3 million, consisting of $294.4 million in purchase of short-term investment, and $3.9 million in purchases of property and equipment, partially offset by $95.0 million in proceeds from maturities of short-term investments.

During the year ended December 31, 2021, net cash provided by investing activities was $222.4 million, consisting of $225.0 million in proceeds from maturities of short-term investments, partially offset by $2.6 million in purchases of property and equipment.

The timing of purchase and sales of our short-term investments is driven by our available cash balance and maturity of existing investments. The purchase of property and equipment for all periods related to equipment purchases as we expanded our research and development and manufacturing activities, in addition to corporate office space.

*Cash Provided by Financing Activities*

During the year ended December 31, 2022, net cash provided by financing activities was $105.2 million, consisting of $75.3 million of net proceeds from our public offering of common stock, $28.6 million of proceeds from the 2022 Loan Agreement, net of debt issuance cost and repayment of the Amended Loan Agreement, and $1.3 million of proceeds from purchases under our ESPP and exercises of stock options.

During the year ended December 31, 2021, net cash provided by financing activities was $2.5 million, consisting of proceeds from the exercises of stock options and purchases under our ESPP.

**Critical Accounting Policies and Significant Judgments and Estimates**

Management's discussion and analysis of our financial condition and results of operations are based upon our financial statements, which are prepared in accordance with accounting principles that are generally accepted in the United States. The preparation of these financial statements requires us to make estimates and judgments that affect the reported amounts of assets and liabilities, related disclosure of contingent liabilities at the date of the financial statements, and the reported amounts of expenses and other income during the reporting period. We continually evaluate our estimates and judgments, the most critical of which are those related to revenue, preclinical and clinical study accruals and stock-based compensation costs. We base our estimates and judgments on historical experience and other factors that we believe to be reasonable under the circumstances. Materially different results can occur as circumstances change and additional information becomes known.

While our significant accounting policies are described in more detail in Note 2 to our consolidated financial statements, we believe the following accounting policies and estimates to be most critical to the preparation of our consolidated financial statements. We believe that the following discussion addresses our most critical accounting policies, which are those that are most important to the portrayal of our financial condition and results of operations and require management's most difficult, subjective and complex judgments.

***Revenue Recognition***

Our revenues to date have been generated primarily through collaboration and license agreements. Our collaboration and license agreements may contain multiple elements including intellectual property licenses and research, and development services. Consideration we receive under these arrangements may include upfront payments, research and development funding, cost reimbursements, research, development, regulatory and commercial milestone payments, and royalty payments.

We apply Accounting Standard Codification Topic 606, *Revenue from Contracts with Customers* ("ASC 606"), issued by the Financial Accounting Standards Board ("FASB") to account for our contracts with customers. Under ASC 606, revenue is recognized when a customer obtains control of promised goods or services. The amount of revenue recognized reflects the consideration that we expect to be entitled to receive in exchange for these services and excludes sales incentives and amounts collected on behalf of third parties. We analyze the nature of these performance obligations in the context of individual collaboration and license agreements in order to assess the distinct performance obligations. We evaluate our contracts with customers for proper classification in the consolidated statements of operations based on the nature of the underlying activity. Transactions with customers recorded in our consolidated statements of operations are recorded on either a gross or net basis, depending on the characteristics of the collaborative relationship.

To determine revenue recognition for arrangements within the scope of ASC 606, we perform the following five steps: (i) identify the contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price, including variable consideration, if any; (iv) allocate the transaction price to the

performance obligations in the contract; and (v) recognize revenue when (or as) the entity satisfies a performance obligation. We only apply the five-step model to contracts when it is probable that we will collect the consideration to which it is entitled in exchange for the goods or services it transfers to the customer.

We use judgment in determining the customer's ability and intent to pay, which is based upon factors including the customer's historical payment experience or, for new customers, credit and financial information pertaining to the customers. Determining whether a promised goods or service is a separate performance obligation requires the use of significant judgment. A change in such judgment could result in a significant change in the period in which revenue is recognized. We determine standalone selling price based on our overall pricing and discounting objectives, taking into consideration the type of services, estimates of hourly market rates, and stage of the research, development or clinical trials. The process for determining the transaction price involves significant judgment and includes consideration of multiple factors such as estimated revenues, market size, and development risk, among other factors contemplated in negotiating the arrangement with the customer. We determine the transaction price based on the consideration to which we expect to be entitled in exchange for transferring goods and services to the customer. In determining the transaction price, any variable consideration would be considered, to the extent applicable, if, in our judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. In accordance with the royalty exception under ASC 606 for licenses of intellectual property, the transaction price excludes future royalty payments to be received from our customers. Our collaboration and license agreement contains no consideration payable to our customer or a significant financing component.

***Performance Obligations***

The following is a description of principal goods and services from which we generate revenue.

*Intellectual property licenses*

We generate revenue from licensing our intellectual property including know-how and development and commercialization rights. These licenses provide customers with a term-based license to further research, develop and commercialize our internally-discovered platform technologies for specified therapeutic indications. The consideration we receive in the form of nonrefundable upfront consideration allocated to the functional intellectual property licenses is recognized at a point in time for licenses determined to be distinct from other performance obligations in the contract when we transfer such license to the customer. If the license is combined with other goods or services into one performance obligation, the revenue is recognized over a period of time based on our method of measuring progress in which we satisfy the combined performance obligation. We evaluate the measure of progress each reporting period and, if necessary, adjust the measure of performance and related revenue recognition. Our licensing agreements are generally cancelable. Customers have the right to terminate their contracts upon notice. We have the right to terminate the contracts generally only if the customer is in breach of the contract and fails to remedy the breach in accordance with the contractual terms.

*Material Rights*

Arrangements that include rights to additional goods or services that are exercisable at a customer’s discretion are generally considered options. We assess if these options provide a material right, (i.e., an optional good or service offered for free or at a discount) to the customer and if so, whether they are considered performance obligations. The identification of material rights requires judgments related to the determination of the value of the underlying license relative to the option exercise price, including assumptions about the amount of the discount and likelihood that the option will be exercised. The exercise of a material right is accounted for as a contract modification for accounting purposes. Amounts allocated to any material right are recognized as revenue when or as the related future goods or services are transferred or when the option expires.

*Research and development services*

We generate revenue from research and development services we provide to our customers in connection with the licensed intellectual property. The services we provide to our customers primarily include scientific research activities. Revenue associated with these services is recognized over time using the cost-to-cost input method, based on the total estimated costs to fulfill the obligations.

***Contracts with Multiple Performance Obligations***

Our collaboration and license agreements with customers may contain multiple promised goods or services. Based on the characteristics of the promised goods and services we analyze whether they are separate or combined performance obligations. The transaction price is allocated to the separate performance obligations on a relative standalone selling price basis. We determine standalone selling price based on our overall pricing and discounting objectives, taking into consideration the type of services, estimates of hourly market rates, and stage of the development and clinical trials.

ASC 606 requires that we allocate the arrangement consideration on a relative standalone selling price basis for each performance obligation after determining the transaction price of the contract and identifying the performance obligations to which that amount should be allocated. The relative standalone selling price is defined in ASC 606 as the price at which an entity would sell a promised good or service separately to a customer. If other observable transactions in which we have sold the same performance obligation separately are not available, we estimate the standalone selling price of each performance obligation. When standalone selling prices for our products or services are not directly observable, we determine the standalone selling prices using relevant information available and apply suitable estimation methods considering market conditions and entity-specific factors including, but not limited to, features and functionality of the underlying intellectual property licenses and the economic potential associated with ongoing research activities. Key assumptions to determine the standalone selling price may also include development timelines, reimbursement rates for personnel costs, discount rates and probabilities of technical and regulatory success.

***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, however, some require advance payments. We make estimates of our accrued expenses as of each balance sheet date in our 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 preclinical development activities, CMOs in connection with the process development and scale-up activities and the production of clinical trial materials and contract research organizations in connection with clinical trials.

We base the expense recorded related to contract research and manufacturing on our estimates of the services received and efforts expended pursuant to quotes and contracts with multiple CMOs and contract research organizations that supply materials and conduct services. 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.

***Stock-Based Compensation***

We measure stock-based awards granted to employees, non-employees and directors based on their fair value on the date of the grant using the Black-Scholes option-pricing model for options. Compensation expense for those awards is recognized over the requisite service period, which is generally the vesting period of the respective award. We use the straight-line method to record the expense of awards with service-based vesting conditions. Forfeitures are recognized as they occur.

The Black-Scholes option-pricing model requires the use of subjective assumptions to determine the fair value of stock-based awards and shares purchasable under the ESPP. These assumptions include:

- *Expected term*—The expected term represents the period that stock-based awards are expected to be outstanding. The expected term for option grants is determined using the simplified method. The simplified method deems the expected term to be the midpoint between the vesting date and the contractual life of the stock-based awards.
- *Expected volatility*—Since we were a privately held company until July 2020 and do not have significant trading history for our common stock, the expected volatility is estimated based on the average volatility for comparable publicly traded biotechnology companies over a period equal to the expected term of the stock option grants. The comparable companies were chosen based on their similar size, stage in the life cycle or area of specialty. We will continue to apply this process until a sufficient amount of historical information regarding the volatility of our own stock price becomes available.
- *Risk-free interest rate*—The risk-free interest rate is based on the U.S. Treasury zero coupon issues in effect at the time of grant for periods corresponding with the expected term of option.
- *Expected dividend*—We have never paid dividends on our common stock and have no plans to pay dividends on our common stock. Therefore, we used an expected dividend yield of zero.

As of December 31, 2022, the unrecognized stock-based compensation expense related to employee stock options was $30.8 million and is expected to be recognized as expense over a weighted-average period of approximately 2.5 years. The intrinsic value of all outstanding stock options as of December 31, 2022 was approximately $7.7 million, of which approximately $2.4 million related to vested options and approximately $5.3 million related to unvested options.

**JOBS Act**

We are an emerging growth company, as defined in Section 2(a) of the Securities Act of 1933, as amended, or the Securities Act, as modified by the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. The JOBS Act permits an "emerging growth company" such as us to take advantage of an extended transition period to comply with new or revised accounting standards applicable to public companies. We have elected to use this the extended transition period under the JOBS Act until the earlier of the date we (i) are no longer an emerging growth company or (ii) affirmatively and irrevocably opt out of the extended transition period provided in the JOBS Act. As a result, our consolidated financial statements may not be comparable to companies that comply with new or revised accounting pronouncements as of public company effective dates. The JOBS Act also allows us to take advantage of certain exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including relief from the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended, less extensive disclosure obligations regarding executive compensation in our registration statements, periodic reports and proxy statements, exemptions from the requirements to hold a nonbinding advisory vote on executive compensation, and exemptions from stockholder approval of any golden parachute payments not previously approved. We may also elect to take advantage of other reduced reporting requirements in future filings. As a result, our stockholders may not have access to certain information that they may deem important and the information that we provide to our stockholders may be different than, and not comparable to, information presented by other public reporting companies.

We will remain an emerging growth company until the earliest to occur of: (1) the last day of the fiscal year in which we have more than $1.235 billion in annual revenue; (2) the date we qualify as a "large accelerated filer," with at least $700.0 million of equity securities held by non-affiliates; (3) the date on which we have issued more than $1.0 billion in non-convertible debt securities during the prior three-year period; and (4) December 31, 2025.

We are also a smaller reporting company, as defined in the Securities Exchange Act of 1934. We may continue to be a smaller reporting company even after we are no longer an emerging growth company. We may take advantage of certain of the scaled disclosures available to smaller reporting companies and will be able to take advantage of these scaled disclosures for so long as (i) our voting and non-voting common stock held by non-affiliates is less than $250.0 million measured on the last business day of our second fiscal quarter or (ii) our annual

revenue is less than $100.0 million during the most recently completed fiscal year and our voting and non-voting common stock held by non-affiliates is less than $700.0 million measured on the last business day of our second fiscal quarter.

**Recent Accounting Pronouncements**

A description of recently issued accounting pronouncements that may potentially impact our financial position, results of operations or cash flows is disclosed in Note 2 to our consolidated financial statements included in this Annual Report.

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

***Interest Rate Risk***

As of December 31, 2022, we had cash, cash equivalents and short-term investments of $282.5 million. Cash consists of deposits with financial institutions. Interest income is sensitive to changes in the general level of interest rates. However, due to the nature of these investments, a hypothetical 10% change in interest rates during any of the periods presented would not have had a material impact on our consolidated financial statements.

As of December 31, 2022, we had $60.0 million of borrowings outstanding under the 2022 Loan Agreement bearing interest at a variable rate equal to 30-day LIBOR plus 7.83%, subject to a floor of 7.94%. A hypothetical 10% change in interest rates during any of the periods presented would not have had a material impact on our consolidated financial statements. LIBOR is currently scheduled to be phased out on June 30, 2023. Our 2022 Loan Agreement includes provision addressing replacement of LIBOR with an alternate benchmark rate, which may includes SOFR, when LIBOR is phased out, however a new standard has not yet been established. The consequences of a change in benchmark rate cannot be entirely predicted, but could result in higher interest rates on the principal amount outstanding under our 2022 Loan Agreement.

***Foreign Currency Exchange Risk***

To date, foreign currency transaction gains and losses have not been material to our consolidated financial statements, and we have not had a formal hedging program with respect to foreign currency. Our expenses are generally denominated in U.S. dollars. However, we have contracted with a limited number of foreign vendors located in Europe and Canada and may contract with foreign vendors in the future. Our operations may be subject to fluctuations in foreign currency exchange rates in the future. A hypothetical 10% change in exchange rates during any of the periods presented would not have had a material impact on our consolidated financial statements.

***Effects of Inflation***

Inflation generally affects us by increasing our cost of labor. We do not believe that inflation had a material effect on our consolidated financial statements.

**Item 8. Financial Statements and Supplementary Data.**

The financial statements and supplemental data required by this item are set forth at the pages indicated in Part IV, Item 15 of this Annual Report on Form 10-K.

**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***

We are responsible for maintaining disclosure controls and procedures, as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended, or the Exchange Act. Disclosure controls and procedures are designed to ensure that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is recorded, processed, summarized, and reported, within the time periods specified in the SEC's rules and forms and that such information is accumulated and communicated to our management, including our Principal Executive Officer and Principal Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

Based on our management's evaluation, the Principal Executive Officer and Principal Financial Officer have concluded that our disclosure controls and procedures were effective as of December 31, 2022.

***Management's Report on Internal Control over Financial Reporting***

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act. We maintain internal control over financial reporting designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles.

Internal control over financial reporting cannot provide absolute assurance of achieving financial reporting objectives because of its inherent limitations. Internal control over financial reporting is a process that involves human diligence and compliance and is subject to lapses in judgment and breakdowns resulting from human failures. Internal control over financial reporting also can be circumvented by collusion or improper management override. A control system, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within our company have been detected. Because of such limitations, there is a risk that material misstatements may not be prevented or detected on a timely basis by internal control over financial reporting. However, these inherent limitations are known features of the financial reporting process. Therefore, it is possible to design into the process safeguards to reduce, though not eliminate, this risk.

Under the supervision and with the participation of our Principal Executive Officer and Principal Financial Officer, our management conducted an evaluation of the effectiveness of our internal control over financial reporting based on the criteria set forth in "Internal Control-Integrated Framework" issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Based on this assessment, our management concluded that our internal control over financial reporting was effective at the reasonable assurance level as of December 31, 2022.

***Attestation Report of the Registered Public Accounting Firm***

This Annual Report does not include an attestation report of our registered public accounting firm regarding internal control over financial reporting due to an exemption established by the JOBS Act for "emerging growth companies".

***Changes in Internal Control Over Financial Reporting***

There have been no changes in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the quarter ended December 31, 2022 that have materially affected, or are 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.

The information required by this item (other than as set forth below) is incorporated herein by reference to our Proxy Statement with respect to our 2023 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the end of the fiscal year covered by this Annual Report on Form 10-K, under the sections headed "Proposal 1: Election of Directors," "Information Regarding Director Nominees and Current Directors," "Information Regarding the Board of Directors and Corporate Governance" and "Executive Officers."

We have adopted a written code of business conduct and ethics that applies to all our directors, officers and employees, including our principal executive officer, principal financial officer and principal accounting officer. A current copy of the code of business conduct and ethics is available on the Corporate Governance section of our website at www.poseida.com. We intend to disclose on our website any amendments to, or waivers from, our code of business conduct and ethics that are required to be disclosed pursuant to SEC rules.

### Item 11. Executive Compensation.

The information required by this item is incorporated herein by reference to our Proxy Statement with respect to our 2023 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the end of the fiscal year covered by this Annual Report on Form 10-K, under the section headed "Executive Compensation."

### Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

The information required by this item is incorporated herein by reference to our Proxy Statement with respect to our 2023 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the end of the fiscal year covered by this Annual Report on Form 10-K, under the section headed "Security Ownership of Certain Beneficial Owners and Management."

### Item 13. Certain Relationships and Related Transactions, and Director Independence.

The information required by this item is incorporated herein by reference to our Proxy Statement with respect to our 2023 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the end of the fiscal year covered by this Annual Report on Form 10-K, under the sections headed "Transactions with Related Persons and Indemnification" and "Information Regarding the Board of Directors and Corporate Governance."

### Item 14. Principal Accounting Fees and Services.

The information required by this item is incorporated herein by reference to our Proxy Statement with respect to our 2023 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the end of the fiscal year covered by this Annual Report on Form 10-K, under the section headed "Proposal 2: Ratification of Selection of Independent Registered Public Accounting Firm."

## PART IV

**Item 15. Exhibits, Financial Statement Schedules.**

We have filed the following financial statements and financial statement schedules as part of this Annual Report:

### INDEX TO CONSOLIDATED FINANCIAL STATEMENTS



***Exhibits***

The exhibits listed in the accompanying index to exhibits are filed or incorporated by reference as part of this Annual Report on Form 10-K.

## Report of Independent Registered Public Accounting Firm

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

### *Opinion on the Financial Statements*

We have audited the accompanying consolidated balance sheets of Poseida 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 changes in 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.

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.

### *Emphasis of Matter*

As discussed in Note 1 to the consolidated financial statements, the Company will require additional financing to fund future operations. Management's evaluation of the events and conditions and management's plans to mitigate this matter is also described in Note 1.

/s/ PricewaterhouseCoopers LLP

Irvine, California
March 9, 2023

We have served as the Company's auditor since 2015.

**Poseida Therapeutics, Inc.**
**CONSOLIDATED BALANCE SHEETS**
**(In thousands, except share amounts)**

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| **Assets** | | |
| Current assets: | | |
| Cash and cash equivalents | $ 81,378 | $ 206,325 |
| Short-term investments | 201,115 | — |
| Accounts receivable | 9,088 | — |
| Prepaid expenses and other current assets | 6,982 | 7,548 |
| Total current assets | 298,563 | 213,873 |
| Property and equipment, net | 21,586 | 22,050 |
| Operating lease right-of-use assets | 25,085 | 26,177 |
| Intangible assets, net | 1,320 | 1,320 |
| Goodwill | 4,228 | 4,228 |
| Other long-term assets | 1,055 | 1,661 |
| Total assets | $ 351,837 | $ 269,309 |
| **Liabilities and Stockholders' Equity** | | |
| Current liabilities: | | |
| Accounts payable | $ 2,228 | $ 8,961 |
| Accrued expenses and other liabilities | 26,068 | 23,540 |
| Operating lease liabilities, current | 5,866 | 6,337 |
| Deferred revenue, current | 19,723 | 4,497 |
| Total current liabilities | 53,885 | 43,335 |
| Term debt | 58,250 | 29,357 |
| Deferred CIRM grant liability | 3,992 | 3,992 |
| Deferred revenue, non-current | 21,333 | 9,265 |
| Deferred tax liability | 55 | 55 |
| Operating lease liabilities, non-current | 24,636 | 25,504 |
| Other long-term liabilities | 2,091 | 1,590 |
| Total liabilities | 164,242 | 113,098 |
| *Commitments and Contingencies (Note 11)* | | |
| Stockholders' equity: | | |
| Common stock, $0.0001 par value: 250,000,000 shares authorized at December 31, 2022 and December 31, 2021; 85,964,161 and 62,523,596 shares issued and outstanding at December 31, 2022 and December 31, 2021, respectively | 9 | 6 |
| Additional paid-in capital | 658,596 | 563,064 |
| Accumulated other comprehensive loss | (149) | — |
| Accumulated deficit | (470,861) | (406,859) |
| Total stockholders' equity | 187,595 | 156,211 |
| Total liabilities and stockholders' equity | $ 351,837 | $ 269,309 |

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

**Poseida Therapeutics, Inc.**
**CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS**
**(In thousands, except share and per share amounts)**

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Revenues: | | |
| Collaboration revenue | $ 130,492 | $ 31,238 |
| Total revenue | 130,492 | 31,238 |
| Operating expenses: | | |
| Research and development | 152,899 | 136,734 |
| General and administrative | 37,539 | 35,915 |
| Total operating expenses | 190,438 | 172,649 |
| Loss from operations | (59,946) | (141,411) |
| Other income (expense): | | |
| Interest expense | (6,370) | (3,358) |
| Other income, net | 2,858 | 19,795 |
| Net loss before income tax | (63,458) | (124,974) |
| Income tax expense | (544) | — |
| Net loss | $ (64,002) | $ (124,974) |
| | | |
| Other comprehensive expense: | | |
| Unrealized loss on short-term investments | (149) | (5) |
| Comprehensive loss | $ (64,151) | $ (124,979) |
| | | |
| Net loss per share attributable to common stockholders, basic and diluted | $ (0.89) | $ (2.01) |
| Weighted-average number of shares outstanding, basic and diluted | 71,953,703 | 62,235,940 |

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

**Poseida Therapeutics, Inc.**
**CONSOLIDATED STATEMENTS OF CHANGES IN STOCKHOLDERS' EQUITY**
**(In thousands, except share amounts)**

| | Common Stock | | Additional Paid-In Capital | Accumulated Other Comprehensive Income (Loss) | Accumulated Deficit | Total Stockholders' Equity |
|---|---|---|---|---|---|---|
| | Shares | Amount | | | | |
| Balance at January 1, 2020 | 61,860,897 | $ 6 | $ 543,842 | $ 5 | $ (281,885) | $ 261,968 |
| Issuance of common stock under employee stock compensation plans | 662,699 | — | 2,518 | — | — | 2,518 |
| Stock-based compensation expense | — | — | 16,704 | — | — | 16,704 |
| Unrealized loss on available-for-sale securities | — | — | — | (5) | — | (5) |
| Net loss | — | — | — | — | (124,974) | (124,974) |
| Balance at December 31, 2021 | 62,523,596 | $ 6 | $ 563,064 | $ — | $ (406,859) | $ 156,211 |
| Issuance of common stock under employee stock compensation plans | 440,565 | — | 1,310 | — | — | 1,310 |
| Issuance of common stock from public offering, net of issuance costs of $5,223 | 23,000,000 | 3 | 75,296 | — | — | 75,299 |
| Stock-based compensation expense | — | — | 18,926 | — | — | 18,926 |
| Unrealized loss on available-for-sale securities | — | — | — | (149) | — | (149) |
| Net loss | — | — | — | — | (64,002) | (64,002) |
| Balance at December 31, 2022 | 85,964,161 | $ 9 | $ 658,596 | $ (149) | $ (470,861) | $ 187,595 |

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

**Poseida Therapeutics, Inc.**
**CONSOLIDATED STATEMENTS OF CASH FLOWS**
**(In thousands)**

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| **Operating Activities:** | | |
| Net loss | $ (64,002) | $ (124,974) |
| Adjustments to reconcile net loss to net cash used in operating activities: | | |
| Depreciation and amortization expense | 5,172 | 4,552 |
| Stock-based compensation | 18,926 | 16,704 |
| Write off of deferred CIRM grant liability | — | (19,763) |
| Accretion of discount on issued term debt | 844 | 639 |
| Amortization (accretion) on investment securities, net | (1,775) | 133 |
| Loss (gain) on disposal of property and equipment | 348 | (2) |
| Changes in operating assets and liabilities: | | |
| Accounts receivable | (9,088) | — |
| Prepaid expenses and other current assets | 499 | (2,656) |
| Operating lease right-of-use assets | 4,605 | 3,580 |
| Other long-term assets | 605 | 1,957 |
| Accounts payable | (6,748) | 7,842 |
| Accrued liabilities | 1,399 | (1,204) |
| Operating lease liabilities | (4,852) | (3,113) |
| Deferred revenue | 27,295 | 13,762 |
| Net cash used in operating activities | (26,772) | (102,543) |
| **Investing Activities:** | | |
| Purchases of property and equipment | (3,924) | (2,634) |
| Proceeds from disposal of property and equipment | 12 | 18 |
| Purchases of short-term investments | (294,422) | — |
| Proceeds from maturities of short-term investments | 95,000 | 225,000 |
| Net cash (used in) provided by investing activities | (203,334) | 222,384 |
| **Financing Activities:** | | |
| Proceeds from issuance of common stock under employee stock compensation plans | 1,310 | 2,518 |
| Proceeds from public offering of common stock, net of issuance costs | 75,299 | — |
| Proceeds from term debt | 30,000 | — |
| Payment of debt issuance costs | (1,450) | — |
| Net cash provided by financing activities | 105,159 | 2,518 |
| Net (decrease) increase in cash and cash equivalents | (124,947) | 122,359 |
| Cash and cash equivalents at beginning of period | 206,325 | 83,966 |
| Cash and cash equivalents at end of period | $ 81,378 | $ 206,325 |
| | | |
| **Non-cash operating, investing and financing activities:** | | |
| Purchases of property and equipment included in accounts payable and accrued liabilities | $ 1,144 | $ 647 |
| Right-of-use assets obtained in exchange for operating lease liabilities | 4,425 | 4,771 |
| | | |
| **Supplemental disclosure of cash flow information:** | | |
| Interest paid | $ 5,138 | $ 2,719 |

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

**Poseida Therapeutics, Inc.**
**Notes to Consolidated Financial Statements**

## Note 1. Nature of Business and Basis of Presentation

### *Nature of Operations*

Poseida Therapeutics, Inc. (the "Company" or "Poseida") is a clinical-stage cell and gene therapy company advancing a new class of treatments for patients with cancer and rare diseases. The Company has discovered and is developing a broad portfolio of product candidates in a variety of indications based on its core proprietary platforms, including its non-viral piggyBac DNA Delivery System, Cas-CLOVER Site-specific Gene Editing System and nanoparticle- and AAV-based gene delivery technologies.

The Company is subject to risks and uncertainties common to development-stage 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 and the ability to secure additional capital to fund operations. Product candidates currently under development will require significant additional research and development efforts, including extensive 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 therapeutic development efforts are successful, it is uncertain when, if ever, the Company will realize significant revenue from product sales.

### *Liquidity and Capital Resources*

The Company has experienced net losses and negative cash flows from operations since its inception and has relied on its ability to fund its operations primarily through equity financings. For the years ended December 31, 2022 and 2021, the Company has incurred net losses of $64.0 million and $125.0 million respectively, and negative cash flows from operations for these same periods of $26.8 million and $102.5 million, respectively. The Company expects it will continue to incur net losses and negative cash flows from operations for at least the next several years. As of December 31, 2022 the Company had an accumulated deficit of $470.9 million.

The Company expects that its cash, cash equivalents and short-term investments as of December 31, 2022 of $282.5 million will be sufficient to fund its operations for at least the next twelve months from the date of issuance of these consolidated financial statements. In the long term the Company will need additional financing to support its continuing operations and pursue its business strategy. Until such time as the Company can generate significant revenue from product sales, if ever, it expects to finance its operations through a combination of equity offerings, debt financings, collaborations, strategic alliances, and licensing arrangements. The Company may be unable to raise additional funds or enter into such other agreements when needed on favorable terms or at all. The inability to raise capital as and when needed would have a negative impact on the Company's financial condition and its ability to pursue its business strategy. The Company will need to generate significant revenue to achieve profitability, and it may never do so.

### *Basis of Preparation and Consolidation*

The consolidated financial statements reflect the Company's financial position, results of operations and cash flows, in conformity with generally accepted accounting principles in the United States ("GAAP") and include the accounts of Poseida Therapeutics, Inc. and its wholly-owned subsidiaries. All intercompany transactions and balances have been eliminated.

### *Risk and Uncertainties*

In March 2020, the World Health Organization made the assessment that a novel strain of coronavirus, SARS-CoV-2, a novel strain of coronavirus, commonly referred to as COVID-19 had become a global pandemic. The impact of this pandemic has been and may continue to be extensive in many aspects of society, which has resulted in

and may continue to result in significant disruptions to the global economy, as well as businesses and capital markets around the world.

Impacts to the Company's business, some of which the Company has already experienced, include, but are not limited to, temporary closures of its facilities or those of its vendors, disruptions or restrictions on its employees' ability to travel, disruptions to or delays in ongoing laboratory experiments, preclinical studies, clinical trials, third-party manufacturing supply and other operations, the diversion of healthcare resources away from the conduct of clinical trials to focus on pandemic concerns, interruptions or delays in the operations of the U.S. Food and Drug Administration ("FDA") or other regulatory authorities, and the Company's ability to raise capital and conduct business development activities.

**Note 2. Summary of Significant Accounting Policies**

***Use of Estimates***

The preparation of consolidated financial statements in conformity with GAAP requires the Company to make estimates and assumptions that affect the amounts reported in the consolidated financial statements and accompanying notes. On an ongoing basis, the Company evaluates its estimates, which include, but are not limited to, estimates related to revenue, accrued expenses, stock-based compensation expense, deferred tax valuation allowances. The Company bases its estimates on historical experience and other market-specific or relevant assumptions that it believes to be reasonable under the circumstances. Actual results may differ from those estimates or assumptions.

***Segment Information***

The Company's sole operations consist of developing therapeutics for patients with high unmet medical need. Accordingly, the Company has determined that it operates in one operating and reportable business segment. Operating segments are defined as components of an enterprise about which separate financial information is evaluated regularly by the Company's chief operating decision maker, who is its Chief Executive Officer, in deciding how to allocate resources and assess performance. The Company's chief operating decision maker allocates resources and assesses performance based upon discrete financial information at the consolidated level. All of the Company's tangible assets are held in the United States.

***Fair Value Measurements***

Certain financial instruments are required to be recorded at fair value. Other financial instruments, like cash are recorded at cost, which approximates fair value. Cash equivalents and short-term investments are comprised of available-for-sale securities, which are carried at fair value. Additionally, carrying amounts of accounts payable and accrued liabilities approximate fair value because of the short maturity of those instruments. The carrying value of the Company's term debt approximates its fair value due to its variable interest rate, which approximates a market interest rate.

***Concentration of Business Risk***

The Company relies, and expects to continue to rely, on a small number of vendors to manufacture supplies and materials for its development programs. These programs could be adversely affected by a significant interruption in these manufacturing services. The Company's revenue has been derived from collaboration and license agreements with two customers.

***Leases***

The Company accounts for leases in accordance with Accounting Standards Codification Topic 842, *Leases*, ("ASC 842"). The Company determines if an arrangement is a lease at contract inception. A lease exists when a contract conveys the right to control the use of identified property, plant, or equipment for a period of time in exchange for consideration. The definition of a lease embodies two conditions: (1) there is an identified asset in the

contract that is land or a depreciable asset (i.e., property, plant, and equipment), and (2) the Company has the right to control the use of the identified asset.

Operating leases where the Company is the lessee are included in lease receivables, operating lease right-of-use ("ROU") assets, operating lease liabilities, current and operating lease liabilities, non-current on its consolidated balance sheets. The lease liabilities are initially and subsequently measured at the present value of the unpaid lease payments at the lease commencement date.

ASC 842 requires a lessee to discount its unpaid lease payments using the interest rate implicit in the lease or, if that rate cannot be readily determined, its incremental borrowing rate. The rates implicit in the Company's leases are not known, therefore, the incremental borrowing rate is used based on the information available at commencement date in determining the present value of lease payments. The Company's incremental borrowing rate for a lease is the rate of interest it would have to pay on a collateralized basis to borrow an amount equal to the lease payments under similar terms.

The lease term for all of the Company's leases includes the noncancelable period of the lease. Where the Company's lease term is impacted by options to extend or terminate the lease, when it is reasonably certain that it will exercise such option, then the lease payments are included in the measurement of the lease asset or liability.

The Company has elected not to recognize ROU assets and lease liabilities for all short-term leases that have a lease term of 12 months or less. The Company recognizes the lease payments associated with its short-term leases as an expense on a straight-line basis over the lease term. There are no variable lease payments associated with these leases. Additionally, the Company has elected to account for the lease and non-lease components together as a single lease component for its real estate asset class.

***Concentration of Credit Risk***

Financial instruments that potentially subject the Company to a concentration of credit risk consist of cash, cash equivalents and short-term investments. The Company maintains its cash and cash equivalent balances with high-quality financial institutions and, consequently, the Company believes that such funds are subject to minimal credit risk. Deposits held at these institutions may exceed the amount of insurance provided on such deposits.

***Cash and Cash Equivalents***

The Company considers all highly liquid investments purchased with original final maturities of 90 days or less from the date of purchase to be cash equivalents. Cash and cash equivalents consist of deposits with financial institutions and marketable securities. Cash equivalents are reported at fair value.

***Short-Term Investments***

Investments with a remaining maturity when purchased of greater than three months are classified as short-term investments in the consolidated balance sheet and consist primarily of U.S. Treasury and other government agency obligations. As the Company's entire investment portfolio is considered available for use in current operations, the Company classifies all investment as available-for-sale and as current assets. Debt securities are carried at fair value with the unrealized gains and losses included in other comprehensive income (loss) as a component of stockholders' equity until realized. Any premium or discount arising at purchase is amortized and/or accreted to interest income and/or expense over the life of the instrument. If any adjustment to fair value reflects a decline in the value of the investment that the Company considers to be "other than temporary," the Company reduces the investment to fair value through a charge to the statement of operations and comprehensive loss. No such adjustments were necessary during the periods presented.

***Goodwill and Other Intangible Assets***

Intangible assets were acquired as part of a business combination and have been capitalized at their acquisition date fair value. Indefinite-lived in process research and development ("IPR&D") is not subject to amortization but is

tested annually for impairment or more frequently if there are indicators of impairment. The Company tests its indefinite-lived IPR&D annually for impairment during the fourth quarter. In testing indefinite-lived IPR&D for impairment, the Company has the option to first assess qualitative factors to determine whether the existence of events or circumstances would indicate that it is more likely than not that its fair value is less than its carrying amount, or the Company can perform a quantitative impairment analysis to determine the fair value of the indefinite-lived IPR&D without performing a qualitative assessment. Qualitative factors that the Company considers 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 the Company chooses to first assess qualitative factors and it determines that it is more likely than not that the fair value of the indefinite-lived IPR&D is less than its carrying amount, the Company would then determine the fair value of the indefinite-lived IPR&D. Under either approach, if the fair value of the indefinite-lived IPR&D is less than its carrying amount, an impairment charge would be recognized for the difference between the fair value and the carrying amount. There was no impairment of IPR&D for the years ended December 31, 2022 and 2021.

The Company additionally tests its goodwill for impairment annually during the fourth quarter, or whenever events or changes in circumstances indicate an impairment may have occurred. Should an impairment exist, the impairment loss would be measured based on the excess of the carrying amount of the asset or asset group over the estimated asset's fair value. Impairment may result from, among other things, deterioration in the performance of the acquired business, adverse results from developmental work, adverse changes in applicable laws or regulations and a variety of other circumstances. In evaluating the recoverability of the carrying value of goodwill, the Company must make assumptions regarding estimated future cash flows and other factors to determine the fair value of the acquired assets. Changes in strategy or market conditions could significantly impact those judgments in the future and require an adjustment to the recorded balances. There were no impairments of goodwill for the years ended December 31, 2022 and 2021.

***Property and Equipment***

Property and equipment are stated at cost and depreciated or amortized using the straight-line method, based on their estimated useful lives as follows:

| Asset Classification | Estimated Useful Life (years) |
|---|---|
| Laboratory equipment | 5 |
| Leasehold improvements | Lesser of useful life or lease-term |
| Computer equipment and software | 3 |
| Furniture and fixtures | 7 |

Maintenance and repair costs are charged to expense as incurred. When assets are retired or otherwise disposed of, the cost and accumulated depreciation are removed from the Company's consolidated balance sheet and any resulting gain or loss is reflected in the Company's consolidated statement of operations and comprehensive loss.

Property and equipment are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. Recoverability is measured by comparison of the carrying amount to the future net undiscounted cash flows which the assets are expected to generate. If such assets are considered to be impaired, the impairment to be recognized is measured by the amount by which the carrying amount of the assets exceeds the projected discounted future net cash flows arising from the asset. There has been no impairment of long-lived assets during the years ended December 31, 2022 and 2021.

***Revenue Recognition***

The Company's revenues to date have been generated primarily through collaboration and license agreements. The Company's collaboration and license agreements may contain multiple elements including intellectual property licenses and research, and development services. Consideration the Company receives under these arrangements

may include upfront payments, research and development funding, cost reimbursements, research, development, regulatory and commercial milestone payments, and royalty payments.

The Company applies Accounting Standard Codification Topic 606, *Revenue from Contracts with Customers* ("ASC 606"), issued by the Financial Accounting Standards Board ("FASB") to account for its contracts with customers. Under ASC 606, revenue is recognized when a customer obtains control of promised goods or services. The amount of revenue recognized reflects the consideration that the Company expects to be entitled to receive in exchange for these services and excludes sales incentives and amounts collected on behalf of third parties. The Company analyzes the nature of these performance obligations in the context of individual collaboration and license agreements in order to assess the distinct performance obligations. The Company evaluates its contracts with customers for proper classification in the consolidated statements of operations based on the nature of the underlying activity. Transactions with customers recorded in the Company's consolidated statements of operations are recorded on either a gross or net basis, depending on the characteristics of the collaborative relationship.

To determine revenue recognition for arrangements within the scope of ASC 606, the Company performs the following five steps: (i) identify the contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price, including variable consideration, if any; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) the entity satisfies a performance obligation. The Company only applies the five-step model to contracts when it is probable that it will collect the consideration to which it is entitled in exchange for the goods or services it transfers to the customer.

The Company uses judgment in determining the customer's ability and intent to pay, which is based upon factors including the customer's historical payment experience or, for new customers, credit and financial information pertaining to the customers. Determining whether a promised goods or service is a separate performance obligation requires the use of significant judgment. A change in such judgment could result in a significant change in the period in which revenue is recognized. The Company determines standalone selling price based on its overall pricing and discounting objectives, taking into consideration the type of services, estimates of hourly market rates, and stage of the research, development or clinical trials. The process for determining the transaction price involves significant judgment and includes consideration of multiple factors such as estimated revenues, market size, and development risk, among other factors contemplated in negotiating the arrangement with the customer. The Company determines the transaction price based on the consideration to which it expects to be entitled in exchange for transferring goods and services to the customer. In determining the transaction price, any variable consideration would be considered, to the extent applicable, if, in the Company's judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. In accordance with the royalty exception under ASC 606 for licenses of intellectual property, the transaction price excludes future royalty payments to be received from our customers. The Company's collaboration and license agreements contain no consideration payable to our customer or a significant financing component.

***Performance Obligations***

The following is a description of principal goods and services from which the Company generates revenue.

*Intellectual property licenses*

The Company generates revenue from licensing its intellectual property including know-how and development and commercialization rights. These licenses provide customers with a term-based license to further research, develop and commercialize the Company's internally-discovered platform technologies for specified therapeutic indications. The consideration the Company receives in the form of nonrefundable upfront consideration allocated to the functional intellectual property licenses is recognized at a point in time for licenses determined to be distinct from other performance obligations in the contract when the Company transfers such license to the customer. If the license is combined with other goods or services into one performance obligation, the revenue is recognized over a period of time based on the Company's method of measuring progress in which it satisfies the combined performance obligation. The Company evaluates the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition. The Company's licensing agreements are generally cancelable. Customers have the right to terminate their contracts upon notice. The Company has the right to terminate the contracts generally only if the customer is in breach of the contract and fails to remedy the breach in accordance with the contractual terms.

*Material Rights*

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 (i.e., an optional good or service offered for free or at a discount) to the customer and if so, whether they are considered performance obligations. The identification of material rights requires judgments related to the determination of the value of the underlying license relative to the option exercise price, including assumptions about the amount of the discount and likelihood that the option will be exercised. The exercise of a material right is accounted for as a contract modification for accounting purposes. Amounts allocated to any material right are recognized as revenue when or as the related future goods or services are transferred or when the option expires.

*Research and development services*

The Company generates revenue from research and development services it provides to its customers in connection with the licensed intellectual property. The services the Company provides to its customers primarily include scientific research activities. Revenue associated with these services is recognized over time using the cost-to-cost input method, based on the total estimated costs to fulfill the obligations.

***Contracts with Multiple Performance Obligations***

The Company's collaboration and license agreements with customers may contain multiple promised goods or services. Based on the characteristics of the promised goods and services the Company analyzes whether they are separate or combined performance obligations. The transaction price is allocated to the separate performance obligations on a relative standalone selling price basis. The Company determines standalone selling price based on its overall pricing and discounting objectives, taking into consideration the type of services, estimates of hourly market rates, and stage of the development and clinical trials.

ASC 606 requires the Company to allocate the arrangement consideration on a relative standalone selling price basis for each performance obligation after determining the transaction price of the contract and identifying the performance obligations to which that amount should be allocated. The relative standalone selling price is defined in ASC 606 as the price at which an entity would sell a promised good or service separately to a customer. If other observable transactions in which the Company has sold the same performance obligation separately are not available, the Company estimates the standalone selling price of each performance obligation. When standalone selling prices for the Company's products or services are not directly observable, the Company determines the standalone selling prices using relevant information available and applies suitable estimation methods considering market conditions and entity-specific factors including, but not limited to, features and functionality of the underlying intellectual property licenses and the economic potential associated with ongoing research activities. Key assumptions to determine the standalone selling price may also include development timelines, reimbursement rates for personnel costs, discount rates and probabilities of technical and regulatory success.

***Variable Consideration***

The Company's contracts with customers generally include two types of variable consideration: (i) research, development and regulatory milestone payments, which the Company is entitled to upon achievement of such specific milestones and (ii) one-time sales-based payments and sales-based royalties associated with licensed intellectual property.

If an arrangement includes research, development or 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 will not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within the Company's control are generally not considered probable of being achieved until those approvals are received.

Product sales-based royalties under licensed intellectual property are accounted for under the royalty exception. The Company recognizes revenue for sales-based royalties under licensed intellectual property and one-time payments at the later of when the sales occur or the performance obligation is satisfied or partially satisfied.

Under the royalty exception in ASC 606 for licensed intellectual property the Company does not recognize any revenue for the variable amounts related to sales-based royalties and milestones until the later of when the sales occur, or the performance obligation is satisfied or partially satisfied. Accordingly, the revenue related to future sales-based royalties and milestones are excluded from the estimated revenue expected to be recognized in the future related to performance obligations that are unsatisfied.

***Disaggregation of Revenue***

The Company operates in one reportable business segment and has two customers.

***Contract Assets and Contract Liabilities***

The Company receives payments from customers based on contractual terms. Accounts receivable are recorded when the right to consideration becomes unconditional. For research and development services, the Company generally bills its customers monthly or quarterly as the services are performed. Payment terms on invoiced amounts are typically 30 - 60 days. Contract assets include amounts related to the Company's contractual right to consideration for both completed and partially completed performance obligations that have not been invoiced and for which the Company does not yet have the right to payment. The current portion of contract asset is included in prepaid expenses and other current assets in the consolidated balance sheet. The non-current portion of contract assets is included in other non-current assets in the consolidated balance sheet. Contract liabilities consist of deferred revenue and include payments received in advance of performance under the contract.

***Cost to Obtain and Fulfill a Contract***

The Company generally does not incur costs to obtain new contracts. Costs to fulfill contracts are expensed as incurred.

***Accounts Receivable and Allowance for Credit Losses***

Accounts receivable primarily consist of amounts due from customers for services and payments due based on contractual terms. Accounts receivable are recorded when the right to consideration becomes unconditional. For research and development services, the Company generally bills its customers monthly or quarterly as the services are performed. Payment terms on invoiced amounts are typically 30 - 60 days. The Company recognizes estimated allowance for credit losses based on an assessment of a customer's ability to pay, credit quality of the customer, age of receivable balances and current economic conditions. As of December 31, 2022 and 2021, the Company recorded no allowance for credit losses.

***Research and Development***

Research and development expense consists of labor, material, equipment, and allocated facilities costs of the Company's scientific staff who are working on research and development projects. Research and development costs are charged to operations as incurred.

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 or other long-term assets. The advanced payments are expensed as the related goods are delivered or the services are performed.

***Research and Manufacturing Contract Costs and Accruals***

The Company has entered into various research and development and manufacturing agreements. These agreements are generally cancelable, and related payments are recorded as the corresponding expenses are incurred. The Company records accruals for estimated costs incurred to date. When evaluating the adequacy of the accrued liabilities, the Company analyzes progress of the research studies or clinical trials and manufacturing activities, 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.

***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.

***Stock-Based Compensation***

Stock-based compensation related to stock options and restricted stock units ("RSUs") granted to the Company's employees and consultants and the 2020 Employee Stock Purchase Plan ("ESPP") awards is measured at the grant date based on the fair value of the award. The fair value is recognized as stock-based compensation expense in the consolidated financial statements over the requisite service period, which is generally the vesting period of the respective awards. Compensation related to service-based awards is recognized starting on the grant date on a straight-line basis over the vesting period, which is typically two to four years. The Company recognizes the fair value of stock options and RSUs granted to non-employees as stock-based compensation expense over the period in which the related services are received. Stock-based compensation expense related to stock options granted to non-employees is recognized based on the grant date fair value of awards as the stock options are earned. The Company believes that the estimated fair value of stock options is more readily measurable than the fair value of the services rendered. All option grants require continued service to continue vesting. For the ESPP, the requisite service period is generally the period of time from the offering date to the purchase date. The Company accounts for the forfeitures in the period in which they occur.

The Company uses the Black-Scholes valuation model to estimate the grant date fair value of the stock option awards and shares purchasable under the ESPP. The determination of the fair value of each stock award using the option-pricing model is affected by the Company's assumptions regarding a number of variables including the fair value of the common stock at the date of grant, the expected term of the awards, the expected stock price volatility over the term of the awards, risk-free interest rate, and dividend rate. The Company's assumptions with respect to these variables are as follows:

- Expected Term—The expected term represents the period that the stock-based awards are expected to be outstanding. The Company determines the expected term using the simplified method. The simplified method deems the term to be the average of the time-to-vesting and the contractual life of the options. For stock options granted to non-employees, the expected term equals the remaining contractual term of the option from the vesting date. For the ESPP, the expected term is the period of time from the offering date to the purchase date.
- Expected Volatility—Given the limited period of time the Company's stock has been traded in an active market, the expected volatility is estimated by taking the average historical price volatility for industry peers, consisting of several public companies in the Company's industry that are similar in size, stage, or financial leverage, over a period of time commensurate with to the expected term of the awards.
- Risk-Free Interest Rate—The risk-free interest rate is calculated using the average of the published interest rates of U.S. Treasury zero-coupon issues with maturities that are commensurate with the expected term.
- Dividend Rate—The dividend yield assumption is zero, as the Company has no plans to make dividend payments in the foreseeable future.

***Comprehensive Loss***

Comprehensive loss is defined as the change in equity during a period from transactions and other events and circumstances from non-owner sources, including unrealized gains and losses on short-term investments. Comprehensive losses have been reflected in the consolidated statements of operations and comprehensive loss.

***Net Loss Per Share***

Basic net loss per share is calculated by dividing the net loss by the weighted-average number of shares of common stock outstanding during the period without consideration for common stock equivalents. Diluted net loss per share is the same as basic net loss per common share, since the effects of potentially dilutive securities are anti-dilutive due to the net loss position of all periods presented.

***Income Taxes***

Deferred tax assets and liabilities are determined based on the difference between the financial statement carrying amounts of assets and liabilities and their respective tax bases, as well as net operating losses and credit carry forwards applied by the enacted tax rates expected to be 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.

***Emerging Growth Company Status***

The Company is an emerging growth company, as defined in the Jumpstart Our Business Startups Act of 2012 (the "JOBS Act"). Under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards issued subsequent to the enactment of the JOBS Act until such time as those standards apply to private companies. The Company has elected to use this extended transition period for complying with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date that it (i) is no longer an emerging growth company or (ii) affirmatively and irrevocably opts out of the extended transition period provided in the JOBS Act. As a result, these consolidated financial statements may not be comparable to companies that comply with the new or revised accounting pronouncements as of public company effective dates.

***Recently Adopted Accounting Pronouncements***

In May 2021, the FASB issued ASU 2021-04, Earnings Per Share (Topic 260), Debt-Modifications and Extinguishments (Subtopic 470-50), Compensation- Stock Compensation (Topic 718), and Derivatives and Hedging-Contracts in Entity's Own Equity (Subtopic 815- 40) which provides guidance on modifications or exchanges of a freestanding equity-classified written call option that is not within the scope of another Topic. An entity should treat a modification of the terms or conditions or an exchange of a freestanding equity-classified written call option that remains equity classified after modification or exchange as an exchange of the original instrument for a new instrument ASU 2021-04 also provides further guidance on measuring the effect of a modification or an exchange of a freestanding equity-classified written call option that remains equity classified

after modification or exchange. ASU 2021-04 also provides guidance on the recognition of the effect of a modification or an exchange of a freestanding equity-classified written call option that remains equity classified after modification or exchange on the basis of the substance of the transaction, in the same manner as if cash had been paid as consideration. The Company adopted ASU 2021-04 on January 1, 2022. The adoption of this standard had no impact on the Company's condensed consolidated financial statements and disclosures.

***Recently Issued Accounting Pronouncements***

In June 2016, the FASB issued ASU 2016-13, *Financial Instruments — Credit Losses on Financial Instruments*, which established ASC 326, *Financial Instruments - Credit Losses*. This ASU, along with subsequent amendments, improves financial reporting by requiring timely recording of credit losses on loans and other financial instruments held by financial institutions and other organizations. ASU 2016-13 requires the measurement of all expected credit losses for financial assets held at the reporting date based on historical experience, current conditions and reasonable and supportable forecasts. This guidance will become effective for the Company beginning January 1, 2023, with early adoption permitted. The Company is currently evaluating the potential impact ASU 2016-13 may have on its financial position and results of operations upon adoption but does not expect the adoption will have a material impact on the Company's consolidated financial statements and disclosures.

**Note 3. Composition of Certain Balance Sheet Components**

***Prepaid expenses and other current assets***

Prepaid expenses and other current assets consist of the following as of (in thousands):

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Contract research services | $ 2,465 | $ 2,739 |
| Prepaid insurance | 1,507 | 2,355 |
| Prepaid rent | 492 | 354 |
| Other | 2,518 | 2,100 |
| Total prepaid expenses and other current assets | $ 6,982 | $ 7,548 |

***Property and equipment, net***

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

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Laboratory equipment | $ 18,551 | $ 14,192 |
| Leasehold improvements | 14,006 | 13,910 |
| Computer equipment and software | 1,504 | 2,137 |
| Furniture and fixtures | 1,001 | 948 |
| Total property and equipment | 35,062 | 31,187 |
| Less: Accumulated depreciation and amortization | (13,476) | (9,137) |
| Total property and equipment, net | $ 21,586 | $ 22,050 |

Depreciation expense associated with property and equipment was $5.2 million and $4.6 million for the years ended December 31, 2022 and 2021, respectively.

***Goodwill and other intangible assets, net***

Goodwill and other intangible assets, net consist of the following as of (in thousands):

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Goodwill | $ 4,228 | $ 4,228 |
| Indefinite lived intangible assets: | | |
| IPR&D | $ 1,320 | $ 1,320 |
| Total intangible assets, net | $ 1,320 | $ 1,320 |

There were no impairments of goodwill and other intangible assets for the years ended December 31, 2022 and 2021.

***Accrued and other liabilities***

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

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Contract research services | $ 10,908 | $ 12,292 |
| Payroll and related expense | 11,271 | 8,760 |
| Other | 3,889 | 2,488 |
| Total accrued expenses and other liabilities | $ 26,068 | $ 23,540 |

**Note 4. Financial Instruments**

The following table summarizes the amortized cost and fair value of available-for-sale securities at December 31, 2022 and 2021 (in thousands):

| | Amortized Cost/Cost | Unrealized Gains | Unrealized Losses | Fair Value |
|---|---|---|---|---|
| **At December 31, 2022:** | | | | |
| Money market fund | $ 57,799 | $ — | $ — | $ 57,799 |
| U.S. government agency securities and treasuries | 206,520 | 13 | (162) | 206,371 |
| Total | $ 264,319 | $ 13 | $ (162) | $ 264,170 |
| | | | | |
| **At December 31, 2021:** | | | | |
| Money market fund | $ 176,102 | $ — | $ — | $ 176,102 |
| Total | $ 176,102 | $ — | $ — | $ 176,102 |

No available-for-sale debt securities held as of December 31, 2022 and 2021 had remaining maturities greater than one year. Unrealized gains and losses on available-for-sale securities are included as a component of comprehensive loss. At December 31, 2022, the Company did not have any securities in material unrealized loss positions.

The Company reviews its investments to identify and evaluate investments that have an indication of possible other-than-temporary impairment. Factors considered in determining whether a loss is other-than-temporary include the length of time and extent to which fair value has been less than the cost basis, the financial condition and near-term prospects of the investee, and the Company's intent and ability to hold the investment for a period of time sufficient to allow for any anticipated recovery in market value. The Company does not generally sell any investments prior to recovery of their amortized cost basis for any investments in an unrealized loss position.

**Note 5. Fair Value Measurement**

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 as of the measurement date. Applicable accounting guidance provides an established hierarchy for inputs used in measuring fair value that maximizes the use of observable inputs and minimizes the use of unobservable inputs by requiring that the most observable inputs be used when available. Observable inputs are inputs that market participants would use in valuing the asset or liability and are developed based on market data obtained from sources independent of the Company. Unobservable inputs are inputs that reflect the Company's assumptions about the factors that market participants would use in valuing the asset or liability. There are three levels of inputs that may be used to measure fair value:

- Level 1 — Unadjusted quoted prices in active markets that are accessible at the measurement date for identical, unrestricted assets or liabilities
- Level 2 — Significant other observable inputs other than Level 1 prices such as quoted prices in markets that are not active, or inputs that are observable, either directly or indirectly, for substantially the full term of the asset or liability
- Level 3 — Prices or valuation techniques that require inputs that are both significant to the fair value measurement and unobservable (i.e., supported by little or no market activity)

The Company classifies its money market funds and U.S. treasury securities, which are valued based on quoted market prices in active markets with no valuation adjustment, as Level 1 assets within the fair value hierarchy.

The following table summarizes the Company's valuation hierarchy for its financial assets and liabilities measured at fair value on a recurring basis as follows (in thousands):

| | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| **At December 31, 2022:** | | | |
| Assets | | | |
| Money market funds and U.S. government agency treasuries[1] | $ 63,055 | $ — | $ — |
| Short-term investments | 201,115 | — | — |
| Total | $ 264,170 | $ — | $ — |
| | | | |
| **At December 31, 2021:** | | | |
| **Assets:** | | | |
| Money market funds[1] | $ 176,102 | $ — | $ — |
| Short-term investments | — | — | — |
| Total | $ 176,102 | $ — | $ — |

(1) Included in cash and cash equivalents in the accompanying consolidated balance sheet.

**Note 6. Collaboration and License Agreements**

***Roche***

*Terms of the Agreement*

In July 2022, the Company entered into a collaboration and license agreement (the "Roche Collaboration Agreement") with F. Hoffmann-La Roche Ltd and Hoffmann-La Roche Inc. (collectively, "Roche"), pursuant to which the Company granted to Roche: (i) an exclusive, worldwide license under certain Company intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from each of the Company's existing P-BCMA-ALLO1 and P-CD19CD20-ALLO1 programs (each a "Tier 1 Program"); (ii) an exclusive option to acquire an exclusive, worldwide license under certain Company intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from each of the Company's existing P-

BCMACD19-ALLO1 and P-CD70-ALLO1 programs (each, a "Tier 2 Program"); (iii) an exclusive license under certain Company intellectual property to develop, manufacture and commercialize allogeneic CAR-T cell therapy products from the up to six Collaboration Programs (as defined below) designated by Roche; (iv) an option for a non-exclusive, commercial license under certain limited Company intellectual property to develop, manufacture and commercialize certain Roche proprietary cell therapy products for up to three solid tumor targets to be identified by Roche ("Licensed Products"); and (v) the right of first offer for two (2) early-stage existing programs within hematologic malignancies. The Roche Collaboration Agreement became effective in September 2022 upon expiration of the applicable waiting period under the Hart-Scott-Rodino Antitrust Improvements Act of 1976, as amended.

For each Tier 1 Program, the Company will perform development activities through a Phase 1 dose escalation clinical trial, and Roche is obligated to reimburse a specified percentage of certain costs incurred by the Company in its performance of such activities, up to a specified reimbursement cap for each Tier 1 Program. For each Tier 2 Program, the Company will perform research and development activities either through selection of a development candidate for IND-enabling studies or, subject to Roche's election and payment of an option maintenance fee, through completion of a Phase 1 dose escalation clinical trial. In addition, for each Tier 2 Program for which Roche exercises its option for an exclusive license, Roche is obligated to pay an option exercise fee. For each Tier 1 Program and Tier 2 Program, the Company will perform manufacturing activities until the completion of a technology transfer to Roche.

The parties will conduct an initial two-year research program to explore and preclinically test a specified number of agreed-upon next generation therapeutic concepts relating to allogeneic CAR-T cell therapies. Subject to Roche's election and payment of a specified fee, the parties would subsequently conduct a second research program of 18 months under which the parties would explore and preclinically test a specified number of additional agreed-upon next generation therapeutic concepts relating to allogeneic CAR-T therapies. Roche may designate up to six heme malignancy-directed, allogeneic CAR-T programs from the two research programs, for each of which the Company will perform research and development activities through selection of a development candidate for IND-enabling activities (each, a "Collaboration Program"). Upon its designation of each Collaboration Program, Roche is obligated to pay a designation fee. After the Company's completion of lead optimization activities for a Collaboration Program, Roche may elect to transition such program to Roche with a payment to the Company or terminate it. Alternatively, Roche may elect, for a limited number of Collaboration Programs, to have the Company conduct certain additional development and manufacturing activities through the completion of a Phase 1 dose escalation clinical trial, in which case Roche will pay certain milestones and reimburse a specified percentage of the Company's costs incurred in connection with such development and manufacturing activities. For each Collaboration Program, the Company will perform manufacturing activities until the completion of a technology transfer to Roche.

In consideration for the rights granted to Roche under the Roche Collaboration Agreement, the Company received an upfront payment of $110.0 million. In addition, subject to Roche exercising its Tier 2 Program options, designating Collaboration Programs, and exercising its option for the Licensed Products commercial license and further contingent on, among other things, achieving specified objectives, the Company is eligible to receive up to (i) $1.5 billion in aggregate payments for Tier 1 Programs comprised of research funding, feasibility fees and $1.4 billion in development, regulatory and net sales milestones, (ii) $1.1 billion in aggregate payments for Tier 2 Programs comprised of option exercise and maintenance fees and $1.0 billion in development, regulatory and net sales milestones, (iii) $2.9 billion in aggregate payments for the Collaboration Programs comprised of certain reimbursements, fees and milestone payments; and (iv) $415.0 million in payments for the Licensed Products comprised of certain reimbursements, fees and milestone payments.

The Company is further entitled to receive, on a product-by-product basis, tiered royalty payments in the mid-single to low double digits on net sales of products from the Tier 1 Programs, optioned Tier 2 Programs and Collaboration Programs and in the low to mid-single digits for Licensed Products, in each case, subject to certain customary reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country or ten years from first commercial sale of such product in such country.

The Roche Collaboration Agreement will continue in effect on a product-by-product and country-to-country basis until there is no remaining royalty or other payment obligations. The Roche Collaboration Agreement includes standard termination provisions, including for material breach or insolvency and for Roche's convenience. Certain of these termination rights can be exercised with respect to a particular product or license, as well as with respect to the entire Roche Collaboration Agreement.

*Revenue Recognition*

At contract inception, the Company has identified six performance obligations under the Roche Collaboration Agreement: (i) licenses associated with the Tier 1 Programs, (ii) research and development efforts for the Tier 1 Programs, (iii) clinical drug supply for the Tier 1 Programs, (iv) manufacturing process development program for the Tier 1 Programs, (v) research and development efforts for the Tier 2 Programs, and (vi) research and development efforts for the Collaboration Programs. The Company concluded that Roche's options within the Roche Collaboration Agreement do not represent material rights and are not considered performance obligations as they do not contain a significant and incremental discount. The licenses associated with the Tier 1 Programs, they were delivered at the beginning of the agreement term and deemed capable of being distinct as the Company concluded that Roche has the knowledge and capabilities to continue development work and fully utilize the licenses without the Company's involvement.

In order to determine the transaction price, the Company evaluated all the payments to be received during the term of the Roche Collaboration Agreement. Certain milestones and additional fees were considered variable consideration, which were not included in the initial transaction price based on the most likely amount method. The Company will re-evaluate the transaction price in each reporting period and as uncertain events are resolved or other changes in circumstances occur. The Company determined that the transaction price at the inception of the Roche Collaboration Agreement was $185.0 million, which consists of the upfront payment of $110.0 million, future research funding for the Tier 1 Programs of $40.0 million and a $35.0 million milestone achieved in September 2022 for the Tier 1 Programs. As of December 31, 2022, all other future potential milestone payments were excluded from the estimated total transaction price as they were considered constrained.

The performance obligation associated with the licenses for the Tier 1 Programs was satisfied as of the effective date of the Roche Collaboration Agreement. All other performance obligations will be recognized on a proportional basis as the underlying services are provided based on actual costs incurred as a percentage of total estimated costs. The Company determined that the cost-based input method most faithfully depicts the pattern in which these performance obligations are satisfied. Any cumulative effect of revisions to estimated costs to complete the Company's performance obligation will be recorded in the period in which changes are identified and amounts can be reasonably estimated. This approach requires the Company to use significant judgement and make estimates of future expenditures. If the Company's estimates or judgements change over the course of the collaboration, they may affect the timing and amount of revenue that it recognizes in the current and future periods.

***Takeda***

*Terms of the Agreement*

In October 2021, the Company entered into a collaboration and license agreement (the "Takeda Collaboration Agreement") with Takeda Pharmaceuticals USA, Inc. ("Takeda"), pursuant to which the Company granted to Takeda a worldwide exclusive license under the Company's certain platform technologies including piggyBac, Cas-CLOVER, biodegradable DNA and RNA nanoparticle delivery technology and other proprietary genetic engineering platforms to research, develop, manufacture and commercialize gene therapy products for certain indications, including Hemophilia A. The parties are collaborating to initially develop up to six *in vivo* gene therapy programs and Takeda also has an option to add two additional programs to the collaboration. The Company is obligated to perform research activities to the extent requested by Takeda up to the candidate selection stage, after which Takeda is obligated to assume responsibility for further development, manufacturing and commercialization of each program.

Under the Takeda Collaboration Agreement, the Company received an upfront payment of $45.0 million, of which $5.0 million represents prepaid research funding. Takeda is obligated to provide funding for all collaboration

program development costs; provided that the Company is obligated to perform certain platform development activities at its own cost. Under the Takeda Collaboration Agreement, the Company is eligible to receive preclinical milestone payments that could potentially exceed $82.5 million in the aggregate if preclinical milestones for all six programs are achieved. The Company is also eligible to receive future clinical development, regulatory and commercial milestone payments of $435.0 million in the aggregate per target, with a total potential deal value over the course of the collaboration of up to $2.7 billion, if milestones for all six programs are achieved and up to $3.6 billion if the milestones related to the two optional programs are also achieved. The Company is entitled to receive tiered royalty payments on net sales in the mid-single to low double digits, subject to certain standard reductions and offsets. Royalties will be payable, on a product-by-product and country-by-country basis, until the latest of the expiration of the licensed patents covering such product in such country, ten years from first commercial sale of such product in such country, or expiration of regulatory exclusivity for such product in such country.

*Revenue Recognition*

The promised goods and services under the Takeda Collaboration Agreement were accounted for as following separate performance obligations: (i) development and commercialization licenses for initial two indications, (ii) separate material rights associated with four additional licenses Takeda has an option to acquire individually, (iii) platform technology enhancement services, and (iv) research and development services.

The Company recognizes revenue from platform technology enhancement services, which are delivered over time, based on the amount of incurred development expenses reimbursed by the customer as a percentage of total expected reimbursable expenses associated with the contract. As of December 31, 2022, all future potential milestone payments were excluded from the estimated total transaction price as they were considered constrained.

There are no contract assets as of December 31, 2022 or 2021 related to the Roche Collaboration Agreement or Takeda Collaboration Agreement. A reconciliation of the closing balance of deferred revenue related to the agreements is as follows (in thousands):

| | Roche Collaboration Agreement | Takeda Collaboration Agreement | Total |
|---|---|---|---|
| Balance as of December 31, 2020 | $ — | $ — | $ — |
| Amounts received/invoiced | — | 45,000 | 45,000 |
| Revenue recognized | — | (31,238) | (31,238) |
| Balance as of December 31, 2021 | $ — | $ 13,762 | $ 13,762 |
| Amounts received/invoiced | 153,169 | 4,617 | 157,786 |
| Revenue recognized | (121,420) | (9,072) | (130,492) |
| Balance as of December 31, 2022 | $ 31,749 | $ 9,307 | $ 41,056 |

**Note 7. California Institute of Regenerative Medicine Awards**

The Company has been awarded funding from California Institute of Regenerative Medicine ("CIRM") to develop internal programs. Under the terms of the funding, both CIRM and the Company have co-funded specified programs, under which funding is provided in developmental milestones determined as a part of the award. The Company is obligated to share potential future revenues for the related programs with CIRM. The percentage of revenues due to CIRM in the future is dependent on the amount of the award received and whether revenue is from product sales or through license fees. The maximum revenue sharing amount the Company may be required to pay to CIRM is equal to nine times the total amount awarded and paid to the Company. The Company has the option to decline any and all amounts awarded by CIRM. As an alternative to revenue sharing, the Company has the option to convert the award to a loan, which such option the Company must exercise on or before ten business days after the FDA notifies the Company that it has accepted the Company's application for marketing authorization. In the event the Company exercises its right to convert any award to a loan, it would be obligated to repay the loan within ten business days of making such election. Repayment amounts due to CIRM vary dependent on when the award is converted to a loan, ranging from 60% of the award granted to the full amount received plus interest at the rate of the three-month LIBOR rate plus 10% per annum. Since the Company may be required to repay some or all of the

amounts awarded by CIRM, the Company accounts for these awards as a liability rather than revenue if the Company's intention is to convert the awards into a loan. Given the uncertainty in amounts due upon repayment, the Company has recorded amounts received without any discount or interest recorded, upon determination of amounts that would become due, the Company will adjust accordingly.

In December 2017, the Company was granted an award in the amount of $19.8 million from CIRM to support the Company's P-BCMA-101 Phase 1 clinical trial. The Company received the full amount of the award based on achievement of specific developmental milestones. In the fourth quarter of 2021, the Company made the decision to wind down clinical development of the P-BCMA-101 program, which resulted in write off of the amount previously included in the deferred CIRM grant liability as the Company no longer intends to repay the award and is included in other income in the accompanying consolidated statement of operations.

In September 2018, the Company was granted an award in the amount of $4.0 million from CIRM to support the Company's preclinical studies for its P-PSMA-101 program. The Company received the full amount of the award based on achievement of specific developmental milestones. The amount of the award is presented as a deferred CIRM grant liability in the consolidated balance sheets.

**Note 8. Term Debt**

In 2017, the Company entered into a loan and security agreement-with Oxford Finance LLC ("Oxford"), which was subsequently amended ("Amended Loan Agreement"), pursuant to which the Company borrowed $20.0 million under a Term A loan and $10.0 million under a Term B loan.

In February 2022, the Company entered into a new Loan and Security Agreement ("2022 Loan Agreement") with Oxford. Pursuant to the terms of the 2022 Loan Agreement, the Company borrowed $60.0 million in term loans (the "Term Loans"), of which $31.6 million was used to repay the balance outstanding under the Amended Loan Agreement, including $0.2 million of accrued interest. Under the 2022 Loan Agreement the interest-only period was through April 1, 2025, followed by 23 equal monthly payments of principal and applicable interest. In September 2022, a qualifying equity event, as defined in the 2022 Loan Agreement, was achieved which extended the interest-only period through April 1, 2026, followed by 11 equal monthly payments of principal and applicable interest. As a result, all amounts outstanding under the 2022 Loan Agreement will mature on February 1, 2027 (the "Maturity Date"). In connection with the repayment of the balance outstanding under the Amended Loan Agreement, the Company incurred amendment and final payment fees of $1.5 million previously due on the earlier of (i) the maturity date, (ii) acceleration of any Amended Loan Agreement loans, or (iii) the prepayment of any Amended Loan Agreement loans.

The Company accounted for this amendment as debt modification in accordance with ASC Topic 470, Debt because the modification was not considered substantial.

The balance outstanding under the 2022 Loan Agreement bears interest at a floating per annum rate equal to 7.83% plus the greater of (a) the 30-day U.S. Dollar (USD) LIBOR rate and (b) 0.11%. The interest rate applicable to the Term Loans as of December 31, 2022 was 11.97% per annum. The 2022 Loan Agreement includes a provision addressing replacement of LIBOR with an alternate benchmark rate, which may include the Secured Overnight Financing Rate, when LIBOR is phased out. LIBOR is scheduled to be phased out in June 2023. Consistent with the Amended Loan Agreement, the Company is required to make a final payment fee of 7.5% of the principal balance outstanding, payable on the earlier of (i) the Maturity Date, (ii) acceleration of any Term Loan, or (iii) the prepayment of the Term Loan. As of December 31, 2022, there was $60.0 million outstanding under the Term Loans. In connection with the Amended Loan Agreement, the Company previously incurred debt issuance costs of $1.6 million, which have been recorded as a debt discount and are being accreted to interest expense over the term of the Term Loans. Interest on the Term Loans, consisting of the stated interest rate, final payment fee and amortization of the discount, is being recognized under the effective interest method using a rate of 13.45%. As of December 31, 2022, the balance of the unamortized debt discount was $1.8 million. The balance of the accrued final payment fee was $2.1 million as of December 31, 2022 and is presented as other long-term liability in the accompanying condensed consolidated balance sheet.

The Company has an option to repay the outstanding debt under the 2022 Loan Agreement at any time in increments of $5.0 million, subject to a prepayment fee of 1.00% if the Term Loans are prepaid on or prior to February 22, 2024, after which no prepayment penalty would be applied.

The Company may use the proceeds from the Term Loans solely for its working capital requirements and to fund its general business operations. The Company's obligations under the 2022 Loan Agreement are secured by a first priority security interest in substantially all of its current and future assets, other than its intellectual property. In addition, the Company has also agreed not to encumber its intellectual property assets, except as permitted by the 2022 Loan Agreement. While any amounts are outstanding under the 2022 Loan Agreement, the Company is subject to a number of affirmative and restrictive covenants, including covenants regarding dispositions of property, business combinations or acquisitions, among other customary covenants. The Company is also restricted from declaring dividends or making other distributions or payments on its capital stock in excess of $0.3 million per calendar year, subject to limited exceptions. As of December 31, 2022, the Company was in compliance with all covenants under the 2022 Loan Agreement.

**Note 9. Stockholders' Equity**

***Authorized Shares***

In connection with the completion of the Company's IPO in July 2020, the Company amended its certificate of incorporation to authorize 250,000,000 shares of common stock, par value $0.0001 per share, and 10,000,000 shares of undesignated preferred stock, par value $0.0001 per share, that may be issued from time to time by the Company's board of directors in one or more series. Each share of common stock is entitled to one vote. The holders of common stock are also entitled to receive dividends whenever funds are legally available and when declared by the Company's board of directors. Since the Company's inception, there have been no dividends declared.

***Warrants***

Pursuant to the Amended Loan Agreement, the Company issued Oxford (i) in 2017, a warrant to purchase 93,518 shares of common stock at an exercise price of $4.28 per share, which will expire in 2027 unless earlier exercised and (ii) in 2018 and 2019, warrants to purchase an aggregate of 27,604 shares of common stock at an exercise price of $7.25 per share, which will expire in 2028 and 2029, respectively, unless earlier exercised.

***Sale of Common Stock***

In August 2022, the Company completed the sale of an aggregate of 23,000,000 shares of its common stock in an underwritten public offering, at a price of $3.50 per share, including 3,000,000 shares sold pursuant to the full exercise of the underwriters' option to purchase additional shares. The net proceeds to the Company from the offering was $75.3 million after deducting underwriting discounts and commissions and offering expenses payable by the Company.

***Common Stock***

Each share of common stock is entitled to one vote. The holders of common stock are also entitled to receive dividends whenever funds are legally available and when declared by the Company's board of directors. Since the Company's inception, there have been no dividends declared.

***Common Stock Reserved for Future Issuance***

Common stock reserved for future issuance consists of the following at December 31, 2022:

| | |
|---|---|
| Stock options issued and outstanding | 11,861,881 |
| Restricted stock units issued and outstanding | 2,614,402 |
| Authorized for future options and award grants | 4,188,473 |
| Authorized for future issuance under Employee Stock Purchase Plan | 1,450,822 |
| Total | 20,115,578 |

**Note 10. Stock-Based Compensation**

***Equity Incentive Plan***

In July 2020, the Company's board of directors and stockholders approved and adopted the 2020 Equity Incentive Plan (the "2020 Plan"). Under the 2020 Plan, the Company may grant stock options, stock appreciation rights, restricted stock, restricted stock units and other stock or cash-based awards to individuals who are employees, officers, directors or consultants of the Company. A total of 11,183,476 shares of common stock were approved to be initially reserved for issuance under the 2020 Plan. The number of shares that remained available for issuance under the Company's previous equity incentive plan as of the effective date of the 2020 Plan and shares subject to outstanding awards under the Company's previous equity incentive plan as of the effective date of the 2020 Plan that are subsequently canceled, forfeited or repurchased by the Company are added to the shares reserved under the 2020 Plan. The number of shares of common stock available for issuance under the 2020 Plan is automatically increased on the first day of each calendar year during the ten-year term of the 2020 Plan, beginning with January 1, 2021 and ending with January 1, 2030, by an amount equal to 5% of the outstanding number of shares of the Company's common stock on December 31 of the preceding calendar year or such lesser amount as determined by the Company's board of directors.

As of December 31, 2022, there were 2,927,388 shares available to be granted under the 2020 Plan. Through December 31, 2022, the Company has exclusively granted stock options and restricted stock units under the 2020 Plan. Shares issued under the 2020 Plan are newly issued shares and the Company has no intention to repurchase previously issued shares. The exercise price of stock options granted under the 2020 Plan cannot be less than 100% of the fair value of the common stock on the grant date. The term and vesting period of each option shall be stated in the underlying agreements. However, the term shall be no more than ten years from the date of grant. The stock options generally vest over a four-year period. If stock options are granted to an optionee who, at the grant date, owns the Company common stock representing more than ten percent of the voting power of all classes of stock of the Company, then the term of the stock option shall be five years from the date of grant and the stock option exercise price is equal to 110% of the fair value at the date of grant.

In February 2022, the Company's board of directors approved and adopted the 2022 Inducement Plan (the "Inducement Plan"). Under the Inducement Plan, the Company may grant nonstatutory stock options, stock appreciation rights, restricted stock awards, restricted stock unit awards, performance awards and other awards to individuals not previously employees or non-employee directors of the Company, as an inducement toward entering into employment with the Company. The maximum number of shares of common stock that may be issued under the Inducement Plan is 2,000,000 shares. As of December 31, 2022, there were 1,261,085 shares available to be granted under the Inducement Plan.

*Stock Options*

The following is a summary of the Company's stock option plan activity and related information for the year ended December 31, 2022:

| | Shares | Weighted Average Exercise Price | Weighted Average Remaining Contractual Term (Years) | Intrinsic Value (thousands) |
|---|---|---|---|---|
| Balance at January 1, 2022 | 9,899,707 | $ 9.57 | 8.57 | |
| Granted | 4,101,635 | 3.68 | | |
| Exercised | (111,911) | 1.72 | | |
| Forfeited/Cancelled | (2,027,550) | 9.52 | | |
| Balance at December 31, 2022 | 11,861,881 | $ 7.61 | 8.21 | $ 7,730 |
| Options vested and expected to vest as of December 31, 2022 | 11,861,881 | $ 7.61 | 8.21 | $ 7,730 |
| Options vested and exercisable as of December 31, 2022 | 5,006,884 | $ 8.88 | 7.57 | $ 2,400 |

The weighted-average grant date fair value of options granted for the years ended December 31, 2022 and 2021 was $2.64 and $6.12, respectively. The aggregate intrinsic value of options exercised was $0.2 million and $3.4 million for the years ended December 31, 2022 and 2021, respectively, determined as of the date of exercise. The Company received $0.2 million and $2.0 million in cash from options exercised for the years ended December 31, 2022 and 2021, respectively. The total fair value of options vested was $22.1 million and $16.7 million during the years ended December 31, 2022 and 2021, respectively.

As of December 31, 2022, total unrecognized compensation cost related to stock options was $30.8 million, and the weighted-average period over which this cost is expected to be recognized is approximately 2.5 years.

The fair value of options granted is estimated at the date of grant using the Black-Scholes option pricing model. Forfeitures are accounted for as incurred as a reversal of any share-based compensation expense related to options that will not vest. The weighted-average assumptions used to determine the fair value of options granted to employees, non-employees and directors were as follows:

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Risk-free interest rate | 2.16% | 0.78% |
| Expected volatility | 84.94% | 82.51% |
| Expected term (years) | 5.97 | 5.98 |
| Dividend yield | — | — |

*Risk-free interest rate*—The risk-free interest rate is based on the U.S. Treasury zero coupon issues in effect at the time of grant for periods corresponding with the expected term of option.

*Expected volatility*—The expected volatility is estimated based on the average volatility for comparable publicly traded biotechnology companies over a period equal to the expected term of the stock option grants. The comparable companies were chosen based on their similar size, stage in the life cycle or area of specialty.

*Expected term*—The expected term represents the period that stock-based awards are expected to be outstanding. The expected term for option grants is determined using the simplified method which is used when there is insufficient historical data about exercise patterns and post-vesting employment termination behavior. The simplified method deems the expected term to be the midpoint between the vesting date and the contractual life of the stock-based awards.

*Expected dividend*—The Company has never paid dividends on its common stock, and has no plans to pay any dividends on its common stock. Therefore, the Company used an expected dividend yield of zero.

*Restricted Stock Units*

The following is a summary of the Company's restricted stock unit ("RSU") activity for the years ended December 31, 2022:

| | Shares | Weighted Average Grant Date Fair Value |
|---|---|---|
| Balance at January 1, 2022 | — | $ — |
| Granted | 2,874,165 | 3.68 |
| Vested | — | — |
| Forfeited/Cancelled | (259,763) | 3.63 |
| Balance at December 31, 2022 | 2,614,402 | $ 3.69 |

RSU awards are share awards that, upon vesting, will deliver to the holder shares of the Company's common stock. The RSUs vest over four years from the grant date. The grant-date fair value is recognized as compensation expense over the vesting period. As of December 31, 2022, total unrecognized compensation cost related to RSUs was $7.7 million, and the weighted-average period over which this cost is expected to be recognized was approximately 3.1 years.

***2020 Employee Stock Purchase Plan***

In July 2020, the Company's board of directors and stockholders approved and adopted the 2020 Employee Stock Purchase Plan (the "ESPP"), which became effective as of the pricing of the IPO. A total of 615,000 shares of common stock were approved to be initially reserved for issuance under the ESPP. The number of shares of common stock available for issuance under the ESPP is automatically increased on the first day of each calendar year during the first ten-years of the term of the ESPP, beginning with January 1, 2021 and ending with January 1, 2030, by an amount equal to the lessor of (i) 1% of the outstanding number of shares of the Company's common stock on December 31 of the preceding calendar year, (ii) 1,230,000 shares of common stock or (iii) such lesser amount as determined by the Company's board of directors. Under the 2020 ESPP, substantially all employees can elect to have up to 15% of their annual compensation withheld to purchase up to 3,000 shares of common stock per purchase period, subject to certain limitations. The shares of common stock can be purchased over an offering period of six months and at a price of 85% of the fair market value per share of common stock on the first trading day of the applicable offering period or on the exercise date of the applicable offering period, whichever is less. Under applicable accounting guidance, the 2020 ESPP is classified as a compensatory plan. The initial purchase period commenced in March 2021. During the year ended December 31, 2022, a total of 328,654 shares were purchased by the Company's employees under the 2020 ESPP resulting in net proceeds of $1.1 million.

The Company uses the Black-Scholes pricing model to estimate the fair value of the purchase rights issued under the ESPP on each offering date. The weighted average assumptions that the Company used to determine the fair value of the purchase rights issued to employees during the twelve months ended December 31, 2022 and 2021 were as follows:

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Risk-free interest rate | 2.39% | 0.05% |
| Expected volatility | 93.68% | 79.99% |
| Expected term (years) | 0.5 | 0.5 |
| Dividend yield | — | — |

The Company recorded total stock-based compensation expense in the following expense categories of the accompanying consolidated statements of operations and comprehensive loss (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Research and development | $ 9,566 | $ 8,090 |
| General and administrative | 9,360 | 8,614 |
| Total stock-based compensation expense | $ 18,926 | $ 16,704 |

**Note 11. Commitments and Contingencies**

***Operating Leases***

In October 2018, the Company entered into a lease agreement for a facility in San Diego, California to be used for research and development and administrative activities. The lease term commenced on April 1, 2019 and will expire on December 31, 2029. In October 2019, the Company entered into a lease amendment to expand the existing premises. The lease term for the additional premises commenced on July 29, 2020 and will expire on December 31, 2029. Both the original lease and amendment provides for rent abatements and scheduled increases in base rent. In connection with the lease and its amendment, the Company made cash security deposits in the amount of $0.3 million, included in other long-term assets in the Company's consolidated balance sheets as of December 31, 2022 and 2021.

In July 2019, the Company entered into a lease agreement for a facility in San Diego, California that was retrofitted to Good Manufacturing Practice standards and is used for manufacturing in its early-stage clinical trials. The lease term commenced on June 26, 2020 and will expire on December 31, 2029. The lease provides for rent abatements and scheduled increases in base rent. In connection with the lease, the Company made a one-time cash security deposit in the amount of $0.1 million, included in other long-term assets in the Company's consolidated balance sheets as of December 31, 2022 and 2021.

As of December 31, 2022, the Company had operating leases of approximately 110,000 square feet of manufacturing, laboratory and office space in San Diego, California, of which 87,000 square feet is under a lease that expires on December 31, 2029, and includes a pilot manufacturing facility adjacent to office and laboratory space. The lease agreements include two options to extend the term for a period of 5 years each.

In October 2021, the Company entered into a sublease agreement for a facility in San Diego, California consisting of approximately 23,000 square feet to be used for research and administrative activities. The lease term commenced in March 2022 and will expire on December 31, 2025. During the year ended December 31, 2022, the Company recorded an ROU asset of $4.4 million and a corresponding lease liability related to a sublease of a laboratory and office space facility, which commenced during the period.

During the years ended December 31, 2022 and 2021, the Company recognized $7.0 million and $6.3 million, respectively, of operating lease expense, including $0.6 million impairment of an ROU asset during the year ended December 31, 2022. During the year ended December 31, 2022, the Company paid $7.9 million in cash payments for its operating leases. As of December 31, 2022, the weighted average remaining lease term for operating leases was 6.5 years and the weighted-average discount rate for operating leases was 8.92%.

As of December 31, 2022, maturities of lease liabilities were as follows (in thousands):

| Year ending December 31, | |
|---|---|
| 2023 | $ 6,096 |
| 2024 | 6,188 |
| 2025 | 6,374 |
| 2026 | 5,107 |
| 2027 | 5,260 |
| Thereafter | 10,999 |
| Total future lease payments | 40,024 |
| Imputed interest | (9,522) |
| Total lease liability balance | 30,502 |
| Less current portion of lease liability | 5,866 |
| Lease liability, net of current portion | $ 24,636 |

***Indemnification Agreements***

In the ordinary course of business, the Company may provide indemnification of varying scope and terms to vendors, lessors, contract research organizations, 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 and certain of its executive officers 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. The Company has not incurred any material costs as a result of such indemnifications and is not currently aware of any indemnification claims.

***April 2017 Commercial License Agreement with TeneoBio, Inc. (a subsidiary of Amgen Inc.)***

In April 2017, the Company entered into a commercial license agreement (the "2017 TeneoBio Agreement") with TeneoBio, Inc. ("TeneoBio") pursuant to which the Company obtained exclusive worldwide rights to use and develop pharmaceutical products comprising allogeneic T-cells expressing a CAR molecule containing certain heavy chain sequences provided by TeneoBio for treatment of human disease.

***August 2018 Commercial License Agreement with TeneoBio, Inc. (a subsidiary of Amgen Inc.)***

In August 2018, the Company entered into a commercial license agreement (the "2018 TeneoBio Agreement") with TeneoBio pursuant to which the Company obtained exclusive rights to research, develop and commercialize up to a certain number of targets from TeneoBio, for the development and use of TeneoBio's human heavy-chain-only antibodies in CAR-T cell therapies.

***October 2019 License Agreement with Xyone Therapeutics, Inc (a successor-in-interest to Genus Oncology, LLC)***

In October 2019, the Company entered into a license agreement (the "Xyone Agreement") with Xyone, pursuant to which the Company obtained an exclusive worldwide license under certain patents and a non-exclusive worldwide license under certain know-how controlled by Xyone to research, develop and commercialize pharmaceutical products incorporating CAR cells expressing antibodies and derivatives thereof targeting MUC1, or a Xyone licensed product, and a non-exclusive worldwide license under certain patents and know-how controlled by Xyone to research, develop and commercialize companion diagnostics for the treatment, prevention and palliation of human diseases and conditions.

***Legal Contingencies***

In the ordinary course of business, the Company may face claims brought by third parties against the Company. The Company does not believe that there is any litigation, asserted or unasserted claim pending that could, individually or in the aggregate, have a material adverse effect on the Company's results of operations or financial condition.

**Note 12. Income Taxes**

The components of the pretax loss from operations for the years ended December 31, 2022 and 2021 are as follows (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| U.S. Domestic | $ (63,458) | $ (124,974) |
| Net loss before income tax | $ (63,458) | $ (124,974) |

The provision for income taxes for the years ended December 31, 2022 and 2021 consists of the following (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Current: | | |
| Federal | $ 456 | $ — |
| State | 88 | — |
| Total current provision | 544 | — |
| Deferred: | | |
| Federal | — | — |
| State | — | — |
| Total deferred provision | — | — |
| Total provision | $ 544 | $ — |

Beginning in 2022, the Tax Cuts and Jobs Act of 2017 requires taxpayers to capitalize and amortize research and development expenditures over five years for domestic research and 15 years for foreign research pursuant to Section 174 of the Internal Revenue Code of 1986, as amended (the "Internal Revenue Code"). Although the U.S. Congress is considering legislation that would defer or eliminate the capitalization and amortization requirement to later years, the Company has no assurance that the provision will be repealed or otherwise modified. As a result, the Company recorded income tax expense of $0.5 million for the year ended December 31, 2022.

The provision for income taxes differs from the amount of income tax determined by applying the applicable U.S. statutory federal income tax rate to pretax income as a result of the following differences (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Federal statutory rate | $ (13,326) | $ (26,245) |
| Adjustments for tax effects of: | | |
| Tax credits | (9,026) | (22,448) |
| State taxes, net | (2,842) | (7,575) |
| Unrecognized tax benefits | 2,209 | 3,431 |
| Stock-based compensation | 3,106 | 2,308 |
| Other, net | 171 | (139) |
| Change in valuation allowance | 20,252 | 50,668 |
| Total | $ 544 | $ — |

Significant components of the Company's deferred tax assets and liabilities consist of the following as of (in thousands):

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Deferred tax assets: | | |
| Net operating losses | $ 89,300 | $ 98,815 |
| Income tax credit carryforwards | 38,674 | 33,524 |
| R&D capitalization | 23,370 | — |
| Lease liabilities | 8,468 | 8,885 |
| Deferred revenue | 2,584 | 2,280 |
| Accrued expenses | 2,910 | 2,233 |
| Amortization | 1,252 | 1,406 |
| Grant income | 1,108 | 1,114 |
| Other, net | 3,612 | 2,430 |
| Total deferred tax assets | 171,278 | 150,687 |
| Deferred tax liabilities: | | |
| Right of use assets | (6,965) | (7,305) |
| Depreciation | (1,948) | (1,308) |
| Acquired indefinite lived intangibles | (366) | (368) |
| Total deferred tax liabilities | (9,279) | (8,981) |
| Valuation allowance | (162,054) | (141,761) |
| Net deferred tax liability | $ (55) | $ (55) |

The realization of deferred tax assets may be dependent on the Company's ability to generate sufficient income in future years in the associated jurisdiction to which the deferred tax assets relate. The Company considers all available positive and negative evidence, including scheduled reversals of deferred tax liabilities, projected future taxable income, tax planning strategies, and recent financial performance. A valuation allowance of $162.1 million has been recorded as of December 31, 2022, as compared to $141.8 million as of December 31, 2021. The valuation allowance is based on management's assessment that it is more likely than not that the Company will not realize its net deferred tax asset in the foreseeable future.

Deferred tax liabilities associated with indefinite-life intangibles cannot be considered a source of income to support the realization of deferred tax assets because the reversal of these deferred tax liabilities is considered indefinite. However, as the Company has an indefinite-life asset with an unlimited loss carryforward period within the same jurisdiction, and of appropriate character, the deferred tax liability associated with the indefinite-life intangible constitutes a source of taxable income to support the realization of the deferred tax asset, since both have indefinite reversal or expiration periods.

As of December 31, 2022, the Company had state net operating loss carryforwards of $388.6 million, which begin to expire in 2035 and the Company had federal net operating loss carryforwards that do not expire but utilization is limited to 80% of taxable income for any given tax year in the amount of $295.0 million.

As of December 31, 2022, the Company had federal orphan drug credits and research and development credits and state research and development tax credits of $38.6 million and $14.2 million, respectively. The federal research and development tax credits will begin to expire in 2037, while the state credits do not expire.

Additionally, the utilization of the net operating loss and research and development tax credit carryforwards is subject to an annual limitation under Section 382 of the Internal Revenue Code. Future ownership changes as determined under Section 382 could further limit the utilization of net operating loss carryforwards. Due to the existence of the valuation allowance, future changes in the deferred tax assets related to these tax attributes will not impact the Company's effective tax rate.

The Company is subject to taxation in the U.S. and state jurisdictions. As of December 31, 2022, the Company's tax years beginning 2012 to date are subject to examination by federal and other state taxing authorities

due to the carry forward of unutilized net operating losses and research and development tax credits. 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 tax authorities to the extent utilized in a future period. The Company is not currently under examination by the IRS or state and local tax authorities.

As of December 31, 2022, the Company had unrecognized tax benefits of $11.8 million, determined as follows:

| | December 31, | |
|---|---|---|
| | 2022 | 2021 |
| Balance at beginning of year | $ 9,494 | $ 5,457 |
| Increase for current year positions | 2,403 | 4,105 |
| Decrease for prior year positions | (92) | (68) |
| Balance at the end of year | $ 11,805 | $ 9,494 |

These unrecognized tax benefits are not expected to change within the next twelve months. Of the $11.8 million of unrecognized tax benefits, zero would impact the effective tax rate due to the valuation allowance, if reversed. The Company recognizes interest and penalties related to uncertain tax positions as a component of income tax expense. As of December 31, 2022, there are no accrued interest or penalties.

**Note 13. Employee Benefit Plan**

The Company has a defined contribution retirement savings plan under Section 401(k) of the Internal Revenue Code. This plan covers all employees who meet minimum age and service requirements and allows participants to defer a portion of their annual compensation on a pre-tax basis. Company contributions to the plan may be made at the discretion of the Board of Directors. Total contributions by the Company during the years ended December 31, 2022 and 2021 were $1.5 million and $0.9 million, respectively.

**Note 14. Net Loss Per Share**

Net loss per share is computed by dividing net loss attributable to common stockholders for the period by the weighted average number of common shares outstanding during the period. Diluted loss per share reflects the additional dilution from potential issuances of common stock, such as stock issuable pursuant to the exercise of stock options and from purchases under the ESPP, as well as from the possible exercise of the outstanding warrants.

The Company's potentially dilutive securities, which include warrants to purchase common stock, common stock options and common stock from the ESPP, have been excluded 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 shares of common stock outstanding used to calculate both basic and diluted net loss per share attributable to common stockholders 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 |
| Outstanding Stock options and RSUs | 14,476,283 | 9,899,707 |
| Warrants to purchase common stock | 121,122 | 121,122 |
| ESPP shares | 45,285 | 5,310 |
| | 14,642,690 | 10,026,139 |

**Item 16. Form 10-K Summary.**

None.

## Exhibit Index

| Exhibit Number | Description |
|---|---|
| 2.1^ | Agreement and Plan of Merger and Reorganization, by and among the Registrant, Hermes Merger Sub I, Inc., Hermes Merger Sub II, LLC, Vindico NanoBioTechnology, Inc. and Christopher Young as Stockholders' Representative, dated October 10, 2016, as amended (incorporated by reference to Exhibit 2.1 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 3.1 | Amended and Restated Certificate of Incorporation, of the Registrant (incorporated by reference to Exhibit 3.1 to the Registrant's Current Report on Form 8-K (File No. 001-39376), filed with the SEC on July 14, 2020). |
| 3.2 | Amended and Restated Bylaws of the Registrant (incorporated by reference to Exhibit 3.2 to the Registrant's Current Report on Form 8-K (File No. 001-39376), filed with the SEC on July 14, 2020). |
| 4.1 | Form of Common Stock Certificate of the Registrant (incorporated by reference to Exhibit 4.1 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 4.2^ | Amended and Restated Investors' Rights Agreement, by and among the Registrant and certain of its stockholders, dated June 24, 2020 (incorporated by reference to Exhibit 4.2 to the Registrant's Registration Statement on Form S-1, as amended (File No. 333-239321), filed with the SEC on July 6, 2020). |
| 4.3 | Form of Warrant issued to Oxford Finance LLC, dated July 25, 2017 (incorporated by reference to Exhibit 4.3 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 4.4 | Form of Warrant issued to Oxford Finance LLC, dated August 13, 2018 (incorporated by reference to Exhibit 4.4 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 4.5 | Form of Warrant issued to Oxford Finance LLC, dated February 11, 2019 (incorporated by reference to Exhibit 4.5 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 4.6 | Description of Common Stock (incorporated by reference to Exhibit 4.6 to the Registrant's Annual Report on Form 10-K (File No. 001-39376), filed with the SEC on March 11, 2021). |
| 10.1+ | Form of Indemnity Agreement, by and between the Registrant and its directors and officers (incorporated by reference to Exhibit 10.1 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 10.2+ | Poseida Therapeutics, Inc. 2015 Equity Incentive Plan, as amended, and Forms of Option Grant Notice, Option Agreement and Notice of Exercise thereunder (incorporated by reference to Exhibit 10.2 to the Registrant's Registration Statement on Form S-1, as amended (File No. 333-239321), filed with the SEC on July 6, 2020). |
| 10.3+ | Poseida Therapeutics, Inc. 2020 Equity Incentive Plan and Forms of Stock Option Grant Notice, Option Agreement and Notice of Exercise thereunder (incorporated by reference to Exhibit 10.3 to the Registrant's Registration Statement on Form S-1, as amended (File No. 333-239321), filed with the SEC on July 6, 2020). |
| 10.4+ | Form of Restricted Stock Unit Award Grant Notice and Restricted Stock Unit Award Agreement under the Poseida Therapeutics, Inc. 2020 Equity Incentive Plan (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q (File No. 001-39376), filed with the SEC on November 9, 2021). |
| 10.5+ | Poseida Therapeutics, Inc. 2020 Employee Stock Purchase Plan (incorporated by reference to Exhibit 10.4 to the Registrant's Registration Statement on Form S-1, as amended (File No. 333-239321), filed with the SEC on July 6, 2020). |
| 10.6+ | Poseida Therapeutics, Inc. Severance and Change in Control Plan and Form of Participation Agreement (incorporated by reference to Exhibit 10.5 to the Registrant's Registration Statement on Form S-1, as amended (File No. 333-239321), filed with the SEC on July 6, 2020). |

| | |
|---|---|
| 10.7+ | Forms of Non-U.S. Stock Option Grant Notice, Stock Option Agreement and Notice of Exercise under the Poseida Therapeutics, Inc. 2020 Equity Incentive Plan. |
| 10.8+ | Forms of Non-U.S. Restricted Stock Unit Award Grant Notice and Restricted Stock Unit Award Agreement under the Poseida Therapeutics, Inc. 2020 Equity Incentive Plan. |
| 10.9+^ | Transition and Consulting Agreement, by and between the Registrant and Eric Ostertag, dated February 1, 2023. |
| 10.10+^ | Amended and Restated Executive Employment Agreement, by and between the Registrant and Mark Gergen, dated February 1, 2022 (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K (File No. 001-39376), filed with the SEC on February 1, 2022). |
| 10.11+ | Amended and Restated Participation Agreement, by and between the Registrant and Mark Gergen, dated February 1, 2022 (incorporated by reference to Exhibit 10.2 to the Registrant's Current Report on Form 8-K (File No. 001-39376), filed with the SEC on February 1, 2022). |
| 10.12+^ | Offer Letter, by and between the Registrant and Johanna Mylet, dated June 8, 2015 (incorporated by reference to Exhibit 10.10 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 10.13+^ | Offer Letter, by and between the Registrant and Harry Leonhardt, dated July 1, 2020. |
| 10.14+^ | Offer Letter, by and between the Registrant and Brent Warner, dated January 6, 2022. |
| 10.15+ | Poseida Therapeutics, Inc. Amended and Restated Non-Employee Director Compensation Policy (incorporated by reference to Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q (File No. 001-39376), filed with the SEC on August 11, 2022). |
| 10.16+ | Poseida Therapeutics, Inc. 2022 Inducement Plan (incorporated by reference to Exhibit 99.4 to the Registrant's Registration Statement on Form S-8 (File No. 333-262869), filed with the SEC on February 18, 2022). |
| 10.17+ | Forms of Grant Notice, Stock Option Agreement, Notice of Exercise, Restricted Stock Unit Grant Notice and Award Agreement under the Poseida Therapeutics, Inc. 2022 Inducement Plan (incorporated by reference to Exhibit 99.5 to the Registrant's Registration Statement on Form S-8 (File No. 333-262869), filed with the SEC on February 18, 2022). |
| 10.18* | Commercial License Agreement, by and between the Registrant and TeneoBio, Inc., effective April 27, 2017 (incorporated by reference to Exhibit 10.13 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 10.19* | Commercial License Agreement, by and between the Registrant and TeneoBio, Inc., effective August 3, 2018 (incorporated by reference to Exhibit 10.14 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 10.20* | License Agreement, by and between the Registrant and Helmholtz-Zentrum München—Deutsches Forschungszentrum für Gesundheit und Umwelt GmbH, dated May 20, 2016 (incorporated by reference to Exhibit 10.15 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 10.21* | License Agreement, by and between the Registrant and Genus Oncology, LLC, effective October 24, 2019 (incorporated by reference to Exhibit 10.16 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 10.22* | Collaboration and License Agreement, by and between the Registrant and Takeda Pharmaceuticals USA, Inc., effective October 11, 2021 (incorporated by reference to Exhibit 10.22 to the Registrants's Annual Report on Form 10-K (File No. 001-39376), filed with the SEC on March 10, 2022). |
| 10.23^ | Loan and Security Agreement, by and among the Registrant, Vindico NanoBioTechnology, LLC and Oxford Finance LLC, dated February 22, 2022 (incorporated by reference to Exhibit 10.23 to the Registrants's Annual Report on Form 10-K (File No. 001-39376), filed with the SEC on March 10, 2022). |
| 10.24 | Lease, by and between the Registrant and BMR-9360-9390 Towne Centre LP, dated October 1, 2018, as amended on October 4, 2019 and March 11, 2020 (incorporated by reference to Exhibit 10.18 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |

| | |
|---|---|
| 10.25 | Lease, by and between the Registrant and BMR-Eastgate Mall LP, dated July 12, 2019 (incorporated by reference to Exhibit 10.19 to the Registrant's Registration Statement on Form S-1 (File No. 333-239321), filed with the SEC on June 19, 2020). |
| 10.26 | Controlled Equity Offering℠ Sales Agreement, by and between the Registrant and Cantor Fitzgerald & Co., dated August 13, 2021 (incorporated by reference to Exhibit 1.2 to the Registrant's Registration Statement on Form S-3 (File No. 333-258804), filed with the SEC on August 13, 2021). |
| 10.27* | Amended and Restated License Agreement, by and between the Registrant and Helmholtz-Zentrum München—Deutsches Forschungszentrum für Gesundheit und Umwelt GmbH, executed as of March 12, 2021 (incorporated by reference to Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q (File No. 001-39376), filed with the SEC on May 11, 2021). |
| 10.28* | Collaboration and License Agreement, dated July 30, 2022, by and among the Registrant, F. Hoffmann-La Roche Ltd and Hoffmann-La Roche Inc. (incorporated by reference to Exhibit 10.1 to Registrant's Quarterly Report on Form 10-Q (File No. 001-393376), filed with the SEC on November 10, 2022. |
| 21.1 | Subsidiaries of the Registrant. |
| 23.1 | Consent of Independent Registered Public Accounting Firm. |
| 24.1 | Power of Attorney (reference is made to the signature page hereto). |
| 31.1 | Certification of Principal Executive Officer Pursuant to Rules 13a-14(a) and 15d-14(a) Under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002. |
| 31.2 | Certification of Principal Financial Officer Pursuant to Rules 13a-14(a) and 15d-14(a) Under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002. |
| 32.1 | Certification of Principal Executive Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002. |
| 32.2 | Certification of Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002. |
| 101.INS | Inline XBRL Instance Document – the instance document does not appear in the Interactive Data File because XBRL tags are embedded within the Inline XBRL document |
| 101.SCH | Inline XBRL Taxonomy Extension Schema Document |
| 101.CAL | Inline XBRL Taxonomy Extension Calculation Linkbase Document |
| 101.DEF | Inline XBRL Taxonomy Extension Definition Linkbase Document |
| 101.LAB | Inline XBRL Taxonomy Extension Label Linkbase Document |
| 101.PRE | Inline XBRL Taxonomy Extension Presentation Linkbase Document |
| 104 | Cover Page Interactive Data File (embedded within the Inline XBRL document) |

^ Certain exhibits and schedules have been omitted pursuant to Item 601(a)(5) of Regulation S-K. The Registrant hereby undertakes to furnish supplementally a copy of any omitted exhibit or schedule upon request by the SEC.

+ Indicates management contract or compensatory plan.

* Pursuant to Item 601(b)(10) of Regulation S-K, certain portions of this exhibit have been omitted by means of marking such portions with asterisks because the Registrant has determined that the information is not material and would likely cause competitive harm to the Registrant if publicly disclosed.

## SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the Registrant has duly caused this Report to be signed on its behalf by the undersigned, thereunto duly authorized, in San Diego, California**.**

POSEIDA THERAPEUTICS, INC.

Date: March 9, 2023

By: /s/ Mark J. Gergen
Mark J. Gergen, J.D.
*Chief Executive Officer*

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Mark J. Gergen, J.D. and Johanna Mylet, and each of them, his true and lawful attorneys-in-fact and agents, with full power of substitution and resubstitution, for him and in his name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this Report, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or either of them, or their or his substitutes or substitute, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, 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/ Mark J. Gergen<br>**Mark J. Gergen, J.D.** | Chief Executive Officer and Director<br>(Principal Executive Officer) | March 9, 2023 |
| /s/ Johanna M. Mylet<br>**Johanna M. Mylet, C.P.A.** | Chief Financial Officer<br>(Principal Financial and Accounting Officer) | March 9, 2023 |
| /s/ Charles M. Baum<br>**Charles M. Baum, M.D., Ph.D.** | Director | March 9, 2023 |
| /s/ Cynthia Collins<br>**Cynthia Collins, M.B.A.** | Director | March 9, 2023 |
| /s/ Luke Corning<br>**Luke Corning** | Director | March 9, 2023 |
| /s/ Marcea B. Lloyd<br>**Marcea B. Lloyd, J.D.** | Director | March 9, 2023 |
| /s/ John P. Schmid<br>**John P. Schmid, M.B.A.** | Director | March 9, 2023 |