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, 2023

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: 001-39979

VOR BIOPHARMA INC.

(Exact name of registrant as specified in its charter)

Delaware	**81-1591163**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
100 Cambridgepark Drive, Suite 101 Cambridge, Massachusetts	**02140**
(Address of principal executive offices)	**(Zip Code)**

Registrant's telephone number, including area code: (617) 655-6580

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	VOR	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 ☒

As of June 30, 2023, the last day of the registrant's most recently completed second fiscal quarter, the aggregate market value of the registrant's common stock, $0.0001 par value per share ("Common Stock"), held by non-affiliates of the registrant was approximately $136,250,599 based upon the closing price of the Common Stock on June 30, 2023.

The number of shares of registrant's Common Stock outstanding as of March 15, 2024 was 68,168,771.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Proxy Statement for its 2024 Annual Meeting of Stockholders, to be filed with the Securities and Exchange Commission no later than 120 days after December 31, 2023, are incorporated by reference in Part III of this Annual Report on Form 10-K.

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Note Regarding Company References

Throughout this Annual Report on Form 10-K ("Annual Report"), the "Company," "Vor," "Vor Bio," "Vor Biopharma Inc.," "we," "us," and "our," except where the context requires otherwise, refer to Vor Biopharma Inc. and its consolidated subsidiary, and "our board of directors" refers to the board of directors of Vor Biopharma Inc.

Special Note Regarding Forward-Looking Statements and Industry Data

This Annual Report contains forward-looking statements that involve substantial risks and uncertainties. All statements, other than statements of historical facts, contained in this Annual Report, including statements regarding our strategy, future operations, future financial position, future revenue, projected costs, prospects, plans, and objectives of management, are forward-looking statements. In some cases, you can identify forward-looking statements by terms such as "may," "will," "should," "would," "expect," "plan," "anticipate," "could," "might," "intend," "target," "ongoing," "project," "estimate," "believe," "estimate," "predict," "potential" or "continue" or the negative of these terms or other similar expressions intended to identify statements about the future. These statements speak only as of the date of this Annual Report and involve known and unknown risks, uncertainties and other important factors that may cause our actual results, levels of activity, performance or achievements to be materially different from any future results, levels of activity, performance or achievements expressed or implied by the forward-looking statements. We have based these forward-looking statements largely on our current expectations and projections about future events and financial trends that we believe may affect our business, financial condition and results of operations. These forward-looking statements include, without limitation, statements about:

- the timing, progress and results of our preclinical studies and clinical trials of our product candidates, including statements regarding the timing and pace of initiation, enrollment and completion of studies or trials and related preparatory work, the period during which the results of the trials will become available and plans with respect to our research and development programs;
- the timing and success of our in-house or third party clinical manufacturing capabilities and efforts;
- the timing of any submission of filings for regulatory approval of, and our ability to obtain and maintain regulatory approvals for, our product candidates for any indication;
- our ability to identify patients with the diseases treated by our product candidates, and to enroll patients in trials;
- our expectations regarding the market acceptance and opportunity for and clinical utility of our product candidates, if approved for commercial use;
- our expectations regarding the scope of any approved indication for any product candidate;
- our ability to successfully commercialize our product candidates;
- our estimates of our expenses, ongoing losses, future revenue, capital requirements and our need for or ability to obtain additional funding;
- our ability to establish or maintain collaborations or strategic relationships;
- our ability to identify, recruit and retain key personnel, including executive officers and members of management;
- our reliance upon intellectual property licensed from third parties and our ability to obtain such licenses on commercially reasonable terms or at all;
- our ability to protect and enforce our intellectual property position for our product candidates, and the scope of such protection;
- our financial performance;
- the period over which we estimate our existing cash, cash equivalents and marketable securities will be sufficient to fund our future operating expenses and capital expenditure requirements;

- our competitive position and the development of and projections relating to our competitors or our industry;
- the impact of laws and regulations; and
- our expectations regarding the time during which we will be an emerging growth company under the Jumpstart Our Business Startups Act of 2012.

You should read this Annual Report and the documents that we have filed as exhibits to this Annual Report completely and with the understanding that our actual future results may be materially different from what we expect. The forward-looking statements contained in this Annual Report are made as of the date of this Annual Report, and we do not assume any obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by applicable law. We have included important factors in this Annual Report, particularly in the "Summary Risk Factors" and "Risk Factors" sections, that could cause actual results or events to differ materially from the forward-looking statements that we make.

This Annual Report includes statistical and other industry and market data, which we obtained from our own internal estimates and research, as well as from industry and general publications and research, surveys, and studies conducted by third parties. Industry publications, studies, and surveys generally state that they have been obtained from sources believed to be reliable, although they do not guarantee the accuracy or completeness of such information. While we believe that each of these studies and publications is reliable, we have not independently verified market and industry data from third-party sources. While we believe our internal company research is reliable and the market definitions are appropriate, neither such research nor these definitions have been verified by any independent source.

All brand names or trademarks appearing in this Annual Report, including Mylotarg, are the property of their respective owners.

Summary Risk Factors

Our business is subject to a number of risks that if realized could materially affect our business, financial condition, results of operations, cash flows and access to liquidity. These risks are discussed more fully in the "Risk Factors" section of this Annual Report. Our principal risks include the following:

- We have incurred significant net losses since inception. We expect to incur net losses for the foreseeable future and may never achieve or maintain profitability.
- We will need substantial additional funding. If we are unable to raise capital when needed, we would be forced to delay, reduce or eliminate our research and product development programs or future commercialization efforts.
- We have a limited operating history, have not yet completed any clinical trials and have no history of commercializing products, which may make it difficult to evaluate the success of our business to date and to assess our future viability.
- Engineered hematopoietic stem cells ("eHSCs") is an emerging technology containing risk and might never lead to a commercially viable product.
- We are substantially dependent on the success of our two most advanced product candidates, trem-cel and VCAR33^{ALLO}. If we are unable to complete development of, obtain approval for and commercialize trem-cel or VCAR33^{ALLO} in a timely manner, our business will be harmed.
- We may not be successful in our efforts to identify, develop or commercialize additional product candidates. If these efforts are unsuccessful, we may never become a commercial stage company or generate any revenues.
- We have not successfully tested our product candidates in clinical trials and any favorable preclinical results are not predictive of results that may be observed in clinical trials.

- Development of a product candidate such as trem-cel, which is intended for use in combination or in sequence with an already approved therapy, will present increased complexity and more or different challenges than development of a product candidate for use as a single agent.
- If our product candidates, the delivery modes we rely on to administer them, and/or the conditioning, administration process or related procedures or treatments which may be used alongside our product candidates cause serious adverse events, undesirable side effects or unexpected characteristics, such events, side effects or characteristics could delay or prevent regulatory approval of the product candidates, limit their commercial potential or result in significant negative consequences following any potential marketing approval, even if these side effects or characteristics are unrelated to our product candidate.
- We face significant competition in an environment of rapid technological change, and there is a possibility that our competitors may achieve regulatory approval before us or develop therapies that are safer or more advanced or effective than ours, which may harm our financial condition and our ability to successfully market or commercialize our product candidates, if approved.
- Adverse public perception of genetic medicines, and of genome engineering in particular, including as a result of other trials out of our control, such as the VCAR33^{AUTO} trial currently sponsored by NMDP, may negatively impact regulatory approval of, and/or demand for, our potential products.
- Success in preclinical studies or clinical trials may not be indicative of results in future clinical trials, particularly for our clinical trials that involve only a small number of patients.
- Genome engineering technology is subject to a number of challenges and risks. Because genome engineering technology is novel and the regulatory landscape that will govern our product candidates is uncertain and may change, we cannot predict the time and cost of obtaining regulatory approval, if we receive it at all, for our product candidates.
- Because we are developing product candidates using new technologies, as well as potential mechanisms of action for which there are few precedents, there is increased risk that the U.S. Food and Drug Administration, the European Medicines Agency or other regulatory authorities may not consider the endpoints of our clinical trials to provide clinically meaningful results and that these results may be difficult to analyze.
- Interim "top-line" and preliminary results from our clinical trials that we may announce or publish from time to time may change as more patient data become available and are subject to audit and verification procedures that could result in material changes in the final data. Investors and analysts may have difficulty analyzing our interim and preliminary results or may not consider them to be meaningful.
- If we experience significant delays or difficulties in the enrollment of patients in clinical trials, including with respect to completing a complex donor identification and screening process, the cost of developing product candidates could increase and our receipt of necessary regulatory approvals could be delayed or prevented.
- If we are unable to successfully identify patients who are likely to benefit from our product candidates or eligible donors, or experience significant delays in doing so, we may not realize the full commercial potential of our product candidates.
- We have initiated manufacturing at our in-house facility, but until and unless we complete the total transfer of our manufacturing capabilities in-house, we will continue to contract with third parties for the manufacture and supply of materials for development of our product candidates and advancement of our current clinical trials, as well as our research programs and preclinical studies, and we expect to continue to do so for future clinical trials and for commercialization of our product candidates. This reliance on third parties increases the risk that we will not have sufficient quantities of such materials, product candidates or any products that we may develop and commercialize, or that such supply will not be available to us at an acceptable cost, which could delay, prevent or impair our development or commercialization efforts.

- We are highly dependent on intellectual property licensed from third parties and termination of any of these licenses could result in the loss of significant rights, which would harm our business.
- We may not be successful in acquiring or in-licensing necessary rights to key technologies underlying our product candidates.
- Third-party claims of intellectual property infringement, misappropriation or other violations may prevent or delay our product discovery and development efforts and have a material adverse effect on our business.
- Failure or perceived failure to comply with existing or future laws, regulations, contracts, self-regulatory schemes, standards, and other obligations related to data privacy and security (including security incidents) could harm our business. Compliance or the actual or perceived failure to comply with such obligations could increase the costs of our products and services, limit their use or adoption, and otherwise negatively affect our operating results and business.

PART I

Item 1. Business.

Overview

Vor Bio is a clinical-stage company harnessing the power of cell and genome engineering to develop potentially transformative therapies in acute myeloid leukemia ("AML"), a devastating disease with few treatment options. AML is the most common type of acute leukemia in adults and one of the deadliest and most aggressive blood cancers, affecting 20,000 newly diagnosed patients each year in the United States.

The traditional tumor targeting approach to treating blood cancers such as AML focuses on cancer cells expressing a target antigen. However, very few targets are tumor-specific, as healthy cells usually express these same target antigens alongside cancer cells. While technologies may improve the specificity of target antigen binding or enhance potency, these approaches are subject to the same fundamental biological limitation of killing healthy cells expressing these targets, known as on-target toxicity. A number of targeted therapies have failed in clinical development, and those that have succeeded possess limited utility and narrow applicability, in part due to their on-target toxicity. Hematopoietic cell transplant ("HCT") is the standard of care for AML, replacing cancerous marrow with cells from a matched healthy donor. Unfortunately, approximately 40% of patients with AML who receive a HCT suffer a relapse of their leukemia and have two-year survival rates of less than 20%. Transplanted hematopoietic stem cells ("HSCs") are fragile following transplant, preventing the use of potentially curative treatment options.

Vor Bio's proprietary platform aims to change the entire paradigm of AML treatments by developing highly potent chimeric antigen receptor ("CAR")-T cell therapies to kill cancer, uniquely deriving these treatments from healthy transplant donors. Vor Bio's vision is to couple these CAR-T therapies with shielded HSC transplants, where we genetically engineer healthy donor cells by removing therapeutic targets, thereby creating patients' bone marrow and blood systems that are shielded from on-target toxicities from targeted therapies. Vor believes that this therapeutic approach of shielded HSC transplants followed by healthy transplant donor CAR-T therapies, what we call our Treatment System, has the potential to cure AML beyond existing therapeutic options.

The Vor Bio Platform

We have built a technology platform to realize our vision that allows for selective cancer targeting with highly potent targeted therapies by leveraging our expertise and recent advances in stem cell biology and genome engineering. Our approach is in stark contrast to conventional approaches that have focused solely on developing the therapeutic and have faced clinical limitations due to toxicities. The key components of our proprietary platform are stem cell biology and manufacturing expertise, genome engineering to HSCs and unlocking the potential of targeted therapies**.**

- ***Leveraging Stem Cell Biology and Manufacturing Expertise.*** We have built an extensive understanding of the biology of HSCs to enable our shielded transplants to retain their cellular viability and functionality during manipulation. In addition, we have built process development expertise centered around HSCs, enabling us to process these cells quickly, precisely, reproducibly and efficiently for patients. We are continuing to develop our in-house clinical GMP manufacturing capabilities and facilities to further allow us to leverage our expertise and maintain strategic control over the manufacturing process.
- ***Applying Genome Engineering to Hematopoietic Stem Cells.*** Recent developments in genome engineering allow permanent changes to DNA in cells and all their progeny. We have assembled a team with extensive experience in applying genome engineering technologies to HSCs, which display distinct DNA repair mechanisms compared to many other cell types. We possess expertise in a variety of genome engineering technologies including CRISPR-Cas9, CRISPR analog enzymes and base editing, and we are capable of multiplex editing using a variety of techniques, all with the objective of creating various shielded transplants.

- ***Unlocking the Potential of Targeted Therapies.*** We believe our shielded transplants are a potential solution to the lack of tumor-specific targets and can enable selective cancer targeting. We are directly developing CAR-T therapies, which we believe is the most potent form of targeted therapies available. Our CAR-T product candidates are uniquely generated from prior healthy transplant donors where these cells are healthy, more stemlike compared to other cell sources and exactly matched to the patient since the patient's blood and immune system was previously reconstituted by the transplant donor. Our objective is to create highly potent CAR-T therapies that are designed to strongly proliferate and persist in patients, in order to drive prolonged relapse-free survival or induce cures in patients.

Advantages of Our Shielded Transplant Technology and Manufacturing Process

Our shielded transplant technology and manufacturing process is designed to confer advantages and address limitations associated with existing cell therapy processes.

- *Speed—Rapid Manufacturing Cycle and Vein-to-Vein Time.* In contrast to other patient-specific cell therapies, such as CAR-T therapies and gene-modified allogeneic cell therapies, the manufacturing of our shielded transplant is a rapid and elegant process that fits into the standard HSC transplant process. The primary reason we can produce a shielded transplant so quickly is the lack of a need for cell expansion. Our approach to creating eHSCs also does not involve the insertion of new genetic material, thereby avoiding complications related to the use of delivery modalities necessary for gene insertion, such as the viral vectors used in CAR-T therapies. The relatively simple and streamlined process of creating our shielded transplant provides significant advantages in the required manufacturing infrastructure, and we are continuing to develop in-house clinical Current Good Manufacturing Practices ("cGMP) capabilities to support our planned clinical trials. We believe the efficiency and low capital expenditure of our manufacturing process should translate into higher scalability, a lower cost of goods and easy integration into routine transplant practice.

- *Investment in our internal manufacturing facility.* In September 2022, we initiated operations at our new in-house clinical manufacturing facility in Cambridge, Massachusetts to support our development of potentially transformative shielded transplants and CAR-T therapeutic product candidates for patients with blood cancers. The facility will provide us with end-to-end oversight over drug product for our planned clinical trials. With this new facility, our manufacturing teams are seamlessly integrated within our wider organization, a crucial component of our strategy as we continue to enroll our clinical studies. The facility has been designed to support clinical manufacturing for our cell therapy programs, including both shielded transplants and CAR-T therapeutic candidates, and to be cGMP compliant. By integrating our internal research, process development, analytical development, manufacturing and quality control testing capabilities under one roof, we aim to achieve flexible manufacturing capacity and to reduce the time and cost required to manufacture complex cell therapy clinical product candidates.

Our Clinical Development Programs & Pipeline

Tremtelectogene empogeditemcel (trem-cel)

Trem-cel is a genome-edited hematopoietic stem and progenitor allogeneic donor product candidate where CD33 has been deleted using genome engineering. Transplant with trem-cel is designed to replace standard of care transplants for patients suffering from AML and potentially other blood cancers. Trem-cel has the potential to enable powerful targeted therapies in the post-transplant setting including CD33-targeted CAR-T cells.

Trem-cel has received Fast Track designation for the treatment of AML from the U.S. Food and Drug Administration ("FDA"), allowing for potential facilitated development and an expedited review process, and orphan drug designation ("ODD"), which is granted by the FDA to a drug or biologic intended to treat a rare disease or condition that affects fewer than 200,000 individuals in the United States. ODD entitles companies to development incentives including tax credits for clinical testing, prescription drug user fee exemptions and seven-year marketing exclusivity in the event of regulatory approval.

We are actively enrolling VBP101 (NCT04849910), a Phase 1/2a clinical trial for patients with CD33-positive AML who are at high risk of relapse. The primary goals of the trial are to evaluate tolerability and feasibility of the trem-cel stem cell transplant, with a focus on confirming that trem-cel can engraft normally. Following engraftment, patients are eligible to be treated with Mylotarg, a CD33-directed antibody drug conjugate ("ADC") therapy, in order to potentially prolong leukemia-free survival and provide evidence that trem-cel protects against the myelosuppression that typically accompanies treatment with Mylotarg. To administer trem-cel, HSCs from matched healthy donors are isolated, engineered into trem-cel and then introduced into patients following myeloablative conditioning. We expect that engraftment of trem-cel will occur within 28 days of administration, which occurs in over 90% of standard HCT procedures. As a safety measure, we freeze and preserve a portion of the original donor cells to use in case trem-cel fails to engraft. At day 60, we re-evaluate patients for disease status. Those patients with successful trem-cel grafts who experience relapse of their AML will then become eligible to be treated with therapeutic doses of Mylotarg. Other patients are treated with maintenance doses of Mylotarg once a month for four months to address any remaining minimal residual disease ("MRD").

The latest data update from VBP101 was presented at the American Society of Hematology ("ASH") Meeting on December 10, 2023 ("ASH 2023"). The data showed that primary neutrophil engraftment occurred in all eight patients treated with trem-cel as of the data cutoff date, with a median time to engraftment of 10 days, providing evidence that CD33 is biologically dispensable. Additionally, platelet recovery occurred at a median of 15 days, excluding one patient with previously documented anti-platelet antibodies (immune thrombocytopenia).

Three out of three patients treated with Mylotarg experienced hematologic protection from deep cytopenias through repeat doses, suggesting that trem-cel transplants shielded patients' healthy cells from the on-target toxicity (myelosuppression) typically seen with Mylotarg treatment. The hematological protection exhibited provides support that dose escalation of Mylotarg is warranted and highlights the potential to dose CD33-targeted CAR-T therapy without expected hematologic toxicity.

Mylotarg first-dose pharmacokinetics for the three patients treated showed that the 0.5 mg/m^2 dose was within the exposure range measured for the therapeutic dose of Mylotarg in relapsed/refractory AML patients, potentially due to the decreased CD33 antigen sink in patients treated with trem-cel. In all three patients, the percentage of CD33-negative donor cells increased following Mylotarg administration, suggesting that Mylotarg treatment at the first cohort level of 0.5 mg/m^2 was pharmacologically active and enriched for CD33-edited donor cells.

Dose escalation of Mylotarg to 1.0 mg/m^2 has commenced per the 3+3 dose escalation schema with multiple patients now treated. Patients receiving a trem-cel transplant in VBP101 who become MRD-positive or relapse have the option to receive induction-course Mylotarg or VCAR33^{ALLO}. The Company expects to report further engraftment and protection data from the VBP101 clinical trial in the second half of 2024.

Trem-cel and Myelodysplastic Syndrome

We are also conducting IND-enabling and clinical activities to explore the potential of trem-cel in patients with myelodysplastic syndrome ("MDS"). Scientific evidence produced by third parties shows that blast cells responsible for MDS express CD33 and other myeloid cell surface targets. We believe trem-cel has the potential to provide a therapeutic window that enables anti-CD33 therapies to be effective in this setting.

VCAR33^{ALLO}

VCAR33^{ALLO} is manufactured from lymphocytes collected from the patient's original transplant donor, generating a CAR-T cell therapy that is exactly matched to the recipient's engrafted blood system. By using healthy transplant donor cells as the starting material to produce VCAR33^{ALLO}, the CAR-T cells have a more stem-like phenotype, leading to greater potential for expansion, persistence and anti-leukemia activity compared to a product derived from a patient's own lymphocytes.

We are actively enrolling VBP301 (NCT05984199), a Phase 1/2, multicenter, open-label, first-in-human study of VCAR33^{ALLO} in patients with relapsed or refractory AML after standard-of-care transplant or a trem-cel transplant. We announced that the first patient was dosed in VBP301 in January 2024 and expect to treat additional

patients in the first half of 2024. We anticipate initial data from the study in the second half of 2024. The trial is evaluating safety, as well as key outcome measures including incidence of graft-versus-host disease related to VCAR33, percentage of patients who achieve response and overall survival and progression-free survival post-VCAR33 infusion. The first phase, which is expected to enroll approximately 12 patients, is designed to determine the maximum tolerated dose of VCAR33^{ALLO} using a 3+3 trial design; the second phase, which is expected to enroll up to 12 patients, is an expansion phase designed to evaluate the rate of clinical response to treatment. The trial is designed to test the hypothesis that a CD33-targeted CAR-T derived from a healthy donor can be safely administered to a patient with AML who has relapsed after transplant and that the CAR-T can demonstrate anti-leukemia activity.

The FDA has granted Fast Track and Orphan Drug Designation to VCAR33^{ALLO}.

We licensed VCAR33 from the U.S. Department of Health and Human Services, as represented by National Cancer Institute ("NCI") of the National Institutes of Health ("NIH").

Trem-cel + VCAR33 Treatment System

We believe that the combination of trem-cel followed by treatment with VCAR33^{ALLO}, our in-house CD33-directed CAR-T program, which we refer to as the trem-cel + VCAR33 Treatment System, in the post-transplant setting has the potential to transform patient outcomes in AML and establish a new standard of care for patients that have limited treatment options.

The trem-cel + VCAR33 Treatment System would utilize the same healthy donor allogenic cell source for both trem-cel and VCAR33^{ALLO}. In this scenario, the apheresis product from the healthy donor can be processed to serve as starting materials for both products. One advantage of this approach is that donor-derived T cells should not recognize CAR-T cells as foreign, potentially prolonging persistence. In addition, sourcing T cells from healthy donors may provide a healthier, more abundant cell source, allowing for optimizations and efficiencies in the manufacturing process that are not possible with autologous sources. Unlike autologous CAR-T therapies, the manufacturing of the CAR-T cells would not be rate limiting when combined with trem-cel, as we expect the CAR-T therapy would not be needed until 60 days after administration of trem-cel.

We plan to collect initial data on trem-cel from the VBP101 clinical trial and initial clinical data from the first-in-human trial studying the VCAR33^{ALLO} program prior to the IND submission for the trem-cel + VCAR33 Treatment System. However, patients who have relapsed after a trem-cel transplant are also eligible to enroll in the VBP301 protocol and to receive VCAR33^{ALLO}. The ability to treat relapsed trem-cel transplant patients with VCAR33^{ALLO} may provide valuable early insights into the potential of the trem-cel + VCAR33 Treatment System.

Ongoing Preclinical Programs

We believe our approach can extend beyond CD33 where protein targets fulfill three important criteria: first, the targets are expressed on cancer cells; second, the targets are expressed on cells of hematopoietic lineage (and therefore present a safety concern); and last, there is evidence that the targets are biologically dispensable. We have generated preclinical data exploring targets such as CD123, EMR2 and CD5, which all currently show promise fulfilling these criteria.

Other Myeloid Targets: CD123, CLL-1 and EMR2

CD123, CLL-1 and EMR2 are targets expressed strongly in various myeloid blood cancers including AML. These targets are expressed both in bulk AML cells as well as leukemic stem cells. Our preclinical data demonstrates our ability to genetically engineer HSCs in human cells to remove expression of these targets with good efficiency. As such, we continue to research these targets as potential target candidates for our shielded transplants and CAR-T therapies.

Multiplex Engineering: High Editing Efficiency Across CD123, CLL-1 and EMR2 Targets

Multiplex engineering is a strategy and method where multiple genetic targets are engineered within the same cells in the same manufacturing process. Multiplex engineering could allow removal or modification of two or more distinct genes, thus allowing for targeted therapies directed at two or more separate targets to be used in combination or in sequence.

A multiplex approach may provide advantages in two areas. First, target expression can vary in tumor cells from the same patient, a phenomenon known as tumor heterogeneity. Applying therapies such as a multi-specific CAR-T may reduce that concern. Second, it is possible for tumor cells to downregulate expression of a target to avoid being killed, known as tumor escape. Again, pursuing multiple targets simultaneously may reduce the effectiveness of the tumor escape mechanism.

We have developed several techniques for multiplex engineering HSCs. One such technique is sequential Cas9 editing, where HSCs are subject to a two separate Cas9 edits separated by a defined time period in order to allow the first edit to complete before applying the second edit. This separation is important to avoid translocation errors, which are gene repairs resulting in one DNA segment joining other DNA segments from different parts of the same chromosome or segments of other chromosomes. We have demonstrated that we can efficiently knock out expression of both CD33 and CLL-1 from HSCs using this technique.

Another technique involves a technology called base editing, which involves converting a specific DNA base into another at a targeted genomic locus. As such, base editing does not require a cut, lowering the risk of translocation errors. We have demonstrated that we can efficiently knock out expression of both CD33 and CLL-1 from HSCs using a single base editing step.

CD33-CLL1 Treatment System

Leveraging our platform, we are advancing the creation and preclinical testing of multiplex-engineered HSCs, in which multiple surface targets are removed, potentially obviating concern around tumor heterogeneity and potential escape mechanisms.

We are pursuing our first multi-targeted CD33-CLL1 Treatment System comprising a CD33-CLL1 multiplex-edited HSC therapy and a CD33-CLL1 multi-specific CAR-T therapy. These next-generation, multiplex-edited HSCs may enable a wide range of treatment options post-transplant, including the use of multi-specific CAR-T therapies. Our dual-specific CAR-T uses the potency of two targets to address the large unmet need of patients with relapsed/refractory AML.

We have demonstrated *in vitro* proof of concept for this approach. In this experiment we compared the survival of wild type, $CD33^{Del}$, $CLL\text{-}1^{Del}$ and $CD33^{Del}$+$CLL\text{-}1^{Del}$ cell lines when simultaneously exposed to CD33 and CLL-1 CAR-T treatments. We observed statistically significant higher survival of cell lines with protein removals corresponding to the CAR-T targets, with the highest survival in the cell line lacking both CD33 and CLL-1 surface targets. These results suggest that the removal of these surface targets provided protection of the cell lines from the target-specific effects of the CAR-T therapy.

IND-enabling work is progressing for the CD33-CLL1 dual-specific CAR-T with key *in vivo* proof-of-concept experiments underway.

Commercial Strategy and Reimbursement Framework for Our Shielded Transplants and CAR-T Product Candidate

Given the potential value proposition of shielded transplants enabling targeted therapies, our goal is to maximize the reach of our therapies, if approved, to all patients in the transplant setting suffering from blood cancers. Each year, approximately 42,500 new cases of AML are diagnosed across the United States (approximately 20,000), Europe (approximately 18,000) and Japan (approximately 4,500). For the past 20 years, there has been an increasing trend in allogeneic transplants for AML. Currently, there are approximately 12,000 allogeneic HCTs

performed globally each year, with approximately 3,500 performed in the United States, 7,000 in Europe and 1,500 in Japan.

We believe we will be able to commercialize our shielded transplants and targeted therapies, if approved, with a focused footprint where we can leverage the existing logistical infrastructure of NMDP and HSC transplants centers. HCTs are performed at tertiary medical care hospitals with specialized HSC transplant centers. The United States, EU5 and Japan have approximately 200, 300 and 185 transplant centers, respectively. The transplant volumes are further concentrated with 15% transplant centers performing 50% of U.S. transplants. Building on a concentrated network of transplant centers, we have the added advantage of an approximately seven-day manufacturing process. This turn-around time for collecting cells and shipping is a critical component of successful commercialization.

We believe multiple reimbursement pathways may be available in the United States to capture the value of shielded transplants and targeted therapies, such as CAR-T. Effective for cost reporting periods beginning on or after October 1, 2020, under the Hospital Inpatient Prospective Payment System ("IPPS"), Medicare payment for HCT will include a carve-out for the actual cost of stem cell acquisition and processing, and payment will instead be made on a reasonable cost basis. We believe this new rule may apply to innovative sources of donor stem cells like eHSCs. In addition, a new Medicare Severity Diagnosis-Related Group ("MS-DRG") establishes a base payment rate of approximately $248,000 for CAR-T cases.

A potential alternative reimbursement pathway for shielded transplants is Medicare New Technology Add-on Payment ("NTAP") which, if approved, allows for temporary reimbursement for new cell therapies above the standard MS-DRG payment threshold. When certain criteria are met, the Centers for Medicare & Medicaid Services ("CMS"), the federal agency responsible for administering the Medicare program, may provide incremental reimbursement for up to 65% of the cost of therapy in addition to the standard MS-DRG payment. For patients covered by commercial insurance, we believe that reimbursement will be based on a case rate methodology with provisions for separate payments for new therapies such as shielded transplants. Lastly, risk-sharing agreements or value-based purchasing models is another option that is becoming more common with novel cell and gene therapies.

Sales and Marketing

Given our stage of development, we have not yet established a commercial organization or distribution capabilities. We plan to build focused capabilities in the United States to commercialize our development programs focused on shielded transplants and targeted therapies, where we believe the patient populations and medical specialists for the indications we are targeting are sufficiently concentrated to allow us to effectively promote our products, if approved for commercial sale, with a targeted sales team. In other markets for which commercialization may be less capital efficient where the patient populations and medical specialists are less concentrated we may selectively pursue strategic collaborations with third parties in order to maximize the commercial potential of our product candidates.

License Agreements

Exclusive License Agreement with Columbia University

In April 2016, we entered into an exclusive license agreement with The Trustees of Columbia University in the City of New York ("Columbia"), which agreement was subsequently amended in February 2019 and November 2021 (the "Columbia Agreement"). Pursuant to the Columbia Agreement, we obtained a worldwide, exclusive license, with the right to grant sublicenses (subject to certain restrictions), under certain of Columbia's patents, know-how and materials to discover, develop, manufacture, have made, use, sell, offer to sell, have sold, import, export, distribute, rent or lease products that are covered by such patents or involve the use of or otherwise incorporate such know-how or materials, in each case for any and all uses, related to the inhibition of lineage-specific antigens, including related to eHSCs. The foregoing license is subject to certain customary retained rights of Columbia, including the right to conduct academic research and publish know-how. We are also obligated to use commercially reasonable efforts to research, discover, develop and market licensed products for commercial sale and distribution, including by achieving one or more specified diligence milestones.

We are obligated to pay Columbia royalties on net sales of products that are covered by the licensed patents on a patented product-by-patented product basis and country-by-country basis for such period as a valid claim covers such patented product in such country, which we expect to be until January 2040, absent any applicable patent term extensions, and, on an unpatented product-by-unpatented product and country-by-country basis for the longer of ten years from first commercial sale of such unpatented product in such country or expiration of any market exclusivity for such unpatented product in such country. If the royalty term for a patented product expires in a country and such product would otherwise qualify as an unpatented product in such country (and the applicable royalty term for such unpatented product has yet to expire in such country), then we are obligated to pay Columbia royalties for such unpatented product for the remainder of the royalty term in such country.

The Columbia Agreement expires on a country-by-country and product-by-product basis upon expiration of the applicable royalty term for such product in such country. Columbia may either terminate the Columbia Agreement or convert our license to a non-exclusive license in the case of our insolvency, or upon our uncured material breach of the agreement of certain specified provisions, including in the event that we fail to achieve one or more specified diligence milestone(s) and fail to mutually agree upon a revised plan for development of a licensed product. Additionally, we have the right to terminate the Columbia Agreement at any time upon specified written notice to Columbia.

Exclusive License Agreement with National Institutes of Health

In October 2020, we entered into a patent license agreement (the "Patent License") with the U.S. Department of Health and Human Services, as represented by National Cancer Institute ("NCI") of the NIH. Pursuant to the Patent License, we hold an exclusive, worldwide license, sublicensable with the prior written consent of NIH, to certain intellectual property rights to develop, manufacture and commercialize licensed products, or to practice licensed processes, in each case, for use in the development of a CAR therapy mono-specific for CD33 for the prophylaxis or treatment of CD33-expressing hematological malignancies (but excluding CD33-specific logic-gated CAR-based immunotherapies) wherein the CAR is comprised of the CD33-binding domain referenced as Hu195 or hP67.6, is delivered via lentiviral transduction, and the T cells are derived from the patient or from an allogeneic source, which we collectively refer to as the field of use.

We must pay NCI tiered royalties on net sales of licensed products on a licensed product-by-licensed product and country-by-country basis, commencing on the date of first commercial sale of such licensed product in such country, until the date such licensed product ceases to be covered by a valid claim of a licensed patent in such country, which we expect to occur in March 2039, absent any applicable patent term extensions, and are subject to reduction for unblocking licenses from third parties, subject to a specified royalty floor.

The Patent License will expire upon expiration of the last valid claim of a licensed patent, unless terminated earlier as described below. NCI may terminate the Patent License in the event of a material breach, including if we do not use reasonable commercial efforts to execute the commercial development plan, or if we do not achieve the performance milestones by certain dates, following the expiration of a 90-day notice period during which we must ether cure the relevant breach or initiate corrective action to NCI's reasonable satisfaction. We may terminate the Patent License, in its entirety or with respect to any license in any country, in our sole discretion at any time upon 60 days' written notice to NCI. In addition, NCI has the right to require us to grant sublicenses under the licensed patent rights in any of the fields of use under specified conditions, if required by public health or safety concerns, or to terminate or modify the Patent License if deemed necessary to meet requirements for public use as specified by federal regulations, if NCI determines that we are not reasonably satisfying such requirements.

Worldwide non-exclusive license to Cas9 gene-edited HSCs from Editas Medicine, Inc.

In August 2023, we entered into a worldwide non-exclusive license from Editas Medicine for *ex-vivo* Cas9 gene-edited HSC therapies for the treatment and/or prevention of hematological malignancies. The license provides access to key intellectual property for the continued development and commercialization of edited HSCs including trem-cel, with the option to elect additional product candidate targets within the next five years.

Competition

We face potential competition from various sources, including larger and better-funded pharmaceutical, specialty pharmaceutical and biotechnology companies, as well as from academic institutions, governmental agencies and public and private research institutions, any of which may be more successful in developing or marketing products and technologies that are more effective, safer or less costly. These entities may also compete with us in hiring scientific and management personnel, establishing clinical study sites, recruiting patients to participate in clinical trials and acquiring technologies complementary to, or necessary for, our programs.

In the case of our lead shielded transplant product candidate, trem-cel, we are not aware of any approved products in development that apply gene engineering technology to donor HSCs to reduce the on-target toxicity of targeted cancer therapies. However, we face potential competition from multiple private and public HSC companies such as Beam Therapeutics, Inc., Cimeio Therapeutics, ExCellThera and Garuda Therapeutics.

In the case of VCAR33, there are several companies exploring CAR-T therapies in early trials for relapsed/refractory AML, including Bristol Myers Squibb, Inc., Caribou Biosciences, Inc., Cellectis S.A., Guangzhou Bio-gene Technology Co., Ltd, iCell Gene Therapeutics, LLC, Kite Pharma, Inc., and Precigen, Inc. In addition, there are companies attempting to address on-target toxicity through other treatment modalities such as Actinium Pharmaceuticals, Inc., Affirmed GmbH, and Aptevo Therapeutics, Inc., AvenCell Therapeutics, Inc., Bristol Myers Squibb, Inc., GT Biopharma, Inc., MacroGenics, Inc., Molecular Partners AG, Sanofi S.A., Senti Biosciences, Stemline Therapeutics, Inc. Trueline Therapeutics, Inc., Vincerx Pharma, Inc.

Beyond CAR-T therapies, a number of small molecule and monoclonal antibody products have been approved in recent years for the treatment of AML, including AbbVie Inc.'s Venclexta (venetoclax), Agios Pharmaceuticals Inc.'s Tibsovo (ivosidenib), Astella Pharma Inc.'s Xospata (gilteritinib), Bristol-Myers Squibb Company's Idhifa (enasidenib) and Onureg (azacitidine), Daiichi Sankyo, Inc.'s Vanflyta (quizartinib), Jazz Pharmaceuticals plc's Vyxeos (daunorubicin and cytarabine), Novartis International AG's Rydapt (midostaurin), Pfizer Inc.'s Mylotarg (gemtuzumab ozogamicin) and Daurismo (glasdegib), Rigel Pharmaceuticals, Inc.'s Rezlidhia (olutasidenib) and Vidaza (azacitidine).

Manufacturing

We operate an in-house clinical manufacturing facility in Cambridge, Massachusetts to support development of our shielded transplants and CAR-T therapeutic candidates for patients with blood cancers. The facility is located in the same premises as our headquarters, in Cambridge, MA. We have designed the facility to support clinical manufacturing for our shielded transplants and cell therapy programs and to be cGMP compliant. By integrating our internal research, process development, analytical development, manufacturing, and quality control testing capabilities under one roof, we believe we can achieve flexible manufacturing capacity and reduce the time and cost required to manufacture our complex cell therapy clinical candidates. While this facility is now operational, we continue to rely on third-party contract manufacturers for our required raw materials, manufacturing devices, active pharmaceutical ingredients and finished product for our research and clinical manufacturing. We do not have long-term agreements with any of these third parties. We also do not have any current contractual relationship for the manufacture of material for clinical trials beyond Phase 1/2a or commercial supplies. We intend to enter into agreements with third-party contract manufacturers and one or more backup manufacturers for future production. Although we are developing certain in-house manufacturing capabilities for our current clinical needs, we continue to analyze the feasibility of building additional manufacturing capabilities for future development and commercial quantities of any products that we develop. Such products will need to be manufactured in facilities, and by processes, that comply with the requirements of the FDA and the regulatory agencies of other jurisdictions in which we are seeking approval.

Intellectual Property

Overview

We strive to protect the proprietary product candidates and technologies that we believe are important to our business, including seeking and maintaining patent protection intended to cover the composition of matter of our product candidates, their methods of use, their methods of production, related technologies, and other inventions. In addition to patent protection, we also rely on trade secrets to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection, including certain aspects of technical know-how.

Our commercial success depends in part upon our ability to obtain and maintain patent and other proprietary protection for commercially important technologies, inventions and know-how related to our business, defend, and enforce our intellectual property rights, particularly our patent rights, preserve the confidentiality of our trade secrets and operate without infringing valid and enforceable intellectual property rights of others.

The patent positions for biopharmaceutical companies like us are generally uncertain and can involve complex legal, scientific, and factual issues. In addition, the coverage claimed in a patent application can be significantly reduced before a patent is issued, and its scope can be reinterpreted and even challenged after issuance. As a result, we cannot guarantee that any of our product candidates will be protectable or remain protected by enforceable patents. 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.

As of March 1, 2024, our owned patent portfolio is composed of more than 130 pending U.S. and foreign patent applications, approximately 3 pending U.S. provisional patent applications, 10 granted or allowed U.S. and foreign patents. In addition, we have licensed 11 granted U.S. and foreign patents, and approximately 54 pending patent applications in the United States and foreign jurisdictions.

Patent Rights Relating to Our eHSC Programs

The patent portfolio related to our lead eHSC product candidate, trem-cel (formerly VOR33), includes four patent families that are exclusively licensed from Columbia. The first patent family licensed from Columbia is directed to compositions and methods for gene engineering lineage-specific cell surface antigens, such as CD33, in HSCs and use thereof, and includes ten granted U.S. and foreign patents, two pending U.S. applications and at least 12 pending foreign applications in Europe, Japan, Canada, China, Australia and other jurisdictions. Any patents that grant from applications claiming priority to this patent family would be expected to expire in 2036, absent any applicable patent term extensions.

As of March 1, 2024, the second patent family licensed from Columbia, directed to compositions and methods of use of HSCs containing a single nucleotide polymorphism in CD33, includes an issued U.S. application, one pending U.S. application, and two pending foreign applications in Europe and Japan. Any patents that grant from applications claiming priority to this patent family would be expected to expire in 2038, absent any applicable patent term extensions.

As of March 1, 2024, the third patent family licensed from Columbia, directed to compositions and methods for gene engineering CD33 in HSCs and use thereof, includes a pending U.S. application and at least 14 pending foreign applications in Europe, Japan, Canada, China, Australia and other jurisdictions. Any patents that grant from applications claiming priority to this patent family would be expected to expire in 2040, absent any applicable patent term extensions.

As of March 1, 2024, the fourth patent family licensed from Columbia, directed to compositions and methods for inhibition of lineage-specific cell antigens using CRISPR-based base editor systems in HSCs and use thereof, includes a pending U.S. application and at least 9 pending foreign applications in Europe, Japan, Canada, China,

Australia and other jurisdictions. Any patents that grant from applications claiming priority to this patent family would be expected to expire in 2041, absent any applicable patent term extensions.

The patent portfolio related to trem-cel or gene-edited HSCs also includes three patent families that we own. As of March 1, 2024, the first family, directed to compositions and methods of engineering lineage-specific antigens in HSCs includes one granted Japanese patent, one pending patent application in the United States and 14 pending foreign applications in Europe, Japan, Canada, China, Australia and other jurisdictions. Any patents that grant from applications claiming priority to this patent family would be expected to expire in 2038, absent any applicable patent term extensions. As of March 1, 2024, the second family, directed to compositions and methods of engineering multiple lineage-specific antigens in HSCs, includes seven U.S. patents, two pending U.S. patent applications and 14 pending foreign patent applications. Any patents that grant from applications within these families would be expected to expire in 2039, absent any applicable patent term extensions. As of March 1, 2024, the third family, directed to compositions and methods of treating a hematopoietic malignancy, includes a pending U.S. application and seven pending foreign applications in Europe, Japan, Canada, China, Australia, and other jurisdictions. Any patents that grant from applications within this family would be expected to expire in 2041, absent any applicable patent term extensions.

We also own five patent families directed to compositions and methods of engineering specific antigens in HSCs, including CD33, CLL-1 and CD123. As of March 1, 2024, the first family, directed to compositions and methods for engineering CD33 in HSCs includes one pending U.S. application and eight pending foreign patent applications. As of March 1, 2024, the second and third patent families, directed to compositions and methods for engineering CLL-1 in HSCs include at least two pending U.S. applications and twelve pending foreign patent applications. As of March 1, 2024, the fourth and fifth patent families, directed to compositions and methods for engineering CD123 in HSCs include at least two pending U.S. applications and twelve pending foreign applications.

We also own eight patent families directed to compositions and methods of engineering additional target antigens in HSCs. These families include one pending PCT application, seven pending U.S. applications and at least eleven pending foreign patent applications. Any patents that grant from applications within these families would be expected to expire in 2041 or 2042, absent any applicable patent term extensions.

We also own patent families directed to compositions and methods of generating genetically engineered cells using homology-directed repair, epitope engineering, multiplex engineering and generating an artificial protospacer-adjacent motif. These patent families each include one pending PCT application. Any patents that grant from applications within these patent families would be expected to expire in 2042 or 2043, absent any applicable patent term extensions.

Patent Rights Relating to Our Targeted Therapy Programs

We own three patent families directed to compositions and methods of making and using CARs. As of March 1, 2024, these families each include one pending U.S. application and at least two pending foreign patent applications, and any patents that grant from applications in these families would be expected to expire in 2041, absent any applicable patent term extensions.

We have one patent family that is exclusively licensed from the NIH related to our VCAR33 program. As of March 1, 2024, the patent family licensed from NCI is directed to CARs targeting CD33, compositions containing cells expressing CARs, and methods of use thereof, and includes one pending U.S. application and at least 13 pending foreign applications in Europe, Japan, Canada, China, Australia and other countries. Any patents that grant from applications in this patent family would be expected to expire in 2039, absent any applicable patent term extensions.

We own one patent family directed to compositions and methods of using single domain antibodies targeting CD33. As of March 1, 2024, this family includes one pending U.S. patent application and six pending foreign patent applications. Any patents that grant from applications in this family would be expected to expire in 2041, absent any applicable patent term extensions.

We own one patent family directed to compositions and methods of using CARs targeting CD123. As of March 1, 2024, this family includes one pending U.S. patent application and six pending foreign patent applications. Any patents that grant from applications in this family would be expected to expire in 2042, absent any applicable patent term extensions.

We also own one patent family directed to compositions and methods of using antibodies targeting CLL-1. As of March 1, 2024, this family includes one pending PCT application. Any patents that grant from applications in this family would be expected to expire in 2043, absent any applicable patent term extensions.

Provisional Patent Applications

As indicated above, some of our owned patent applications are provisional patent applications. Provisional patent applications are not eligible to become issued patents until, among other things, we file a non-provisional patent application within 12 months of filing of one or more of our related provisional patent applications. If we do not timely file any non-provisional patent applications, we may lose our priority date with respect to our provisional patent applications and any patent protection on the inventions disclosed in our provisional patent applications. 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. Moreover, the patent application and approval process is expensive and time-consuming. We may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner.

Patent Term and Term Extensions

The term of individual patents depends upon the legal term for patents in the countries in which they are obtained. In most countries in which we have filed, including the United States, the patent term is 20 years from the earliest filing date of a non-provisional patent application. In the United States, a patent's term may be lengthened by patent term adjustment, which compensates a patentee for administrative delays by the U.S. Patent and Trademark Office in examining and granting a patent, or may be shortened if a patent is terminally disclaimed over an earlier filed patent. The term of a patent that covers a drug or biological product may also be eligible for patent term extension when FDA approval is granted for a portion of the term effectively lost as a result of the FDA regulatory review period, subject to certain limitations and provided statutory and regulatory requirements are met. Any such patent term extension can be for no more than five years, only one patent per approved product can be extended, the extension cannot extend the total patent term beyond 14 years from FDA approval, and only those claims covering the approved drug, a method for using it, or a method for manufacturing it may be extended. We may not receive an extension if we fail to exercise due diligence during the testing phase or regulatory review process, fail to apply within applicable deadlines, fail to apply prior to expiration of relevant patents or otherwise fail to satisfy applicable requirements. Moreover, the length of the extension could be less than we request. In the future, if and when our product candidates receive approval from the FDA or foreign regulatory authorities, we expect to apply for patent term extensions on issued patents we may obtain in the future covering those products, depending upon the length of the clinical trials for each product and other factors. There can be no assurance that any of our pending patent applications will issue or that we will benefit from any patent term extension or favorable adjustment to the term of any of our patents.

As with other biotechnology and pharmaceutical companies, our ability to maintain and solidify our proprietary and intellectual property position for our product candidates will depend on our success in obtaining effective patent claims and enforcing those claims if granted. However, our owned and licensed pending patent applications, and any patent applications that we may in the future file or license from third parties may not result in the issuance of patents. We also cannot predict the breadth of claims that may be allowed or enforced in our patents. Any issued patents that we may receive in the future may be challenged, invalidated, infringed or circumvented. In addition, because of the extensive time required for clinical development and regulatory review of a product candidate we may develop, it is possible that, before any of our product candidates can be commercialized, any related patent may expire or remain in force for only a short period following commercialization, thereby limiting the protection such patent would afford the respective product and any competitive advantage such patent may provide. For more information, see the section entitled "Risk Factors—Risks Related to Intellectual Property."

Other IP Rights

In addition to patents, we rely upon unpatented trade secrets and know-how, continuing technological innovation and confidential information to develop and maintain our proprietary position and protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection, including our proprietary processes for generating and propagating eHSCs. However, trade secrets and know-how can be difficult to protect. We seek to protect our proprietary information, in part, by executing confidentiality agreements with our collaborators and scientific advisors, and non-competition, non-solicitation, confidentiality and invention assignment agreements with our employees and consultants. We have also executed agreements requiring assignment of inventions with selected scientific advisors and collaborators. The confidentiality agreements we enter into are designed to protect our proprietary information and the agreements or clauses requiring assignment of inventions to us are designed to grant us ownership of technologies that are developed through our relationship with the respective counterparty. We cannot guarantee, however, that we have executed such agreements with all applicable counterparties, such agreements will not be breached, or that these agreements will afford us adequate protection of our intellectual property and proprietary rights. In addition, our trade secrets may otherwise become known or be independently discovered by competitors. To the extent that our commercial partners, collaborators, employees and consultants use intellectual property owned by others in their work for us, disputes may arise as to the rights in related or resulting know-how and inventions. For more information, see the section entitled "Risk Factors—Risks Related to Our Intellectual Property" in Part I, Item 1A of this Annual Report.

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 drugs or processes, obtain licenses or cease certain activities. Our breach of any license agreements or failure to obtain a license to proprietary rights that we may require to develop or commercialize our future drugs may have an adverse impact on us. Since patent applications in the United States and certain other jurisdictions are maintained in secrecy for 18 months or potentially longer, and since publication of discoveries in the scientific or patent literature often lags behind actual discoveries, we cannot be certain of the priority of inventions covered by pending patent applications.

Trademarks

We also aim to obtain and maintain registration for trademarks that we consider are relevant to our business. As of March 1, 2024, we have filed for registration of the trademarks for VOR BIOPHARMA, for VOR, for our "V" logo, and for VOR BIO, for international class 5 (pharmaceuticals) under the Madrid Protocol, with more than 60 applications in the United States and foreign jurisdictions. VOR, our "V" logo, VOR BIOPHARMA, and VOR BIO are trademarks and registered trademarks of Vor Biopharma Inc. We plan to register additional trademarks in connection with any future pharmaceutical products we may commercialize, if approved.

Government Regulation and Product Approval

As a biopharmaceutical company that operates in the United States, we are subject to extensive regulation. Our cell product candidates will be regulated as biologics. With this classification, commercial production of our product candidates will need to occur in registered facilities in compliance with cGMP for biologics. The FDA categorizes human cell- or tissue-based products as either minimally manipulated or more than minimally manipulated and has determined that more than minimally manipulated products require clinical trials to demonstrate product safety and efficacy and the submission of a Biologics License Application ("BLA") for marketing authorization. Our product candidates are considered more than minimally manipulated and will require evaluation in clinical trials and the submission and approval of a BLA before we can market them.

The FDA and other government authorities in the United States (at the federal, state and local levels) and in other countries extensively regulate, among other things, the research, development, testing, manufacturing, quality control, approval, labeling, packaging, storage, record-keeping, promotion, advertising, distribution, post-approval monitoring and reporting, marketing and export and import of biopharmaceutical products such as those we are developing. Our product candidates must be approved by the FDA before they may be legally marketed in the United States and by the appropriate foreign regulatory agency before they may be legally marketed in foreign

countries. Generally, our activities in other countries will be subject to regulation that is similar in nature and scope as that imposed in the United States, although there can be important differences. Additionally, some significant aspects of regulation in Europe are addressed in a centralized way, but country-specific regulation remains essential in many respects. The process for obtaining regulatory marketing approvals and the subsequent compliance with appropriate federal, state, local and foreign statutes and regulations require the expenditure of substantial time and financial resources.

U.S. Product Development Process

In the United States, the FDA regulates pharmaceutical and biological products under the Federal Food, Drug and Cosmetic Act, the Public Health Service Act ("PHSA") and their implementing regulations. The process of obtaining regulatory approvals and the subsequent compliance with appropriate federal, state, local and foreign statutes and regulations require the expenditure of substantial time and financial resources. Failure to comply with the applicable U.S. requirements at any time during the product development process, approval process or after approval, may subject an applicant to administrative or judicial sanctions. FDA sanctions could include, among other actions, refusal to approve pending applications, withdrawal of an approval, a clinical hold, warning letters, product recalls or withdrawals from the market, product seizures, total or partial suspension of production or distribution injunctions, fines, refusals of government contracts, restitution, disgorgement or civil or criminal penalties. Any agency or judicial enforcement action could have a material adverse effect on us. The process required by the FDA before a biological product may be marketed in the United States generally involves the following:

- completion of nonclinical laboratory tests and animal studies according to FDA's good laboratory practices ("GLPs") and applicable requirements for the humane use of laboratory animals or other applicable regulations;
- submission to the FDA of an IND application, which must become effective before human clinical trials may begin;
- approval by an independent Institutional Review Board ("IRB") or ethics committee at each clinical site before the trial is commenced;
- performance of adequate and well-controlled human clinical trials according to the FDA's regulations commonly referred to as good clinical practices ("GCPs") and any additional requirements for the protection of human research patients and their health information, to establish the safety and efficacy of the proposed biological product for its intended use;
- submission to the FDA of a BLA for marketing approval that includes substantial evidence of safety, efficacy, purity and potency from results of nonclinical testing and clinical trials;
- satisfactory completion of an FDA Advisory Committee review, if applicable;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities where the biological product is produced to assess compliance with cGMP, to assure that the facilities, methods and controls are adequate to preserve the biological product's identity, strength, potency, quality and purity and, if applicable, the FDA's current good tissue practices ("GTPs") for the use of human cellular and tissue products;
- potential FDA audit of the nonclinical GLP study and clinical investigators and clinical trial sites that generated the data in support of the BLA; and
- FDA review and approval of the BLA and licensure of the manufacturing facility to permit commercial marketing of the product for particular indications for use in the United States.

Before testing any biological product candidate, including our product candidates, in humans, the product candidate enters the preclinical testing stage. Preclinical tests, also referred to as nonclinical studies, include laboratory evaluations of product chemistry, toxicity and formulation, as well as animal studies to assess the potential safety, biodistribution and activity of the product candidate. The conduct of the preclinical tests must comply with federal regulations and requirements including GLPs. The clinical trial sponsor must submit the results

of the preclinical tests, together with manufacturing information, analytical data, any available clinical data or literature and a proposed clinical protocol, to the FDA as part of the IND. Some preclinical testing may continue even after the IND is submitted. The IND automatically becomes effective 30 days after receipt by the FDA, unless the FDA raises concerns or questions regarding the proposed clinical trials and places the trial on a clinical hold within that 30-day time period. In such a case, the IND sponsor must resolve any outstanding concerns of the FDA before the clinical trial can begin. The FDA may also impose clinical holds on a biological product candidate at any time before or during clinical trials due to safety concerns or non-compliance. If the FDA imposes a clinical hold, trials may not recommence without FDA authorization and then only under terms authorized by the FDA. Accordingly, we cannot be sure that submission of an IND will result in the FDA allowing clinical trials to begin, or that, once begun, issues will not arise that suspend or terminate such trials.

Supervision of human gene transfer trials includes evaluation and assessment by an Institutional Biosafety Committee ("IBC"), a local institutional committee that reviews and oversees research utilizing recombinant or synthetic nucleic acid molecules at that institution, as set forth in the NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules ("NIH Guidelines"). 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.

For purposes of BLA approval, human clinical trials are typically conducted in three sequential phases that may overlap or be combined:

- *Phase 1.* The biological product candidate is initially introduced into healthy human subjects and tested for safety. In the case of some products for severe or life-threatening diseases, especially when the product may be too inherently toxic to ethically administer to healthy volunteers, the initial human testing is often conducted in patients. The Center for Biological Research and Review has determined that healthy volunteers are not to receive any cell or gene therapy products in a Phase 1 trial because there are risks associated with these products and the effects may not be able to be evaluated in these healthy individuals. As a result, the recruitment of patients, the prolonger persistence of these therapies can prolong this phase of development in determining dose levels.
- *Phase 2.* The biological product candidate is evaluated in a limited patient population to identify possible adverse effects and safety risks, to preliminarily evaluate the efficacy of the product candidate for specific targeted diseases and to determine dosage tolerance, optimal dosage and dosing schedule.
- *Phase 3.* Clinical trials are undertaken to further evaluate dosage, clinical efficacy, potency and safety in an expanded patient population at geographically dispersed clinical trial sites. These clinical trials are intended to establish the overall risk to benefit ratio of the product candidate and provide an adequate basis for product labeling.

Post-approval clinical trials, sometimes referred to as Phase 4 clinical trials, may be conducted after initial marketing approval. These clinical trials are used to gain additional experience from the treatment of patients in the intended therapeutic indication, particularly for long-term safety follow-up. These Phase 4 studies may be made a condition to approval of the BLA. Phase 1, Phase 2 and Phase 3 clinical trials may not be completed successfully within any specified period, if at all. The FDA or the sponsor or its data safety monitoring board may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research patients are being exposed to an unacceptable health risk, including risks inferred from other related or unrelated gene and cell therapy trials. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution if the clinical trial is not being conducted in accordance with the IRB's requirements or if the biological product has been associated with unexpected serious harm to patients. In addition, some clinical trials are overseen by an independent group of qualified experts organized by the sponsor, known as a data safety monitoring board or committee. Depending on its charter, this group may determine whether a trial may move forward at designated check points based on access to certain data from the trial.

Concurrently with clinical trials, companies usually complete additional studies and must also develop additional information about the physical characteristics of the biological product candidate as well as finalize a process for manufacturing the product candidate in commercial quantities in accordance with cGMP requirements. To help reduce the risk of the introduction of adventitious agents with use of biological products, the PHSA emphasizes the importance of manufacturing control for products whose attributes cannot be precisely defined. The manufacturing process must be capable of consistently producing quality batches of the product candidate and, among other things, the sponsor must develop methods that are fully validated for testing the identity, strength, quality, potency and purity of the final biological product candidate. Additionally, appropriate packaging must be selected and tested and stability studies must be conducted to demonstrate that the biological product candidate does not undergo unacceptable deterioration over its shelf life. Ensuring that the manufacturing process is robust and suitable to pass an FDA pre-approval inspection for a BLA is resource-intensive and requires sufficient time to prepare. Process improvement steps taken before, during and after a pivotal trial may also require a comparability protocol that would need to be conducted and reviewed by FDA.

U.S. Review and Approval Processes

After the completion of clinical trials of a biological product candidate, FDA approval of a BLA must be obtained before commercial marketing of the biological product. The BLA submission must include all relevant data of product development, laboratory and animal studies, human trials, information on the manufacture and composition of the product, proposed labeling and other relevant information. The testing and approval processes require substantial time and effort and there can be no assurance that the FDA will accept the BLA for filing and, even if filed, that any approval will be granted on a timely basis, if at all.

Under the Prescription Drug User Fee Act, as amended ("PDUFA"), each BLA must be accompanied by a significant user fee. The FDA adjusts the PDUFA user fees on an annual basis. PDUFA also imposes an annual program fee for biological products. Fee waivers or reductions are available in certain circumstances, including a waiver of the application fee for the first application filed by a small business. Additionally, no user fees are assessed on BLAs for products designated as orphan drugs, unless the product also includes a non-orphan indication.

Within 60 days following submission of the application, the FDA reviews a BLA submitted to determine if it is substantially complete before the agency accepts it for filing. The FDA may refuse to file any BLA that it deems incomplete or not properly reviewable at the time of submission and may request additional information. In this event, the BLA must be resubmitted with the additional information. The resubmitted application also is subject to review before the FDA accepts it for filing. Once the submission is accepted for filing, the FDA begins an in-depth substantive review of the BLA. The FDA reviews the BLA to determine, among other things, whether the proposed product is safe, potent and/or effective for its intended use and has an acceptable purity profile, and whether the product candidate is being manufactured in accordance with cGMP to assure and preserve the product candidate's identity, safety, strength, quality, potency and purity. The FDA may refer applications for novel biological product candidates or biological product candidates that present difficult questions of safety or efficacy to an advisory committee, typically a panel that includes clinicians and other experts, for review, evaluation and a recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions. During the biological product candidate approval process, the FDA also will determine whether a Risk Evaluation and Mitigation Strategy ("REMS") is necessary to assure the safe use of the biological product candidate. A REMS is a safety strategy to manage a known or potential serious risk associated with a medicine 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. If the FDA concludes a REMS is needed, the sponsor of the BLA must submit a proposed REMS. The FDA will not approve a BLA without a REMS, if required.

Before approving a BLA, the FDA will inspect the facilities at which the product candidate is manufactured. The FDA will not approve the product candidate unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product candidate within required specifications. For immunotherapy product candidates, the FDA also will not approve the product candidate if the manufacturer is not in compliance with GTPs, to the extent applicable. These are FDA regulations

and guidance documents that govern the methods used in, and the facilities and controls used for, the manufacture of human cells, tissue and cellular and tissue based products ("HCT/Ps"), which are human cells or tissue intended for implantation, transplant, infusion or transfer into a human recipient. The primary intent of the GTP requirements is to ensure that cell and tissue based products are manufactured in a manner designed to prevent the introduction, transmission and spread of communicable disease. FDA regulations also require tissue establishments to register and list their HCT/Ps with the FDA and, when applicable, to evaluate donors through screening and testing. Additionally, before approving a BLA, the FDA will typically inspect one or more clinical sites to assure that the clinical trials were conducted in compliance with IND trial requirements and GCP requirements. To assure cGMP, GTP and GCP compliance, an applicant must incur significant expenditure of time, money and effort in the areas of training, record keeping, production and quality control.

Notwithstanding the submission of relevant data and information, the FDA may ultimately decide that the BLA does not satisfy its regulatory criteria for approval and deny approval. Data obtained from clinical trials are not always conclusive and the FDA may interpret data differently than we interpret the same data. If the agency decides not to approve the BLA in its present form, the FDA will issue a complete response letter that describes all of the specific deficiencies in the BLA identified by the FDA. The deficiencies identified may be minor, for example, requiring labeling changes, or major, for example, requiring additional clinical trials. Additionally, the complete response letter may include recommended actions that the applicant might take to place the application in a condition for approval. If a complete response letter is issued, the applicant may either resubmit the BLA, addressing all of the deficiencies identified in the letter, or withdraw the application.

If a product receives regulatory approval, the approval may be limited to specific diseases and dosages or the indications for use may otherwise be limited, which could restrict the commercial value of the product. Further, the FDA may require that certain contraindications, warnings or precautions be included in the product labeling. The FDA also may require a 'Black Box Warning' for noting serious adverse effects or other critical warnings regarding the use of the product. The FDA may impose restrictions and conditions on product distribution, prescribing or dispensing in the form of a risk management plan, a more formal REMS requirement or otherwise limit the scope of any approval. In addition, the FDA may require post marketing clinical trials, sometimes referred to as Phase 4 clinical trials, designed to further assess a biological product's safety and effectiveness, and testing and surveillance programs to monitor the safety of approved products that have been commercialized.

In addition, under the Pediatric Research Equity Act ("PREA"), a BLA or supplement to a BLA must contain data to assess the safety and effectiveness of the product for the claimed indications in all relevant pediatric subpopulations and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDA may grant deferrals for submission of data or full or partial waivers. Unless otherwise required by regulation, PREA does not apply to any product for an indication for which orphan designation has been granted. However, if only one indication for a product has orphan designation, a pediatric assessment may still be required for any applications to market that same product for the non-orphan indication(s).

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 generally 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 and 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 candidate 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 product 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 user 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, if the second applicant demonstrates that its product is clinically superior to the approved product with orphan exclusivity, 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. Orphan drug designation may also entitle a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages and user-fee waivers.

Expedited Development and Review Programs

The FDA has established certain programs intended to expedite or facilitate the process for developing, reviewing or approving new products that meet certain criteria, including fast track designation, breakthrough therapy designation, accelerated approval and priority review. Specifically, new product candidates 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 candidate and the specific indication for which it is being studied. Unique to a fast track product, 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 and the payment of applicable user fees, 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.

Any product candidate submitted to the FDA for approval, including a product candidate with a fast track designation, may also be eligible for other types of FDA programs intended to expedite development and review, such as priority review and accelerated approval. A product candidate is eligible for priority review if it has the potential to provide safe and effective therapy where no satisfactory alternative therapy exists or a significant improvement in the treatment, diagnosis or prevention of a disease compared to marketed products. The FDA will attempt to direct additional resources to the evaluation of an application for a new product candidate designated for priority review in an effort to facilitate the review.

Additionally, a product candidate may be eligible for accelerated approval. Product candidates 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 candidate 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 approval, the FDA may require that a sponsor of a drug or biological product candidate receiving accelerated approval perform adequate and well-controlled post-marketing clinical studies. The FDA may withdraw approval of a drug or indication approved under accelerated approval if, for example, the confirmatory trial fails to verify the predicted clinical benefit of the product. 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 candidate. Also, there is the possibility that reimbursement by certain federal programs in the future may be reduced for products that receive accelerated approval.

Breakthrough therapy designation is intended to expedite the development and review of product candidates that treat serious or life-threatening conditions. The designation by FDA requires preliminary clinical evidence that a product candidate, alone or in combination with other drugs and biologics, demonstrates substantial improvement over currently available therapy on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. If the FDA designates a breakthrough therapy, it may take actions appropriate to expedite the development and review of the application, which may include holding meetings with the sponsor and the review team throughout the development of the therapy; providing timely advice to, and interactive communication with, the sponsor regarding the development of the drug to ensure that the development program to

gather the nonclinical and clinical data necessary for approval is as efficient as practicable; involving senior managers and experienced review staff, as appropriate, in a collaborative, cross-disciplinary review; assigning a cross-disciplinary project lead for the FDA review team to facilitate an efficient review of the development program and to serve as a scientific liaison between the review team and the sponsor; and considering alternative clinical trial designs when scientifically appropriate, which may result in smaller trials or more efficient trials that require less time to complete and may minimize the number of patients exposed to a potentially less efficacious treatment. Breakthrough therapy designation comes with all of the benefits of fast-track designation, which means that the sponsor may file sections of the BLA for review on a rolling basis if certain conditions are satisfied, including an agreement with FDA on the proposed schedule for submission of portions of the application and the payment of applicable user fees before the FDA may initiate a review. The breakthrough therapy designation is a distinct status from both accelerated approval and priority review, which can also be granted to the same product candidate if relevant criteria are met. If a product candidate is designated as breakthrough therapy, FDA will expedite the development and review of such product candidate.

Specifically for cell and gene therapy products, a Regenerative Medicine Advanced Therapy ("RMAT") designation may be granted by FDA. It is a process designed to facilitate the development and expedite the review of such products to treat serious conditions and fill an unmet medical need. The criteria for the RMAT designation includes the following: a product that is intended to treat a serious condition, addresses an unmet medical need, and has clinical data demonstrating the product has the potential to address this unmet medical need.

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

Post-Approval Requirements

Any products for which we receive FDA approvals are subject to continuing regulation by the FDA, including, among other things, continuing user fee requirements, record-keeping requirements, reporting of adverse experiences with the product, providing the FDA with updated safety and efficacy information, product sampling and distribution requirements, and complying with FDA promotion and advertising requirements, which include, among others, standards for direct-to-consumer advertising, restrictions on promoting products for uses or in patient populations that are not described in the product's approved uses (known as "off-label use"), limitations on industry-sponsored scientific and educational activities, and requirements for promotional activities involving the internet. Although a physician may prescribe a legally available product for an off-label use, if the physician deems such product to be appropriate in his/her professional medical judgment, a manufacturer may not market or promote off-label uses. However, companies may share truthful and not misleading information that is otherwise consistent with a product's FDA-approved labeling. A company that is found to have promoted off-label use of its product may be subject to significant liability, including administrative, civil and criminal sanctions.

In addition, quality control and manufacturing procedures must continue to conform to applicable manufacturing requirements after approval to ensure the long-term stability of the product. cGMP regulations require among other things, quality control and quality assurance as well as the corresponding maintenance of records and documentation and the obligation to investigate and correct any deviations from cGMP. Manufacturers and other entities involved in the manufacture and distribution of approved products 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 and other laws. Accordingly, manufacturers must continue to expend time, money and effort in the area of production and quality control to maintain cGMP compliance. Discovery of problems with a product after approval may result in restrictions on a product, manufacturer or holder of an approved BLA, including, among other things, recall or withdrawal of the product from the market. In addition, changes to the manufacturing process are strictly regulated and, depending on the significance of the change, may require prior FDA approval before being implemented. Other types of changes to the approved product, such as adding new indications and claims, are also subject to further FDA review and approval.

The FDA also may require post-marketing testing, known as Phase 4 testing, and surveillance to monitor the effects of an approved product. Discovery of previously unknown problems with a product or the failure to comply with applicable FDA requirements can have negative consequences, including adverse publicity, judicial or administrative enforcement, warning letters from the FDA, mandated corrective advertising or communications with doctors, and civil or criminal penalties, among others. Newly discovered or developed safety or effectiveness data may require changes to a product's approved labeling, including the addition of new warnings and contraindications, and also may require the implementation of other risk management measures. Also, new government requirements, including those resulting from new legislation, may be established, or the FDA's policies may change, which could delay or prevent regulatory approval of our products under development.

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.

U.S. Marketing Exclusivity

The Biologics Price Competition and Innovation Act ("BPCIA") amended the PHSA to authorize the FDA to approve similar versions of innovative biologics, commonly known as biosimilars. A competitor seeking approval of a biosimilar must file an application to establish its molecule as highly similar to an approved innovator biologic, among other requirements.

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.

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.

The BPCIA is complex and continues to be interpreted and implemented by the FDA.

Pediatric exclusivity is another type of regulatory 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 trial in accordance with an FDA-issued "Written Request" for such a trial.

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 CMS, other divisions of the U.S. Department of Health and Human Services (e.g., the Office of Inspector General), the U.S. Department of Justice ("DOJ") and individual U.S. Attorney offices within the DOJ, and state and local governments. For example, our business practices, including our clinical research and any future sales, marketing and scientific/educational grant programs may be required to comply with the fraud and abuse provisions of the Social Security Act, the false claims laws, the data privacy and security provisions of the Health Insurance Portability and Accountability Act ("HIPAA"), federal transparency requirements and similar state laws, each as amended.

The federal Anti-Kickback Statute prohibits, among other things, any person or entity, from knowingly and willfully offering, paying, soliciting or receiving any remuneration (including any kickback, bribe or rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce or in return for, either the referral of an individual for, or the purchasing, leasing, ordering or arranging for the purchase, lease or order of any item or service reimbursable 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 pharmaceutical manufacturers on one hand and prescribers, purchasers and formulary managers 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 require strict compliance in order to offer protection. 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 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. In addition, a person or entity does not need to have actual knowledge of the federal Anti-Kickback Statute or specific intent to violate it in order to have committed a violation. Rather, if "one purpose" of the remuneration is to induce referrals, the federal Anti-Kickback Statute is violated.

The federal civil monetary penalties statute imposes penalties against any person or entity who, among other things, is determined to have knowingly presented or caused to be presented a false or fraudulent claim to, among others, a federal healthcare program that the person knows or should know is for an item or service that was not provided as claimed or is false or fraudulent.

The federal civil False Claims Act prohibits, among other things, any person or entity from knowingly presenting, or causing to be presented, a false claim for payment to, or approval by, the federal government or knowingly making, using or causing to be made or used a false record or statement material to a false or fraudulent claim to the federal government in order to avoid, decrease or conceal an obligation to pay money to the federal government. As a result of a modification made by the Fraud Enforcement and Recovery Act of 2009, a claim includes "any request or demand" for money or property presented to the federal government. The federal civil False Claims Act can be enforced through private "qui tam" actions brought by individual whistleblowers in the name of the government. In addition, manufacturers can be held liable under the civil False Claims Act even when they do not submit claims directly to government payors if they are deemed to "cause" the submission of false or fraudulent

claims. Pharmaceutical and other healthcare companies are being investigated or, in the past, have been prosecuted under these laws for, among other things, allegedly providing free product to customers with the expectation that the customers would bill federal programs for the product. In addition, pharmaceutical and other healthcare companies also have been prosecuted for causing false claims to be submitted because of the companies' marketing of the product for unapproved, and thus non-reimbursable, uses and purportedly concealing price concessions in the pricing information submitted to the government for government priced reporting purposes. A claim that includes items or services resulting from a violation of the federal Anti-Kickback Statute also constitutes a false or fraudulent claim for purposes of the federal civil False Claims Act.

HIPAA created additional federal criminal statutes that prohibit knowingly and willfully executing, or attempting to execute, a scheme or artifice 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 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. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation.

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 of 2009 and its implementing regulations (which we collectively refer to as HIPAA), imposes requirements on certain types of individuals and entities, including covered entities (i.e., certain healthcare providers, health plans and healthcare clearinghouses), as well as their business associates that perform certain services on behalf of the covered entities and their covered subcontractors, relating to the privacy, security and transmission of individually identifiable health information. Entities that are found to be in violation of HIPAA as the result of a breach of unsecured protected health information, a complaint about privacy practices or an audit by the U.S. Department of Health and Human Services ("HHS"), may be subject to significant civil, criminal and administrative fines and penalties and/or additional reporting and oversight obligations if required to enter into a resolution agreement and corrective action plan with HHS to settle allegations of HIPAA non-compliance. Further, entities that knowingly obtain, use, or disclose individually identifiable health information maintained by a HIPAA covered entity in a manner that is not authorized or permitted by HIPAA may be subject to criminal penalties. In addition, state laws govern the privacy and security of health information in specified circumstances, many of which differ from each other in significant ways and may not have the same effect, thus complicating compliance efforts.

Additionally, the federal Physician Payments Sunshine Act created under the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, and its implementing regulations (collectively, the "ACA"), 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) annually report information to CMS related to certain payments or other transfers of value made or distributed to physicians (currently defined to include doctors, dentists, optometrists, podiatrists and chiropractors), other healthcare professionals (such as physician assistants and nurse practitioners), and teaching hospitals, or to entities or individuals at the request of, or designated on behalf of, the physicians and teaching hospitals and to report annually certain ownership and investment interests held by physicians and their immediate family members.

Also, many states have similar fraud and abuse statutes or regulations similar to the aforementioned federal laws that apply to items and services reimbursed under Medicaid and other state programs, or, in several states, apply regardless of the payor. 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 and local jurisdictions have enacted legislation requiring pharmaceutical and biotechnology companies to establish marketing compliance programs and comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by

the federal government, 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 also potentially subject to federal and state consumer protection and unfair competition laws.

If our operations are found to be in violation of any of the federal and state healthcare laws described above or any other 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, imprisonment, exclusion from participation in government programs, such as Medicare and Medicaid, injunctions, contractual damages, reputational harm, administrative burdens, diminished profits and future earnings, additional reporting requirements and/or oversight if we become subject to a corporate integrity agreement or similar 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 and Reimbursement

Sales of our product candidates, if approved, will depend, in part, on the extent to which such products will be covered by third-party payors, such as government health care programs, commercial insurance and managed healthcare organizations. These third-party payors are increasingly limiting coverage and/or reducing reimbursements for medical products and services. A third-party payor's decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved. Further, one payor's determination to provide coverage for a drug product does not ensure that other payors will also provide coverage for the drug product. Coverage policies and third-party payor reimbursement rates may change at any time. In addition, the U.S. government, state legislatures and foreign governments have continued implementing cost-containment programs, including price controls, restrictions on reimbursement and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit our net revenue and results. Decreases in third-party payor reimbursement or a decision by a third-party payor to not cover any of our product candidates, if approved, could reduce physician usage of our product candidates, and have a material adverse effect on our sales, results of operations and financial condition.

Additionally, we or our collaborators may develop companion diagnostic tests for use with our product candidates. Companion diagnostic tests require coverage and reimbursement separate and apart from the coverage and reimbursement for their companion pharmaceutical or biological products. Similar challenges to obtaining coverage and reimbursement, applicable to pharmaceutical products, will apply to companion diagnostics.

Healthcare Laws and Regulations

We are subject to healthcare regulation and enforcement by the federal government and the states and foreign governments in which we conduct our business. The healthcare laws and regulations that may affect our ability to operate include the following:

- The federal Anti-Kickback Statute makes it illegal for any person or entity to knowingly and willfully, directly or indirectly, solicit, receive, offer, or pay any remuneration that is in exchange for or to induce the referral of business, including the purchase, order, lease of any good, facility, item or service for which payment may be made under a federal healthcare program, such as Medicare or Medicaid. The term "remuneration" has been broadly interpreted to include anything of value.
- Federal false claims and false statement laws, including the federal civil False Claims Act, and civil monetary penalties laws, prohibit, among other things, any person or entity from knowingly presenting, or causing to be presented, for payment to, or approval by, federal programs, including Medicare and Medicaid, claims for items or services, including drugs, that are false or fraudulent.
- The U.S. federal Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), created additional federal criminal statutes that prohibit among other actions, knowingly and willfully

executing, or attempting to execute, a scheme to defraud any healthcare benefit program, including private third-party payors or making any false, fictitious or fraudulent statement 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 ("HITECH"), and their implementing regulations, imposes obligations on covered entities, including certain healthcare providers, health plans, and healthcare clearinghouses, and their respective business associates that create, receive, maintain or transmit individually identifiable health information for or on behalf of a covered entity as well as their covered subcontractors, with respect to safeguarding the privacy, security and transmission of individually identifiable health information.
- The federal Physician Payments Sunshine Act requires certain manufacturers of drugs, devices, biologics and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program, with specific exceptions, to report annually to CMS information related to payments or other transfers of value made to physicians (as defined to include doctors of medicine, dentists, optometrists, podiatrists and chiropractors by such law), other healthcare professionals (such as physician assistants and nurse practitioners), and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members.

Also, many states have similar laws and regulations, such as anti-kickback and false claims laws that may be broader in scope and may apply regardless of payor, in addition to items and services reimbursed under Medicaid and other state programs. Additionally, we may be subject to state laws that require pharmaceutical companies to comply with the federal government's and/or pharmaceutical industry's voluntary compliance guidelines, state laws that require drug manufacturers to report information related to payments and other transfers of value to physicians and other healthcare providers or marketing expenditures, state laws that require drug manufacturers to report information on the pricing of certain drugs, state and local laws that require the registration of pharmaceutical sales representatives, as well as state and foreign laws governing the privacy and security of health information, many of which differ from each other in significant ways and often are not preempted by HIPAA.

Violations of any of these laws or any other federal or state regulations, may result in significant administrative, civil and/or criminal penalties, damages, fines, disgorgement, imprisonment, exclusion from federal health care programs, and additional reporting requirements and/or oversight.

Additionally, to the extent that our product is sold in a foreign country, we may be subject to similar foreign laws.

Healthcare Reform

The United States and some foreign jurisdictions are considering or have enacted a number of legislative and regulatory proposals to change the healthcare system in ways that could affect our ability to sell our products profitably. By way of example, in March 2010, Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act (collectively, the "ACA") was signed into law, which intended to broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against fraud and abuse, add transparency requirements for the healthcare and health insurance industries, impose taxes and fees on the health industry and impose additional health policy reforms.

The ACA substantially changed the way healthcare is financed by both governmental and private insurers and contains a number of provisions that affect coverage and reimbursement of drug products and/or that could potentially reduce the demand for pharmaceutical products such as increasing drug rebates under state Medicaid programs for brand name prescription drugs and extending those rebates to Medicaid managed care and assessing a fee on manufacturers and importers of brand name prescription drugs reimbursed under certain government programs, including Medicare and Medicaid. Other aspects of healthcare reform, such as expanded government enforcement authority and heightened standards that could increase compliance-related costs, could also affect our business. There have been executive, judicial and Congressional challenges to certain aspects of the ACA. For example, 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. 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 ACA 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 ACA. On August 16, 2022, President Biden signed the Inflation Reduction Act of 2022 ("IRA") into law, which among other things, extends enhanced subsidies for individuals purchasing health insurance coverage in ACA 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 creating a new manufacturer discount program. It is possible that the ACA will be subject to judicial or Congressional challenges in the future. It is unclear how such challenges and the healthcare reform measures of the Biden administration will impact the ACA.

Moreover, recently there has been heightened governmental scrutiny over the manner in which manufacturers set prices for their commercial products. 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, review the relationship between pricing and manufacturer patient programs, reduce the cost of drugs under Medicare, and reform government program reimbursement methodologies for drugs. For example, 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 as well as potential administrative actions HHS can take to advance these principles. In addition, the IRA, among other things, (1) directs HHS to negotiate the price of certain single-source drugs and biologics covered under Medicare and (2) imposes rebates under Medicare Part B and Medicare Part D to penalize price increases that outpace inflation. These provisions take effect progressively starting in fiscal year 2023. On August 29, 2023, HHS announced the list of the first ten drugs that will be subject to price negotiations, although the Medicare drug price negotiation program is currently subject to legal challenges. It is unclear how the IRA will be implemented but is likely to have a significant impact on the pharmaceutical industry. In response to the Biden administration's October 2022 executive order, on February 14, 2023, HHS released a report outlining three new models for testing by the CMS Innovation Center which will be evaluated on their ability to lower the cost of drugs, promote accessibility, and improve quality of care. It is unclear whether the models will be utilized in any health reform measures in the future. Further, on December 7, 2023, the Biden administration announced an initiative to control the price of prescription drugs through the use of march-in rights under the Bayh-Dole Act. On December 8, 2023, the National Institute of Standards and Technology published for comment a Draft Interagency Guidance Framework for Considering the Exercise of March-In Rights which for the first time includes the price of a product as one factor an agency can use when deciding to exercise march-in rights. While march-in rights have not previously been exercised, it is uncertain if that will continue under the new framework. 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. Additional state and federal health reform measures may be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services.

The Foreign Corrupt Practices Act

The Foreign Corrupt Practices Act ("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 the company 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.

Europe/Rest of World Government Regulation

In addition to regulations in the United States, we will be subject to a variety of regulations in other jurisdictions governing, among other things, clinical trials and any commercial sales and distribution of our products. Whether or not we obtain FDA approval of a product, we must obtain the requisite approvals from regulatory authorities in foreign countries prior to the commencement of clinical trials or marketing of the product in those countries. Certain countries outside of the United States have a similar process that requires the submission of a clinical trial application much like the IND prior to the commencement of human clinical trials. In the EU, for example, a clinical trial application must be submitted to each country's national health authority and an independent ethics committee, much like the FDA and IRB, respectively. Once the clinical trial application is approved in accordance with a country's requirements, clinical trial development may proceed. Because biologically sourced raw materials are subject to unique contamination risks, their use may be restricted in some countries. Additionally, for cell and gene therapy products, the requirements for review and approval of genetically modified Organisms prior to clearance of a clinical trial application in Europe and other parts of the world are more time-consuming than in the United States and may delay initiation of clinical trials in these countries.

The requirements and process governing the conduct of clinical trials, product licensing, pricing and reimbursement vary from country to country. In all cases, the clinical trials must be conducted in accordance with GCP and the applicable regulatory requirements and the ethical principles that have their origin in the Declaration of Helsinki.

To obtain regulatory approval of an investigational drug or biological product under EU regulatory systems, we must submit a Marketing Authorisation Application. The application used to file the BLA in the United States is similar to that required in the EU, with the exception of, among other things, country-specific document requirements. Also, with the withdrawal of the United Kingdom from the EU, the requirements in the United Kingdom now need to be addressed separately.

For other countries outside of the EU, such as countries in Eastern Europe, Latin America or Asia, the requirements governing the conduct of clinical trials, product licensing, pricing and reimbursement vary from country to country. In all cases, again, the clinical trials must be conducted in accordance with GCP and the applicable regulatory requirements and the ethical principles that have their origin in the Declaration of Helsinki.

If we or our potential collaborators fail to comply with applicable foreign regulatory requirements, we may be subject to, among other things, fines, suspension or withdrawal of regulatory approvals, product recalls, seizure of products, operating restrictions and criminal prosecution.

Employees and Human Capital Resources

Our human capital is integral to helping us achieve our mission of developing transformative treatments for patients suffering from hematological malignancies. We have built a culture of high performance based on our core values:

- *Passion:* enthusiastically driving our science toward innovative medicines.

- *Fellowship*: fostering genuine bonds of collaboration and mentorship.
- *Humility:* acting selflessly by putting the collective mission first.

Our human capital objectives include, as applicable, identifying, recruiting, retaining, incentivizing and integrating our existing and additional employees. The principal purposes of our equity incentive plans are to attract, retain and motivate selected employees, consultants and directors through the granting of stock-based compensation awards.

As of March 1, 2024, we had 168 full-time employees, 46 of whom held an M.D. or Ph.D. degree and 129 of whom are engaged in research and development activities. None of our employees are represented by a labor union or covered by a collective bargaining agreement. We consider our relationship with our employees to be good.

Corporate Information

Our principal executive offices are located at 100 Cambridgepark Drive, Suite 101, Cambridge, Massachusetts 02140 and our telephone number is 617-655-6580.

Available Information

We maintain an internet website at www.vorbio.com and make available free of charge through our website our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to those reports filed or furnished pursuant to Sections 13(a) and 15(d) of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). We make these reports available through our website as soon as reasonably practicable after we electronically file such reports with, or furnish such reports to, the Securities and Exchange Commission (the "SEC"). You can review our electronically filed reports and other information that we file with the SEC on the SEC's web site at http://www.sec.gov. We also make available, free of charge on our website, the reports filed with the SEC by our executive officers, directors and 10% stockholders pursuant to Section 16 under the Exchange Act as soon as reasonably practicable after copies of those filings are provided to us by those persons. In addition, we regularly use our website to post information regarding our business, product development programs and governance, and we encourage investors to use our website, particularly the information in the section entitled "Investors," as a source of information about us.

The information on our website is not incorporated by reference into this Annual Report and should not be considered to be a part of this Annual Report. Our website address is included in this Annual Report as an inactive technical reference only.

Item 1A. Risk Factors.

The following risk factors and other information included in this Annual Report on Form 10-K ("Annual Report"), including our financial statements and related notes thereto, should be carefully considered. The risks and uncertainties described below are not the only risks and uncertainties we face. Additional risks and uncertainties not presently known to us or that we presently deem less significant may also impair our business operations. Please see the discussion regarding some of the forward-looking statements that are qualified by these risk factors contained elsewhere in this Annual Report. If any of the following risks occur, our business, financial condition, results of operations and future growth prospects could be materially and adversely affected.

Risks Related to Our Financial Position and Need for Additional Capital

We have incurred significant net losses since inception. We expect to incur net losses for the foreseeable future and may never achieve or maintain profitability.

Since inception, we have not generated any revenue and have incurred significant operating losses. For the years ended December 31, 2023 and 2022, our net loss was $117.9 million and $92.1 million, respectively. As of December 31, 2023, we had an accumulated deficit of $340.1 million. We have financed our operations primarily through the sale of our capital stock. We have devoted all of our efforts to organizing and staffing our company, business and scientific planning, raising capital, acquiring and developing technology, identifying potential product candidates, undertaking studies of potential product candidates, developing manufacturing capabilities and evaluating a clinical path for our pipeline programs. We expect to continue to incur significant expenses and increasing operating losses for the foreseeable future. The net losses we incur may fluctuate significantly from quarter to quarter. We anticipate that our expenses will increase substantially if and as we:

- advance and complete clinical trials of our product candidates, including trem-cel and VCAR33^{ALLO};
- initiate clinical development of other product candidates;
- continue our current research programs and development of other potential product candidates from our current research programs;
- seek to identify additional product candidates and research programs;
- initiate preclinical testing and clinical trials for any other product candidates we identify and develop;
- maintain, expand, enforce, defend and protect our intellectual property portfolio and provide reimbursement of third-party expenses related to our patent portfolio;
- research, develop, acquire or in-license additional targeted therapies that could potentially be used in combination or sequence with trem-cel or other engineered hematopoietic stem cell ("eHSC") product candidates;
- seek marketing approvals for any product candidates that successfully complete clinical trials;
- ultimately establish a sales, marketing and distribution infrastructure to commercialize any products for which we may obtain marketing approval;
- adapt our regulatory compliance efforts to incorporate requirements applicable to marketed products;
- further develop our genome engineering capabilities;
- hire additional research and development and clinical personnel;
- hire commercial personnel and advance market access and reimbursement strategies;
- add operational, financial and management information systems and personnel, including personnel to support our product development;
- acquire or in-license product candidates, intellectual property and technologies;
- develop or in-license manufacturing and distribution technologies;

- maintain and expand our own current Good Manufacturing Practices ("cGMP") manufacturing facility;
- should we decide to do so and receive approval for any of our product candidates, build and maintain, or purchase and validate, commercial-scale manufacturing facilities designed to comply with cGMP requirements; and
- operate as a public company.

We have not completed clinical development of any product candidate and expect that it will be several years, if ever, before we have a product candidate ready for commercialization. To become and remain profitable, we must develop and, either directly or through collaborators, eventually commercialize a product or products with significant market potential. This will require us to be successful in a range of challenging activities, including identifying product candidates, completing preclinical testing and clinical trials of 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 do, may never generate revenues that are significant or large enough to achieve profitability. Our product candidates and research programs are currently only in the early stages of development. Because of the numerous risks and uncertainties associated with developing product candidates, we are unable to predict the extent of any future losses or when we will become profitable, if at all. If we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable 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 our stockholders to lose all or part of their investments in us.

We will need substantial additional funding. If we are unable to raise capital when needed, we would be forced to delay, reduce or eliminate our research and product development programs or future commercialization efforts.

We expect our expenses to increase in connection with our ongoing activities, particularly as we continue the clinical development of trem-cel in acute myeloid leukemia ("AML"), advance our VCAR33 programs through clinical development, initiate clinical development of trem-cel in combination or in sequence with VCAR33^{ALLO} as a targeted therapeutic, which we refer to as the trem-cel + VCAR33 Treatment System, and otherwise continue to advance our research programs in support of our pipeline. In addition, if we obtain marketing approval for any of our product candidates, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution to the extent that such sales, marketing, manufacturing and distribution are not the responsibility of a collaborator. In addition, we expect to continue to incur significant additional costs associated with operating as a public company this year and in future years. Accordingly, we will need to obtain substantial additional funding in order to maintain our continuing operations. 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 product development programs or future commercialization efforts.

As of December 31, 2023, our cash, cash equivalents and marketable securities were $137.2 million. We expect that our existing cash, cash equivalents and marketable securities as of December 31, 2023 will enable us to fund our operating expenses and capital expenditure requirements into the second half of 2025. However, our operating plan may change as a result of factors currently unknown to us, and we may need to seek funding sooner than planned. Our future capital requirements will depend on many factors, including:

- the progress, results and costs of clinical trials for our product candidates;
- the costs of continuing to build our technology platform, including in-licensing additional genome engineering technologies for use in developing our product candidates;
- the costs of researching, developing, acquiring or in-licensing additional targeted therapies to use in combination or in sequence with trem-cel and other eHSC product candidates;
- the scope, progress, results and costs of discovery, preclinical development, formulation development and clinical trials for other product candidates;
- the costs of expanding our facilities to accommodate corporate, laboratory, and manufacturing needs, including commercial manufacturing;

- the costs of preparing, filing and prosecuting patent applications, maintaining and enforcing our intellectual property and proprietary rights and defending intellectual property-related claims in the United States and internationally;
- the costs, timing and outcome of regulatory review of any product candidates;
- the costs of future activities, including product sales, medical affairs, marketing, manufacturing, distribution, coverage and reimbursement for any product candidates for which we receive regulatory approval;
- our ability to establish and maintain collaborations on favorable terms, if at all;
- the success of our collaborations, including ones we may establish, and of our license agreements;
- the achievement of milestones or occurrence of other developments that trigger payments under any collaboration agreements we enter;
- the extent to which we acquire or in-license product candidates, intellectual property and technologies;
- the extent to which we develop or in-license manufacturing and distribution technologies; and
- the costs of operating as a public company.

Conducting preclinical testing and clinical trials is a time-consuming, expensive and uncertain process that takes years to complete, and we may never generate the necessary data or results required to obtain marketing approval and achieve product sales. In addition, even if we successfully develop product candidates and those are approved, we may not achieve commercial success. Our commercial revenues, if any, will be derived from sales of products that we do not expect to be commercially available for several years, if at all. Accordingly, we will need to continue to rely on additional financing to achieve our business objectives.

Any additional fundraising efforts may divert our management from their day-to-day activities, which may adversely affect our ability to develop and commercialize product candidates. We cannot be certain that additional funding will be available on acceptable terms, or at all. We have no committed source of additional capital and, if we are unable to raise additional capital in sufficient amounts or on terms acceptable to us, we may have to significantly delay, scale back or discontinue the development or commercialization of product candidates or other research and development initiatives. Our license agreements and any future collaboration agreements may also be terminated if we are unable to meet the payment or other obligations under the agreements. We could be required to seek collaborators for product candidates at an earlier stage than otherwise would be desirable or on terms that are less favorable than might otherwise be available or relinquish or license on unfavorable terms our rights to product candidates in markets where we otherwise would seek to pursue development or commercialization ourselves.

If we are unable to obtain funding on a timely basis, we may be required to significantly curtail, delay or discontinue one or more of our research or development programs or the commercialization of any product candidate, or be unable to expand our operations or otherwise capitalize on our business opportunities, as desired, which could materially affect our business, financial condition and results of operations. Any of the above events could significantly harm our business, prospects, financial condition and results of operations and cause the price of our common stock to decline.

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

Until such time, if ever, as we can generate substantial product revenues, we expect to finance our cash needs through a combination of equity offerings, government or private party grants, debt financings, collaborations, strategic alliances and licensing arrangements. We do not currently have any committed external source of funds. To the extent that we raise additional capital through the sale of equity or convertible debt securities, including through the use of our at-the-market facility, our stockholders' ownership interest will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect rights of our common stockholders. Debt financing and preferred equity financing, if available, may involve agreements that include covenants limiting

or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures, declaring dividends and possibly other restrictions.

If we raise funds through collaborations, strategic alliances or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or product candidates, or we may have to grant licenses on terms that may not be favorable to us or commit to providing us with future payment streams. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce or terminate our product development or future commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves. Market volatility may further adversely impact our ability to access capital as and when needed.

We have a limited operating history, have not yet completed any clinical trials and have no history of commercializing products, which may make it difficult to evaluate the success of our business to date and to assess our future viability.

We are an early-stage company. We were founded in December 2015 and commenced operations in February 2016. Our operations to date have been limited to organizing and staffing our company, business planning, raising capital, acquiring and developing our platform and technology, identifying product candidates and undertaking studies. For example, VBP101, our Phase 1/2a multicenter, open-label, first-in-human study of trem-cel in patients with AML, and VBP301, our Phase 1/2, multicenter, open-label, first-in-human study of VCAR33^{ALLO} in patients with relapsed or refractory AML, are each in the early stages and our other programs are still in the preclinical or research stage. The risk of failure for these activities is high. We have not yet demonstrated an ability to successfully complete any clinical trials, including large-scale, pivotal clinical trials, obtain marketing approvals, manufacture a commercial-scale product or arrange for a third party to do so on our behalf or conduct sales and marketing activities necessary for successful commercialization. For example, while we have demonstrated that our in-house cGMP clinical manufacturing facility at our Cambridge, MA headquarters can successfully manufacture clinical supply of VCAR33^{ALLO}, we may fail to fully realize the cost-savings and efficiency gains that we expect, and we may be unsuccessful in making arrangements with third parties for commercial manufacturing. Consequently, any predictions made about our future success or viability may not be as accurate as they could be if we had a longer operating history.

Our limited operating history may make it difficult to evaluate our technology and industry and predict our future performance. Our short history as an operating company makes any assessment of our future success or viability subject to significant uncertainty. We expect to encounter risks and difficulties frequently experienced by early stage companies in new and rapidly evolving fields. If we do not address these risks and difficulties successfully, our business could suffer.

In addition, as a new business, we may encounter other unforeseen expenses, difficulties, complications, delays and other known and unknown factors. We will need to transition from a company with a research focus to a company capable of supporting commercial activities. We may not be successful in such a transition.

We have never generated revenue from product sales and may never become profitable.

Our ability to generate revenue from product sales and achieve profitability depends on our ability, alone or with collaborators, to successfully complete the development of, and obtain the regulatory approvals necessary to commercialize, product candidates. We do not anticipate generating revenues from product sales for the next several years, if ever. Our ability to generate future revenue from product sales depends heavily on our, or our current or future collaborators', ability to successfully:

- advance and complete clinical trials of our product candidates, including trem-cel and VCAR33^{ALLO};
- initiate and complete clinical development of other product candidates;
- complete research and preclinical and clinical development of any other product candidates we may identify;

- seek and obtain regulatory and marketing approvals for any product candidates for which we complete clinical trials;
- launch and commercialize any product candidates for which we obtain regulatory and marketing approval by establishing a sales force, marketing and distribution infrastructure or, alternatively, collaborating with a commercialization partner;
- qualify for coverage and adequate reimbursement by government and third-party payors for any product candidates for which we obtain regulatory and marketing approval;
- develop, maintain and enhance a sustainable, scalable, reproducible and transferable manufacturing process for our product candidates;
- establish and maintain supply and manufacturing relationships with third parties that can provide adequate, in both amount and quality, products and services to support clinical development and the market demand for any product candidates for which we obtain regulatory and marketing approval;
- obtain market acceptance of product candidates as viable treatment options;
- address competing technological and market developments;
- implement internal systems and infrastructure, as needed;
- negotiate favorable terms in any collaboration, licensing or other arrangements into which we may enter and performing our obligations in such arrangements;
- maintain, protect, enforce, defend and expand our portfolio of intellectual property rights, including patents, trade secrets and know-how, in the United States and internationally;
- avoid and defend against third-party interference, infringement and other intellectual property claims in the United States and internationally; and
- attract, hire and retain qualified personnel.

Even if one or more of the product candidates we develop are approved for commercial sale, we anticipate incurring significant costs associated with commercializing any approved product candidate. Our expenses could increase beyond expectations if we are required by the U.S. Food and Drug Administration (the "FDA"), the European Medicines Agency (the "EMA") or other regulatory authorities to perform clinical and other studies in addition to those that we currently anticipate. Even if we are able to generate revenues from the sale of any approved product candidates, we may not become profitable and may need to obtain additional funding to continue operations.

Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable 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 also could cause stockholders to lose all or part of their investment in us.

Our ability to utilize our net operating loss carryforwards and certain other tax attributes to offset taxable income or taxes may be limited.

As of December 31, 2023, we had gross federal net operating loss carryforwards of $190.2 million including $188.3 million that had an indefinite carryforward period and $1.9 million that were subject to expiration at various dates through 2037. Furthermore, we have state and local net operating loss carryforwards of $180.8 million which will expire at various dates through 2042. Portions of these net operating loss carryforwards could expire unused and be unavailable to offset future income tax liabilities. Under the legislation enacted in 2017, informally titled the Tax Cuts and Jobs Act (the "Tax Act"), as modified by the Coronavirus Aid, Relief, and Economic Security (the "CARES Act") U.S. federal net operating losses incurred in taxable years beginning after December 31, 2017, may be carried forward indefinitely, but the deductibility of such federal net operating losses in taxable years beginning after December 31, 2020, may be limited. It is uncertain how various states will respond to the Tax Act and the CARES Act. For state income tax purposes, there may be periods during which the use of net operating loss

carryforwards is suspended or otherwise limited, which could accelerate or permanently increase state taxes owed. In addition, under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended (the "Code"), and corresponding provisions of state law, if a corporation undergoes an "ownership change," which is generally defined as a greater than 50% change, by value, in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards and other pre-change tax attributes to offset its post-change income or taxes may be limited. The completion of our initial public offering, together with private placements and other transactions that have occurred since our inception, may trigger such an ownership change pursuant to Section 382 of the Code. We have not yet completed a Section 382 analysis, and therefore, there can be no assurances that our net operating losses are not already limited. We may experience ownership changes as a result of subsequent shifts in our stock ownership, some of which may be outside of our control. If an ownership change occurs and our ability to use our net operating loss carryforwards is materially limited, it would harm our future operating results by effectively increasing our future tax obligations. There is a full valuation allowance for net deferred tax assets, including net operating loss carryforwards].

Risks Related to Discovery, Development, Manufacturing and Commercialization

eHSCs is an emerging technology containing risk and might never lead to commercially viable products.

We are developing trem-cel and other eHSCs for transplant into the human body. Although there have been significant advances in the field of genome engineering in recent years, these technologies have rarely been applied to hematopoietic stem cells ("HSCs"), and our approach is new and largely unproven. The scientific evidence to support the feasibility of developing eHSCs is limited. Successful development of eHSCs by us will require solving a number of challenges, including:

- obtaining regulatory authorization from the FDA and other regulatory authorities, which have limited or no experience with regulating the development and commercialization of eHSCs, to proceed with clinical trials;
- identifying appropriate genetic targets for modification within HSCs;
- developing and deploying consistent and reliable processes for procuring cells from consenting third-party donors, isolating HSCs from such donor cells, inactivating genetic targets within such HSCs, storing and transporting the resulting eHSCs for therapeutic use and finally infusing these eHSCs into patients;
- utilizing these eHSC product candidates in combination or in sequence with targeted therapeutics, which may increase the risk of adverse side effects;
- avoiding potential complications of eHSC transplants, including failure to engraft, rejection by host or lack of functionality, any of which could result in serious side effects or death;
- educating medical personnel regarding the potential side effect profile of our product candidates, particularly those that may be unique to our eHSCs;
- understanding and addressing variability in the quality of a donor's cells, which could ultimately affect our ability to manufacture product in a reliable and consistent manner;
- developing processes for the safe administration of eHSC products, including long-term follow-up and registries, for all patients who receive these product candidates;
- relying on third parties to find suitable healthy donors;
- obtaining regulatory approval from the FDA and other regulatory authorities;
- manufacturing product candidates to our specifications and in a timely manner to support our clinical trials and, if approved, commercialization;
- sourcing clinical and, if approved by applicable regulatory authorities, commercial supplies for the materials used to manufacture and process product candidates;

- developing a manufacturing process and distribution network that can provide a stable supply with a cost of goods that allows for an attractive return on investment; and
- establishing sales and marketing capabilities ahead of and after obtaining any regulatory approval to gain market acceptance, and obtaining coverage, adequate reimbursement and pricing by third-party payors and governmental healthcare programs.

We have concentrated our research efforts to date on preclinical work to bring trem-cel into clinical development for the treatment of AML, and our future success is highly dependent on the successful development of eHSCs, such as trem-cel, and the therapeutic applications of these cells. We may decide to alter or abandon our initial programs as new data become available and we gain experience in developing eHSCs. We cannot be sure that our programs will yield satisfactory products that are safe and effective, scalable or profitable in our initial indication or any other indication we pursue.

Moreover, actual or perceived safety issues, including as a result of adverse developments in our eHSC programs or in genome engineering programs undertaken by third parties or of the adoption of novel approaches to treatment, may adversely influence the willingness of subjects to participate in our clinical trials, or, if one of our product candidates is approved by applicable regulatory authorities, of physicians to subscribe to the novel treatment mechanics or of patients to provide consent to receive a novel treatment despite its regulatory approval. The FDA or other applicable regulatory authorities may require specific post-market studies or additional information that communicates the benefits or risks of our products. New data may reveal new risks of our product candidates at any time prior to or after regulatory approval.

We are substantially dependent on the success of our two most advanced product candidates, trem-cel and VCAR33^{ALLO}. If we are unable to complete development of, obtain approval for and commercialize trem-cel or VCAR33^{ALLO} in a timely manner, our business will be harmed.

Our future success is dependent on our ability to timely advance and complete clinical trials, obtain marketing approval for and successfully commercialize our product candidates trem-cel and VCAR33^{ALLO}. We are investing significant efforts and financial resources in the research and development of these product candidates. We released updated clinical data from VBP101, our Phase 1/2a multicenter, open-label, first-in-human trial of trem-cel in combination with Mylotarg in patients with AML, most recently in December 2023 based on eight patients, and we are only in the early stages of advancing VCAR33^{ALLO} through clinical development. Trem-cel and VCAR33^{ALLO} will each require additional clinical development, evaluation of clinical, preclinical and manufacturing activities, marketing approval from government regulators, substantial investment and significant marketing efforts before we can generate any revenues from product sales. We are not permitted to market or promote trem-cel, VCAR33^{ALLO} or any other product candidate, before we receive marketing approval from the FDA and comparable foreign regulatory authorities, and we may never receive such marketing approvals.

The success of trem-cel and VCAR33^{ALLO} will depend on several factors, including the following:

- the acceptance of individual investigational review boards ("IRBs") and scientific review committees at each clinical trial site as to the adequacy of the preclinical data package to support clinical development of trem-cel and their overall general agreement with the use of trem-cel in the intended patient population in the intended manner;
- the willingness of clinical investigators to place patients in the clinical trials, and the willingness of patients to enroll in a clinical trial studying a first-in-human cell therapy;
- the successful and timely completion of our Phase 1/2a clinical trial of trem-cel, the development of our VCAR33^{ALLO} program;
- the initiation and successful patient enrollment and completion of additional clinical trials of trem-cel and VCAR33^{ALLO} on a timely basis;
- maintaining and establishing relationships with contract research organizations ("CROs") and clinical sites for the clinical development of these programs both in the United States and internationally;
- the frequency and severity of adverse events in the clinical trials;

- the results of clinical trials conducted by third parties in hematopoietic cell transplant ("HCT") if such trials result in changes to the standard of care for HCT or otherwise cause us to change our clinical trial protocols;
- the efficacy, safety and tolerability profiles that are satisfactory to the FDA, the EMA or any comparable foreign regulatory authority for marketing approval;
- the timely receipt of marketing approvals for our programs from applicable regulatory authorities;
- the extent of any required post-marketing approval commitments to applicable regulatory authorities;
- the maintenance of existing or the establishment of new supply arrangements with third-party suppliers and manufacturers for clinical development of our programs;
- the maintenance of existing, or the establishment of new, scaled production arrangements with third-party manufacturers to obtain, or the ability of our in-house manufacturing facility to produce, finished products that are appropriate for commercial sale of our programs, if either is approved;
- obtaining and maintaining patent protection, trade secret protection and regulatory exclusivity, both in the United States and internationally;
- the protection of our rights in our intellectual property portfolio;
- the successful launch of commercial sales following any marketing approval;
- a continued acceptable safety profile following any marketing approval;
- commercial acceptance by patients, the medical community and third-party payors;
- our ability to obtain coverage and adequate reimbursement from third-party payors for our products and patients' willingness to pay out-of-pocket in the absence of such coverage and adequate reimbursement; and
- our ability to compete with other treatments.

We do not have complete control over many of these factors, including certain aspects of clinical development and the regulatory submission process, potential threats to our intellectual property rights and the manufacturing, marketing, distribution and sales efforts of any future collaborator. If we are not successful with respect to one or more of these factors in a timely manner or at all, we could experience significant delays or an inability to successfully commercialize trem-cel and/or VCAR33^{ALLO}, which would materially harm our business. If we do not receive marketing approvals for trem-cel and VCAR33^{ALLO} we may not be able to continue our operations.

We may not be successful in our efforts to identify, develop and commercialize additional product candidates. If these efforts are unsuccessful, we may never become a commercial stage company or generate any revenues.

The success of our business depends primarily upon our ability to identify, develop and commercialize additional product candidates based on, or complementary with, our technology platform. Other than our clinical trials for trem-cel and VCAR33^{ALLO}, all of our other product development programs are still in the research or preclinical stage of development. Our research programs may fail to identify additional product candidates for clinical development for a number of reasons. Our research methodology may be unsuccessful in identifying potential product candidates, our potential product candidates may be shown to have harmful side effects in preclinical *in vitro* experiments or animal model studies, they may not show promising signals of efficacy in such experiments or studies or they may have other characteristics that may make the product candidates impractical to manufacture, unmarketable or unlikely to receive marketing approval. The historical failure rate for product candidates is high due to risks relating to safety, efficacy, clinical execution, changing standards of medical care and other unpredictable variables. In addition, although we believe our technology platform will position us to rapidly expand our portfolio of product candidates beyond our current product candidates, our ability to expand our portfolio may never materialize.

If any of these events occur, we may be forced to abandon our research or development efforts for a program or programs, which would have a material adverse effect on our business, financial condition, results of operations

and prospects. Research programs to identify new product candidates require substantial technical, financial and human resources. We may focus our efforts and resources on potential programs or product candidates that ultimately prove to be unsuccessful, which would be costly and time-consuming.

If our product candidates, the delivery modes we rely on to administer them, and/or the conditioning, administration process or related procedures or treatments which may be used alongside our product candidates cause serious adverse events, undesirable side effects or unexpected characteristics, such events, side effects or characteristics could delay or prevent regulatory approval of the product candidates, limit their commercial potential or result in significant negative consequences following any potential marketing approval, even if these side effects or characteristics are unrelated to our product candidate.

We have not yet completed any human clinical trials of our product candidates and it is impossible to predict when or if our product candidates will prove safe in humans. Undesirable side effects caused by our product candidates could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or comparable foreign regulatory authorities. Results of our clinical trials could reveal a high and unacceptable severity and prevalence of side effects or unexpected characteristics.

There have been limited clinical trials of eHSCs and a limited number of clinical trials of certain of the technologies we are using to engineer eHSCs and chimeric antigen receptor ("CAR")-T cells, including the CRISPR/Cas9 method we are using in our trem-cel program. In the genetic medicine field, there have been several significant adverse events from genetically engineered treatments in the past, including reported cases of leukemia and death. There have also been studies suggesting that genome engineering using the CRISPR-Cas9 method may increase the risk that the modified cells themselves become cancerous or otherwise dysfunctional. There can be no assurance that our eHSCs or CAR-T cells and the genome engineering techniques that we may employ in their development will not cause undesirable side effects, as improper modification of a patient's DNA could lead to lymphoma, leukemia or other cancers, or other aberrantly functioning cells.

A significant risk in any genetically engineered product candidate is that "off-target" gene alterations may occur, which could cause serious adverse events, undesirable side effects or unexpected characteristics. Although we and others have demonstrated the ability to improve the specificity of gene alterations in a laboratory setting, we cannot be certain that off-target alterations will not occur in any of our planned or future clinical trials, and the lack of observed side effects in preclinical studies does not guarantee that such side effects will not occur in human clinical trials.

There is also the potential risk of delayed adverse events following exposure to genetically engineered cells due to the permanence of changes to DNA or due to other components of product candidates used to carry the genetic material. Further, because our genome engineering technology makes a permanent change, the treatment cannot be withdrawn, even after a side effect is observed. For example, our eHSCs are designed to permanently reconstitute the blood cells necessary for the survival of HCT patients, and we cannot be certain that these changes will not induce adverse reactions in patients or impair the functionality of the resulting blood cells. The eHSC manufacturing process generally, and the removal of surface targets such as CD33 specifically, could have temporary or permanent harmful effects. While we have discovered anonymous individuals in genome databases who lack CD33, we cannot be certain that these databases are accurate or complete or that the individuals who have contributed DNA to the database are healthy, as comprehensive health information is not included in the databases we have consulted. The removal of CD33 or other surface targets we remove from HSCs could have serious harmful effects, including the impairment of the ability of our eHSCs to migrate to patients' bone marrow, survive and reconstitute properly functioning blood cells. These side effects may not be evident for years after transplant.

In addition to side effects and adverse events that may be caused by our eHSCs, HCT is itself a complicated and risky procedure. The conditioning, administration process or related procedures which may be used in HCT can cause adverse side effects and adverse events. An HCT patient is generally administered cytotoxic drugs to remove stem cells from the bone marrow to create sufficient space in the bone marrow for the modified stem cells to engraft and produce new cells. This procedure compromises the patient's immune system. In addition, the HSCs administered via transplant may fail to engraft in patients' bone marrow, or could be rejected by the patient, either of which could result in serious side effects, including death. If in the future we are unable to demonstrate that such

adverse events were caused by the elements of the HCT process unrelated to our eHSCs, the FDA, the European Commission, the Competent Authorities of the Member States of the European Union, EMA or other regulatory authorities could order us to cease further development of, or deny approval of, our eHSCs for any or all target indications. Even if we are able to demonstrate that adverse events are not related to our product candidates, or are merely a feature of HCT generally, such occurrences could affect patient recruitment, the ability of enrolled patients to complete the clinical trial, or the commercial viability of any product candidates that obtain regulatory approval.

Furthermore, in previous and ongoing clinical trials involving CAR-T or other cell-based therapies from other companies, patients experienced side effects such as neurotoxicity and cytokine release syndrome. There have been life threatening events related to severe neurotoxicity and cytokine release syndrome, requiring intense medical intervention such as intubation or pressor support, and in several cases, resulting in death. Severe neurotoxicity is a condition that is currently defined clinically by cerebral edema, confusion, drowsiness, speech impairment, tremors, seizures, or other central nervous system side effects, when such side effects are serious enough to lead to intensive care. In some cases, severe neurotoxicity was thought to be associated with the use of certain lymphodepletion regimens used prior to the administration of the CAR-T or other cell-based therapies. Cytokine release syndrome is a condition that is currently defined clinically by certain symptoms related to the release of cytokines, which can include fever, chills, low blood pressure, when such side effects are serious enough to lead to intensive care with mechanical ventilation or significant vasopressor support. The exact cause or causes of cytokine release syndrome and severe neurotoxicity in connection with treatment of CAR-T or other cell-based therapies is not fully understood at this time. In addition, patients have experienced other adverse events in these trials, such as a reduction in the number of blood cells (in the form of neutropenia, thrombocytopenia, anemia or other cytopenias), febrile neutropenia, chemical laboratory abnormalities (including elevated liver enzymes) and renal failure.

The delivery modalities for the production of certain of our product candidates may also cause serious adverse events. For example, in order to manufacture VCAR33^{ALLO}, we employ viral vectors, including lentiviruses, which are relatively new approaches. In past clinical trials that were conducted by others with lentivirus vectors, several significant side effects were caused by gene therapy treatments, including reported cases of leukemia and death. Other potential side effects could include an immunologic reaction and insertional oncogenesis, which is the process whereby the insertion of a functional gene near a gene that is important in cell growth or division results in uncontrolled cell division, which could potentially enhance the risk of malignant transformation. If the vectors we use demonstrate a similar side effect, or other adverse events, we may be required to halt or delay further clinical development of VCAR33^{ALLO} and potential product candidates. Furthermore, the FDA has stated that lentiviral vectors possess characteristics that may pose high risks of delayed adverse events.

Undesirable side effects caused by VCAR33^{ALLO} or other cell-based targeted therapeutics we may develop could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in a more restrictive label or the delay or denial of marketing approval by the FDA or other comparable foreign regulatory authorities. In some cases, side effects such as neurotoxicity or cytokine release syndrome have resulted in clinical holds of ongoing clinical trials and/or discontinuation of the development of the product candidate. Results of our studies could reveal a high and unacceptable severity and prevalence of side effects or unexpected characteristics. Treatment-related side effects could also affect patient recruitment or the ability of enrolled patients to complete the trials or result in potential product liability claims. In addition, these side effects may not be appropriately recognized or managed by the treating medical staff, as toxicities resulting from T cell-based immunotherapies are not normally encountered in the general patient population and by medical personnel. Medical personnel may need additional training regarding T cell-based immunotherapy product candidates to understand their side effects. Inadequate training in recognizing or failure to effectively manage the potential side effects of T cell-based immunotherapy product candidates could result in patient deaths. Any of these occurrences may harm our business, financial condition and prospects significantly.

If any product candidates we develop are associated with serious adverse events, undesirable side effects or unexpected characteristics, we may need to abandon their development or limit development to certain uses or subpopulations in which the serious adverse events, undesirable side effects or other characteristics are less prevalent, less severe or more acceptable from a risk-benefit perspective, any of which would have a material adverse effect on our business, financial condition, results of operations, and prospects. Many product candidates that initially showed promise in early stage testing have later been found to cause side effects that prevented further clinical development of the product candidates.

Additionally, if we successfully develop a product candidate and it receives marketing approval, the FDA could require us to adopt a Risk Evaluation and Mitigation Strategy ("REMS"), to ensure that the benefits of treatment with such product candidate outweighs the risks for each potential patient, which may include, among other things, a medication guide outlining the risks of the product for distribution to patients, a communication plan to health care practitioners, extensive patient monitoring or distribution systems and processes that are highly controlled, restrictive and more costly than what is typical for the industry. Furthermore, if we or others later identify undesirable side effects caused by a product candidate, several potentially significant negative consequences could result, including:

- regulatory authorities may suspend or withdraw approvals of such product candidate;
- regulatory authorities may require additional warnings on the label or limit the approved use of such product candidate;
- we may be required to change the way the product is administered, or implement other changes to the labeling or handling of a product, if approved;
- we may be required to conduct additional clinical trials;
- we could be sued and held liable for harm caused to patients; and
- our reputation may suffer.

Any of these events could prevent us from achieving or maintaining market acceptance of product candidates and could have a material adverse effect on our business, financial condition, results of operations and prospects.

We have not successfully tested our product candidates in clinical trials and any favorable preclinical results are not predictive of results that may be observed in clinical trials.

We have not successfully tested our product candidates in clinical trials, and there is a high failure rate for drugs and biologics proceeding through clinical trials. A number of companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in later stage clinical trials even after achieving promising results in earlier stage clinical trials. Data obtained from preclinical and clinical activities are subject to varying interpretations, which may delay, limit or prevent regulatory approval. In addition, regulatory delays or rejections may be encountered as a result of many factors, including changes in regulatory policy during the period of product development. Any such adverse events may cause us to delay, limit or terminate planned clinical trials, any of which would have a material adverse effect on our business, financial condition, results of operations and prospects.

In addition, the results of preclinical studies may not be predictive of the results of later-stage preclinical studies or clinical trials, and preliminary clinical data may not be predictive of later clinical data or the results of later-stage clinical trials. To date, we have generated only limited preclinical study data and preliminary clinical trial results, and any such data or results do not ensure that later preclinical studies or clinical trials will produce similar outcomes. Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their product candidates.

Furthermore, the IND for the T cell therapy product candidate using the same CAR construct as VCAR33^{ALLO}, which we refer to as VCAR33^{AUTO}, is currently held, and this clinical trial is currently sponsored, by NMDP. As such, NMDP is responsible for all aspects of this trial, including the design of the trial, the manufacture of study product, the enrollment, dosing and follow-up of patients, the recording of trial data and the analysis of results. We also did not control the preclinical development of this T cell therapy product candidate, which was conducted by the National Institutes of Health ("NIH"), and we do not have rights under the license agreement to certain intellectual property, such as know-how, employed by NMDP in manufacturing study product or conducting its clinical trial. We have received the right to cross reference NMDP's IND for this T cell therapy product candidate in any future IND application we may make with the FDA. In the event we cross-reference these trial results, we will be required to demonstrate that our VCAR33^{ALLO} is comparable to the T cell therapy studied in NMDP trial, which will require us to show that our manufacturing processes and construct release specifications are sufficiently

comparable to those employed in NMDP trial. While we do not believe that we need to demonstrate comparability of our VCAR33^{ALLO} candidate since we might rely on initial clinical data from our VCAR33^{ALLO} program, if the FDA disagrees, we may have to demonstrate comparability. Regulatory authorities may require us to obtain and submit additional preclinical, manufacturing or clinical data before we may initiate further clinical trials and/or obtain any regulatory approvals. For example, we may be required to conduct additional preclinical toxicology studies, requalify manufacturing processes or conduct further clinical investigation of VCAR33^{ALLO} before advancing our VCAR33^{ALLO} program.

We are also relying on NIH to have conducted its research and development efforts, and on NMDP to conduct its clinical trial, in accordance with applicable protocol, legal, regulatory and scientific standards, to accurately report the results of preclinical studies and clinical trials, and to correctly collect and interpret the data from these studies and trials. To the extent any of these has not occurred or does not occur, the expected time and costs of developing our VCAR33^{ALLO} program, as well as the trem-cel + VCAR33 Treatment System, may be increased, which could adversely affect our business. Furthermore we do not control the timing of the ongoing NMDP trial or the release of information about the trial, including trial results, all of which negatively affect our ability to accurately estimate the timing of anticipated trial milestones. As a result, our estimates may prove to be inaccurate. Additionally, our ability to conduct clinical development of VCAR33^{ALLO} could be delayed or otherwise adversely affected. NMDP also may not publicize data from the trial in a manner that facilitates further clinical development by us, or at all. NMDP may elect to publicize this data at a time or in a manner other than we desire or may interpret data from these trials in a manner differently than we do, any of which could harm our business.

Development of a product candidate such as trem-cel, which is intended for use in combination or in sequence with an already approved therapy, will present increased complexity and more or different challenges than development of a product candidate for use as a single agent.

We expect that our product candidate trem-cel, and any other eHSC product candidates that we may develop, will be required to be used in combination or in sequence with existing or future therapies in order to demonstrate more anti-cancer efficacy than unmodified HSCs. In particular, our Phase 1/2a clinical trial evaluates trem-cel in combination with Mylotarg and we anticipate conducting future trials of trem-cel with VCAR33^{ALLO} as a Treatment System, and also potentially with other targeted therapies. Developing product candidates for use in combination or sequence with other therapies will present challenges. For example, the FDA may require us to use more complex clinical trial designs to evaluate the contribution of each product and product candidate to any observed effects. Moreover, following product approval, the FDA may require that products used in conjunction with each other be cross-labeled, which would require consent from the sponsoring company. To the extent that we do not have rights to already approved products, this may require us to work with another company to satisfy such a requirement. For example, we do not have and do not currently plan to enter into a cross-labeling agreement with Pfizer with respect to Mylotarg, and therefore any such cross-labeling requirement from the FDA would require us to negotiate such an agreement with Pfizer. In addition, developments related to the already approved therapies may impact our clinical trials for the combination as well as our commercial prospects should we receive marketing approval. Such developments may include changes to the approved therapy's safety or efficacy profile, changes to the availability of the approved therapy, changes to the standard of care and a decision by the sponsoring company to withdraw the therapy from the market. For example, Mylotarg was voluntarily withdrawn from the market in 2010 after post-approval testing indicated increased risks of hepatic veno-occlusive disease, or blockage of veins in the liver. Mylotarg was re-approved in 2017 with a lower recommended dose and for use in a new patient population. Also, while we do not currently require a license from or agreement with Pfizer to permit us to conduct clinical trials or, if approved, to commercialize trem-cel with Mylotarg as a targeted therapeutic, we do not have and do not plan to enter into a supply or license agreement with Pfizer that would require Pfizer to produce Mylotarg, or permit us to otherwise produce Mylotarg, for these purposes. If Mylotarg undergoes subsequent labeling changes, or if Mylotarg is again removed from the market due to renewed concerns about its safety profile, or for other reasons, our clinical trial of trem-cel, and our prospects for commercializing trem-cel, might be materially adversely affected. Further, we believe trem-cel could unlock the potential of anti-CD33 therapies, such as VCAR33^{ALLO}, that are much more potent than Mylotarg and are not associated with severe myeloablative toxicities. While VBP101, our Phase 1/2a multicenter, open-label, first-in-human study of trem-cel in patients with AML, is not designed to evaluate the efficacy of the combination of trem-cel and Mylotarg, the clinical data for trem-cel in combination with Mylotarg may not reflect the potential efficacy of trem-cel in the long-term. For example, in February 2022, we announced that the first patient enrolled in VBP101 was moved to other therapies following administration of the third dose of

Mylotarg due to detectable measurable residual disease, and subsequently relapsed, despite the patient maintaining neutrophil and platelet counts approximately five months after transplantation with trem-cel. Patient completion of our clinical trials could be impacted by the efficacy of Mylotarg or any other therapy administered in combination with our product candidates.

Furthermore, we will not be able to market and sell trem-cel or any product candidate we develop in combination with an unapproved cancer therapy, such as VCAR33 or other cell-based targeted therapeutics, for a combination indication, if that unapproved therapy does not ultimately obtain marketing approval either alone or in combination with our product. To our knowledge, the FDA has not previously approved combined cell therapies, and we cannot be certain whether the FDA will apply existing guidance to cell therapies product candidates, such as the trem-cel + VCAR33 Treatment System, or will otherwise apply existing guidance in novel ways. In addition, unapproved cancer therapies face the same risks described with respect to our product candidates currently in development and clinical trials, including the potential for serious adverse effects, delay in their clinical trials and lack of FDA approval. If the FDA, EMA or comparable foreign regulatory authorities do not approve these other drugs or revoke their approval of, or if safety, efficacy, quality, manufacturing or supply issues arise with, the drugs we choose to evaluate in combination with any product candidate we develop, we may be unable to obtain approval of or market such combination therapy.

Any inability to develop targeted therapies for use with our product candidate, any failure to maintain or enter into new successful commercial relationships with respect to targeted therapies, or the expense of purchasing targeted therapies in the market, may delay our development timelines, increase our costs and jeopardize our ability to develop our current product candidates and any future product candidates as commercially viable therapies. If any of these occur, our business, financial condition, results of operations, stock price and prospects may be materially harmed.

If we are unable to successfully develop our current programs into a comprehensive portfolio of product candidates, or experience significant delays in doing so, we may not realize the full commercial potential of our current and future product candidates.

We are developing trem-cel so that it can be used in combination or in sequence with other product candidates that we in-license or develop ourselves, and we are focused on a product development strategy that includes leveraging the synergies among a comprehensive portfolio of our product candidates. For example, if the initial clinical trials of trem-cel and VCAR33^{ALLO} are each successful, we anticipate conducting clinical trials of the trem-cel + VCAR33 Treatment System, for the treatment of myeloid malignancies such as AML. Our development of the trem-cel + VCAR33 Treatment System will involve additional process development and could require additional regulatory submissions, such as an IND. Our success may depend, in part, on our ability to develop a complementary product portfolio with product candidates that will address a major limitation of existing therapies. Given our limited experience in developing product candidates that have received marketing approval, we may not be successful in developing some of our product candidates. The failure of one of our product candidates to obtain regulatory approval or market acceptance may affect our ability to expand our market opportunities for our other product candidates or programs. Although we may develop product candidates that ultimately obtain marketing approval, if we are unable to successfully develop our current programs into a comprehensive portfolio of product candidates, or experience significant delays in doing so, we may not realize the full commercial potential of our current and future product candidates.

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 focus on product candidates and research programs that we identify for specific indications among many potential options. 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 product candidates and research and development programs 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 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. Any such event could have a material adverse effect on our business, financial condition, results of operations and prospects.

Even if a product candidate receives marketing approval, it may fail to achieve the degree of market acceptance by physicians, patients, healthcare payors and others in the medical community necessary for commercial success.

The commercial success of our product candidates, if approved, will depend upon their degree of market acceptance by physicians, patients, third-party payors and others in the medical community. Ethical, social and legal concerns about genetic medicines generally and genome engineering technologies specifically could result in additional regulations restricting or prohibiting the marketing of our product candidates. Even if any product candidate we develop receives marketing approval, it may nonetheless fail to gain sufficient market acceptance by physicians, patients, healthcare payors and others in the medical community. The degree of market acceptance of any product candidate we develop, if approved for commercial sale, will depend on a number of factors, including:

- the efficacy and safety of such product candidate as demonstrated in clinical trials;
- the efficacy and safety of other products that are used in combination or in sequence with our product;
- the potential and perceived advantages of our product candidates compared to alternative treatments;
- the limitation to our targeted patient population and limitations or warnings contained in approved labeling by the FDA or other regulatory authorities;
- the ability to offer our products for sale at competitive prices;
- convenience and ease of administration compared to alternative treatments;
- the clinical indications for which the product candidate is approved by the FDA, the EMA or other regulatory agencies;
- public attitudes regarding genetic medicine generally and genome engineering technologies specifically;
- the willingness of the target patient population to try novel biologics and of physicians to prescribe these treatments, as well as their willingness to accept an intervention that involves the alteration of the patient's gene;
- product labeling or product insert requirements of the FDA, the EMA or other regulatory authorities, including any limitations or warnings contained in a product's approved labeling;
- relative convenience and ease of administration;
- the timing of market introduction of competitive products;
- publicity concerning our products or competing products and treatments;
- the strength of marketing and distribution support;
- availability of third-party coverage and sufficiency of reimbursement; and
- the prevalence and severity of any side effects.

Even if a product candidate is approved, such product may not achieve an adequate level of acceptance, we may not generate significant product revenues, and we may not become profitable.

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

We do not have a sales or marketing infrastructure and have limited experience in the sale, marketing or distribution of pharmaceutical products. 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 or outsource these functions to third parties. In the future, we may choose to build a focused sales, marketing and commercial support 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 commercial capabilities and entering into arrangements with third parties to perform these services. For example, recruiting and training a sales force or reimbursement specialists 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 and other commercialization 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 commercialization personnel.

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

- our inability to recruit and retain adequate numbers of effective sales, marketing, reimbursement, customer service, medical affairs and other support personnel;
- the inability of sales personnel to obtain access to physicians or educate adequate numbers of physicians on the benefits of prescribing any future products;
- the inability of reimbursement professionals to negotiate arrangements for formulary access, reimbursement and other acceptance by payors;
- restricted or closed distribution channels that make it difficult to distribute our product candidates to segments of the patient population;
- the lack of complementary products to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines; and
- unforeseen costs and expenses associated with creating an independent commercialization organization.

If we enter into arrangements with third parties to perform sales, marketing, commercial support and distribution services, our product revenues or the profitability of these product revenues to us may be lower than if we were to market and sell products ourselves. In addition, we may not be successful in entering into arrangements with third parties to commercialize our product candidates or may be unable to do so on terms that are favorable to us. We may have little control over such third parties, and any of them may fail to devote the necessary resources and attention to sell and market our products effectively. If we do not establish commercialization capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our product candidates.

We face significant competition in an environment of rapid technological change, and there is a possibility that our competitors may achieve regulatory approval before us or develop therapies that are safer or more advanced or effective than ours, which may harm our financial condition and our ability to successfully market or commercialize product candidates, if approved.

The development and commercialization of new drug and biologic products is highly competitive. Moreover, the genome engineering and oncology fields are characterized by rapidly changing technologies, significant competition and a strong emphasis on intellectual property. We will face competition with respect to our product candidates that we develop or commercialize in the future from major pharmaceutical companies, specialty pharmaceutical companies and biotechnology companies worldwide. Potential competitors also include academic

institutions, government agencies and other public and private research organizations that conduct research, seek patent protection and establish collaborative arrangements for research, development, manufacturing and commercialization.

There are a number of large pharmaceutical and biotechnology companies that currently market and sell products or are pursuing the development of products for the treatment of the disease indications for which we have product candidates and research programs. Some of these competitive products and therapies are based on scientific approaches that are similar to our approach, and others are based on entirely different approaches.

Any product candidates that we successfully develop and commercialize will compete with existing therapies and new therapies that may become available in the future that are approved to treat the same diseases for which we may obtain approval for our product candidates. This may include other types of therapies, such as small molecule, antibody and/or protein therapies.

Many of our current or potential competitors, either alone or with their collaboration partners, may have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved products than we do. Mergers and acquisitions in the pharmaceutical, biotechnology and gene therapy industries may result in even more resources being concentrated among a smaller number of our competitors. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These 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, as well as in acquiring technologies complementary to, or necessary for, our programs. Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize product candidates that are safer, more effective, have fewer or less severe side effects, are more convenient or are less expensive than our product candidates or that would render our product candidates obsolete or non-competitive. Our competitors also may obtain FDA or other regulatory approval for their product candidates 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. Additionally, technologies developed by our competitors may render our product candidates uneconomical or obsolete, and we may not be successful in marketing any product candidates against competitors.

In addition, as a result of the expiration or successful challenge of our patent rights, we could face more litigation with respect to the validity and/or scope of patents relating to our competitors' products. The availability of our competitors' products could limit the demand, and the price we are able to charge, for our product candidates, if approved.

Adverse public perception of genetic medicines, and of genome engineering in particular, including as a result of other trials out of our control, such as the VCAR33^{AUTO} trial currently sponsored by NMDP, may negatively impact regulatory approval of, and/or demand for, our potential products.

Trem-cel, and future eHSCs and CAR-T or other cell-based targeted therapeutics we may develop, including product candidates that are evaluated in clinical trials out of our control, such as the VCAR33^{AUTO} trial currently sponsored by NMDP, will be created by altering the human genome. The clinical and commercial success of our potential products will depend in part on public understanding and acceptance of the use of genome engineering for the prevention or treatment of human diseases. Public attitudes may be influenced by claims that genome engineering is unsafe, unethical or immoral, and, consequently, our current or future product candidates may not gain the acceptance of the public or the medical community. In addition, developments related to already approved gene therapies, such as Casgevy, may impact public attitudes towards genome editing technology, including changes to the approved therapy's safety or efficacy profile, changes to the availability of the approved therapy, changes to the standard of care or a decision by the sponsoring company to withdraw the therapy from the market. Adverse public attitudes may adversely impact the ability to enroll clinical trials for our current or future product candidates. Moreover, our success will depend upon physicians prescribing, and their patients being willing to receive, treatments that involve the use of product candidates in lieu of, or in addition to, existing treatments with which they are already familiar and for which greater clinical data may be available.

In addition, genome engineering technology is subject to public debate and heightened regulatory scrutiny due to ethical concerns relating to the application of genome engineering technology to human embryos or the human germline. For example, in the United States, germline alteration for clinical application has been expressly prohibited since enactment of a December 2015 FDA ban on such activity. Prohibitions are also in place in the United Kingdom, across most of Europe, in China and many other countries around the world. In the United States, the NIH has announced that the agency would not fund any use of gene engineering technologies in human embryos, noting that there are multiple existing legislative and regulatory prohibitions against such work, including the Dickey-Wicker Amendment, which prohibits the use of appropriated funds for the creation of human embryos for research purposes or for research in which human embryos are destroyed.

Although our product candidates do not involve technologies to alter human embryos or the human germline, public debate about the use of genome engineering technologies in human embryos and heightened regulatory scrutiny could prevent or delay the development of our product candidates. More restrictive government regulations or negative public opinion would have a negative effect on our business or financial condition and may delay or impair the development, commercialization and demand of our current or future product candidates. Adverse events in the preclinical studies or clinical trials for our current or future product candidates or those of our competitors or of academic researchers utilizing genome engineering technologies, even if not ultimately attributable to product candidates we may identify and develop, and the accompanying publicity could result in increased governmental regulation, unfavorable public perception, potential regulatory delays in the testing or approval of potential product candidates we may identify and develop, stricter labeling requirements for those product candidates that are approved and a decrease in demand for any such product candidates. Use of genome engineering technology by a third party or government to develop biological agents or products that threaten U.S. national security could similarly result in such negative impacts to us.

Due to the novel nature of our eHSCs, the small patient population we are addressing and the potential for any of our product candidates to offer benefits in a single administration or limited number of administrations, we face additional uncertainty related to pricing, coverage and reimbursement for these product candidates.

The pricing and reimbursement of our product candidates, if approved, must be adequate to support the necessary commercial infrastructure. If we are unable to obtain adequate levels of reimbursement, our ability to successfully market and sell any such product candidates will be adversely affected. The manner and level at which reimbursement is provided for services related to a product candidate (e.g., for administration of our product candidates to patients) is also important. Inadequate reimbursement for such services may lead to physician and payor resistance and adversely affect our ability to market or sell any product candidate we develop.

We are initially developing product candidates targeting rare diseases with small patient populations. For products that are designed to treat smaller patient populations to be commercially viable, the reimbursement for such products must be higher, on a relative basis, to account for the lack of volume. Accordingly, we will need to implement a coverage and reimbursement strategy for any approved product candidate with a smaller patient population that accounts for the smaller potential market size. Even if we obtain coverage for a given product by a third-party payor, the resulting reimbursement payment rates may not be adequate.

We are also initially developing products that are designed to be used in a single administration. We expect the cost of a single administration of genetic treatments, such as those we are seeking to develop, to be substantial, when and if they achieve regulatory approval. We expect that coverage and reimbursement by governmental healthcare programs such as Medicare and Medicaid, private health insurers and other third-party payors will be essential for most patients to be able to afford these treatments. Accordingly, sales of any such product candidates will depend substantially, both domestically and abroad, on the extent to which the costs of any such product candidates will be paid by governmental healthcare programs, private health plans and other third-party payors. Payors may not be willing to pay high prices for a single administration. Coverage and reimbursement by a third-party payor and physician utilization may depend upon several 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.

There is significant uncertainty related to third-party coverage and reimbursement of eHSCs. For example, effective for cost reporting periods beginning on or after October 1, 2020, under the Medicare Hospital Inpatient Prospective Payment Systems ("IPPS"), Medicare payment to the hospital for hematopoietic stem cell acquisition, including the preparation and processing of stem cells derived from peripheral blood, will be made on a reasonable cost basis. We believe that this new rule may also apply to eHSC products. Alternatively, we may apply for Medicare's New Technology Add-on Payment ("NTAP") designation for our eHSC product candidates, which, if approved, may allow for temporary reimbursement for new cell therapies above the standard Medicare Severity Diagnosis-Related Group payment amount under IPPS. NTAP will only be available for our product candidates, if approved, if we submit a timely and complete application and the Centers for Medicare & Medicaid Services ("CMS") determines that our product candidates meet the eligibility requirements of NTAP, including, among other criteria, demonstrating a substantial clinical improvement relative to services or technologies previously available. We also believe that, for patients covered by commercial insurance, reimbursement will be based on a case rate methodology with possible provisions for separate payments for new therapies, such as eHSC. However, we cannot be certain that our eHSCs would qualify for these carveouts or other reimbursement avenues for new therapies. We also may not be able to provide data sufficient to gain acceptance with respect to coverage and reimbursement. If coverage and reimbursement are not available, or are available only at limited levels, we may not be able to successfully commercialize a product candidate. Even if coverage is provided, the approved reimbursement amount may not be adequate to realize a sufficient return on our investment. Further, even if favorable coverage and reimbursement status is attained for one or more product candidates for which we receive regulatory approval, less favorable coverage policies and reimbursement rates may be implemented in the future. If we are unable to obtain adequate levels of reimbursement, our ability to successfully market and sell any product candidates will be harmed.

We may need to develop new reimbursement models to realize adequate value for our product candidates. Payors may not be able or willing to adopt such new models, and patients may be unable to afford that portion of the cost that such models may require them to bear. If we determine such new models are necessary but we are unsuccessful in developing them, or if such models are not adopted by payors, our business, financial condition, results of operations and prospects could be adversely affected. Additionally, we or our collaborators may develop companion diagnostic tests for use with our product candidates. Companion diagnostic tests require coverage and reimbursement separate and apart from the coverage and reimbursement for their companion pharmaceutical or biological products. Similar challenges to obtaining coverage and reimbursement, applicable to pharmaceutical products, will apply to companion diagnostics.

Outside the United States, international operations are generally subject to extensive governmental price controls and other market regulations, and we believe the increasing emphasis on cost-containment initiatives in Europe and other countries has and will continue to put pressure on the pricing and usage of our products. In many countries, the prices of medical products are subject to varying price control mechanisms as part of national health systems. Other countries allow companies to fix their own prices for medical products but monitor and control company profits. Additional foreign price controls or other changes in pricing regulation could restrict the amount that we are able to charge for our products. Accordingly, in markets outside the United States, the reimbursement for our products may be reduced compared with the United States and may be insufficient to generate commercially reasonable revenue and profits.

Our inability to promptly obtain coverage and profitable payment rates from both government-funded and private payors for any approved products we may 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.

The market for our product candidates, if approved, may be limited to those patients who are ineligible for or have failed, or are at risk of failing, prior treatments and who are able to tolerate the side effects of co-administered or sequentially administered targeted therapies, and our projections regarding the size of the addressable market may be incorrect.

Cancer therapies are sometimes characterized as first line, second line or third line, and the FDA often approves new therapies initially only for last line use. When blood cancers are detected, they are treated with first line of therapy with the intention of curing the cancer. This generally consists of chemotherapy, radiation, antibody drugs, tumor-targeted small molecules or a combination of these. In addition, for myeloid malignancies, HCT is frequently added to the first line therapy after the combination chemotherapy is given. If the patient's cancer relapses, then they are given a second line or third line therapy, which can consist of more chemotherapy, radiation, antibody drugs, tumor-targeted small molecules or a combination of these, or HCT. Generally, the higher the line of therapy, the lower the chance of a cure. If a patient relapses after HCT, the goal of the therapy in the treatment of AML is to control the growth of the tumor and extend the life of the patient, as a cure is unlikely to happen.

We are initially developing trem-cel for use in patients receiving HCT who have been determined to be at high-risk for relapse of AML in the anticipation that trem-cel would enhance the utility and broaden the applicability of therapies subsequently deployed. VCAR33^{ALLO} or any other targeted therapeutic we may develop is not guaranteed approval as an earlier line therapy or in settings other than bridge to transplant. In addition, we may have to conduct additional large randomized clinical trials prior to or post gaining approval for use trem-cel in patients who have not experienced relapse and/or in combination with an earlier line of therapy or of VCAR33^{ALLO} as or in combination with a different line of treatment.

Our projections of both the number of people who have the cancers we are targeting, as well as the size of the patient population subset who are in a position to undergo HCT, who are likely to relapse and who have the potential to benefit from treatment with eHSCs, or who are in a position to benefit from a targeted therapeutic, such as VCAR33^{ALLO}, are based on our estimates and data provided to us by third parties. These estimates have been derived from a variety of sources, including scientific literature, surveys of clinics, NMDP, research facilities, patient foundations or market research and may prove to be incorrect. Further, new studies may change the estimated incidence or prevalence of these cancers. The number of patients may turn out to be fewer than expected.

Additionally, the potentially addressable patient population for our product candidates may be limited, or may not be amenable to treatment with our product candidates. The addressable patient population will ultimately depend upon, among other things, the diagnosis criteria included in the final label, the availability of alternative treatments and the safety, convenience, cost and efficacy of our product candidates relative to such alternative treatments, acceptance by the medical community and patient access, drug pricing and reimbursement.

Even if we obtain significant market share for our product candidates, because the potential target populations are small, we may never achieve significant revenue without obtaining regulatory approval for additional indications or in connection with earlier lines of therapy.

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

We face an inherent risk of product liability exposure related to the testing in human clinical trials of our product candidates and will face an even greater risk if we commercially sell any products that we may develop. For example, we may be sued if our product candidates cause, or are perceived to cause, injury or are found to be otherwise unsuitable during clinical trials, manufacturing, marketing or sale. Any such product liability claims may include allegations of defects in manufacturing, defects in design, a failure to warn of dangers inherent in the product, negligence, strict liability or a breach of warranties. Claims could also be asserted under state consumer protection acts. If we cannot successfully defend ourselves against claims that our product candidates or products caused injuries, we could incur substantial liabilities. Regardless of merit or eventual outcome, liability claims may result in:

- the inability to commercialize any products that we may develop;

- decreased demand for our product candidates or products that we may develop;
- injury to our reputation and significant negative media attention;
- withdrawal of clinical trial participants;
- significant time and costs to defend the related litigation;
- substantial monetary awards to trial participants or patients; and
- loss of revenue.

Insurance coverage is also increasingly expensive and we may not be able to maintain insurance coverage at a reasonable cost or in an amount adequate to satisfy any liability that may arise.

Cell and genetic medicines are novel, and our product candidates are complex and difficult to manufacture. We could experience delays in satisfying regulatory authorities or production problems that result in delays in our development or commercialization programs, limit the supply of our product candidates, or otherwise harm our business.

Our product candidates require processing steps that are more complex than those required for most chemical and other biological pharmaceuticals. Moreover, unlike chemical and other biological pharmaceuticals, the physical and chemical properties of a gene-engineered cell therapy, such as an eHSC or CAR-T or other cell-based targeted therapeutics we may develop, generally cannot be fully characterized. As a result, assays of the finished product candidate may not be sufficient to ensure that the product candidate will perform in the intended manner. Problems with the manufacturing process, even minor deviations from the normal process, could result in product defects or manufacturing failures that result in lot failures, product recalls, product liability claims, insufficient inventory or potentially delay progression of our potential IND filings or clinical trials. If we successfully develop product candidates, we may encounter problems achieving adequate quantities and quality of clinical-grade materials that meet FDA, EMA or other comparable applicable foreign standards or specifications with consistent and acceptable production yields and costs. In addition, our product candidates will require complicated delivery modalities, such as electroporation, which will introduce additional complexities in the manufacturing process. Any of the foregoing factors could limit our ability to replicate the vein-to-vein time achieved in our preclinical manufacturing of trem-cel in a clinical or, if approved, commercial setting.

Our product candidates consist, and any other eHSC or CAR-T or other cell-based targeted therapeutics we may develop will consist, of genetically engineered human cells, and the process of manufacturing such product candidates is complex, concentrated with a limited number of suppliers, highly regulated and subject to numerous risks. Manufacturing such product candidates involves harvesting cells from a donor or from the patient, altering the cells *ex vivo* using genome engineering technology, cryopreservation, storage and eventually shipment and infusing the cell product into the patient's body. Our manufacturing process will be susceptible to product loss or failure, or product variation that may negatively impact patient outcomes, due to logistical issues associated with the collection of starting material from the donor, shipping such material to the manufacturing site, shipping the final product back to the clinical trial recipient, preparing the product for administration, infusing the patient with the product, manufacturing issues or different product characteristics resulting from the differences in donor starting materials, variations between reagent lots, interruptions in the manufacturing process, contamination, equipment or reagent failure, improper installation or operation of equipment, vendor or operator error, inconsistency in cell growth and variability in product characteristics. Our manufacturing process, like that of a number of other cell therapy companies, is also characterized by limited numbers of suppliers, and in some cases sole source suppliers, with the manufacturing capabilities and know-how to create or source the materials, such as donor marrow cells and electroporation machines, used in our cell manufacturing. While we pursue multiple sources for the critical components of our manufacturing process, we may not be successful in securing these additional sources at all or on a timely basis. Even minor deviations from normal manufacturing processes could result in reduced production yields, product defects and other supply disruptions. If microbial, viral or other contaminations are discovered in our product candidates or in any of the manufacturing facilities in which products or other materials are made, such manufacturing facilities may need to be closed for an extended period of time to investigate and remedy the contamination. In addition, because trem-cel and VCAR33^{ALLO} are manufactured for each particular patient, we will be required to maintain a chain of identity with respect to materials as they move from the donor or patient to the

manufacturing facility, through the manufacturing process and back to the clinical trial recipient. Maintaining a chain of identity is difficult and complex, and failure to do so could result in adverse patient outcomes, loss of product or regulatory action, including withdrawal of an approved product from the market. Any failure in the foregoing processes could render a batch of product unusable, could affect the regulatory approval of such product candidate, could cause us to incur fines or penalties or could harm our reputation and that of our product candidates.

We may make changes to our manufacturing process, and change the sites of manufacture, including with respect to our in-house manufacturing capabilities, for various reasons, such as to control costs, achieve scale, decrease processing time, increase manufacturing success rate or for other reasons. Changes to our process made during the course of clinical development could require us to show the comparability of the product used in earlier clinical phases or at earlier portions of a trial to the product used in later clinical phases or later portions of the trial. Other changes to our manufacturing process made before or after commercialization could require us to show the comparability of the resulting product to the product candidate used in the clinical trials using earlier processes. Such showings could require us to collect additional nonclinical or clinical data from any modified process prior to obtaining marketing approval for the product candidate produced with such modified process. If such data are not ultimately comparable to that seen in the earlier trials or earlier in the same trial in terms of safety or efficacy, we may be required to make further changes to our process and/or undertake additional clinical testing, either of which could significantly delay the clinical development or commercialization of the associated product candidate, which would materially adversely affect our business, financial condition, results of operations and growth prospects

In addition, the FDA, the EMA and other regulatory authorities may require us to submit samples of any lot of any approved product together with the protocols showing the results of applicable tests at any time. Under some circumstances, the FDA, the EMA or other regulatory authorities may require that we not distribute a lot until the agency authorizes its release. Slight deviations in the manufacturing process, including those affecting quality attributes and stability, may result in unacceptable changes in the product that could result in lot failures or product recalls. Lot failures or product recalls could cause us to delay clinical trials or product launches, which could be costly to us and otherwise harm our business, financial condition, results of operations and prospects.

We also may encounter problems hiring and retaining the experienced scientific, quality control and manufacturing personnel needed to manage our manufacturing process, which could result in delays in our production or difficulties in maintaining compliance with applicable regulatory requirements.

Given the nature of biologics manufacturing, there is a risk of contamination during manufacturing. Any contamination could materially harm our ability to produce product candidates on schedule and could harm our results of operations and cause reputational damage. Some of the raw materials that we anticipate will be required in our manufacturing process are derived from biologic sources. Such raw materials are difficult to procure and may be subject to contamination or recall. A material shortage, contamination, recall or restriction on the use of biologically derived substances in the manufacture of trem-cel could adversely impact or disrupt the commercial manufacturing or the production of clinical material, which could materially harm our development timelines and our business, financial condition, results of operations and prospects. Also, due to the short time between the collection of donor HSCs, the manufacturing of trem-cel and the shipment to a transplant center for use in HCT, there are limited opportunities for sterility testing and we anticipate that final testing may occur just before or after the administration trem-cel. Any delays in testing may delay administration of trem-cel and any administration prior to testing may result in positive bacterial tests and obligations to notify health authorities.

Any problems in our manufacturing process, including at either our in-house manufacturing facility or the facilities with which we contract could make us a less attractive collaborator for potential partners, including larger pharmaceutical companies and academic research institutions, which could limit our access to additional attractive development programs. Problems in internal or third-party manufacturing process or facilities, including our own facility that we are building, also could restrict our ability to ensure sufficient clinical material for any clinical trials we may be conducting or are planning to conduct and meet market demand for any product candidates we develop and commercialize.

The process for treating cancer patients using T cell therapy or other cell-based targeted therapies is subject to human and systemic risks.

The "vein-to-vein" cycle for treating cancer patients using T cell therapy or other cell-based targeted therapies typically takes approximately four to six weeks and involves a large number of steps and human participants. First, the patient's lymphocytes are isolated by apheresis at the clinical site and shipped to the manufacturing site. Under cGMP conditions at the manufacturing site, the patient's lymphocytes are thawed and washed and then enriched for CD33-positive T cells using specialized reagents. After overnight culture and T cell activation, the T cells are transduced using lentiviral vector transduction technology to introduce the CAR genetic construct into the enriched T cell population. At the completion of T cell transduction, the T cells are harvested, formulated into the final drug product and then cryopreserved for delivery to patients. Similar procedures may be used for other cell-based targeted therapies, such as a CAR natural killer cell therapy. In the United States, samples of the final product are subjected to several release tests which must fulfill specified criteria for the drug product to be released for infusion. These include sterility, identity, purity, potency and other tests. We are subject to stringent regulatory and quality standards for the T cell therapy treatment process. We cannot offer assurances that our quality control and assurance efforts will be successful or that the risk of human or systemic errors in these processes can be eliminated.

Prior treatments can alter the cancer and negatively impact chances for achieving clinical activity with our CAR-T or other cell-based targeted therapies.

Patients with hematological cancers typically receive highly toxic chemotherapy as their initial treatments that can impact the viability of the T cells collected from the patient and may contribute to highly variable responses to CAR-T or other cell-based targeted therapies. In certain instances, we may use the allogeneic derived T cell fraction from the leukapheresis of the HLA-matched normal healthy donors as the starting material. Like the patient derived T cells, these donor-derived T cells may also display variability that will impact responses to VCAR33^{ALLO} or other cell-based targeted therapeutics we may develop. Patients could also have received prior therapies that target the same molecule on the cancer cells as cell-based targeted therapeutics we may develop and thereby these patients may have cancer cells with low or no expression of the target. As a result, VCAR33^{ALLO} or any other cell-based targeted therapeutics we may develop may not recognize the cancer cell and may fail to achieve clinical activity. For example, AML patients could have received a BCMA-targeting antibody drug conjugate BCMA-ADC like GSK2857916, BCMA targeting T cell engagers like AMG-420 (Amgen) and CC-93269 (Bristol-Myers Squibb), or similar products or product candidates prior to receiving VCAR33 or any other cell-based targeted therapeutics we may develop. If any product candidates we develop do not achieve a sufficient level of clinical activity, we may discontinue the development of that product candidate, which could have an adverse effect on the value of our common stock.

We and any third-party manufacturers and any third-party collaborators may be unable to successfully scale-up manufacturing of our product candidates in sufficient quality and quantity, which would delay or prevent us from developing such product candidates and commercializing approved products, if any.

Although we have demonstrated our internal cGMP manufacturing capabilities to produce clinical supply of VCAR33^{ALLO}, in order to conduct clinical trials of our product candidates, we may need to work with third-party manufacturers to manufacture them in sufficient quantities if we are not able to produce sufficient quantities on our own. Our use of third-parties and multiple facilities require technology transfer of our processes. Technology transfer carries risk and could impact our spend, timelines and clinical supply. We, or our manufacturing partners or our third-party collaborators, may be unable to successfully increase the manufacturing capacity of our product candidates in a timely or cost-effective manner, or at all. We expect that each lot of trem-cel and VCAR33^{ALLO} will need to be manufactured for a specific individual patient, and each lot will need to be individually tested and released for that patient. As a result, we may experience limited production capacity and be unable to meet the need of all patients who could benefit from treatment, if approved. In addition, quality issues may arise during scale-up activities. If we or our manufacturing partners or collaborators are unable to successfully scale up the manufacture of our current or future product candidates in sufficient quality and quantity, the development, testing and clinical trials of that product candidate may be delayed or infeasible, and marketing approval or commercial launch of any resulting product may be delayed or not obtained, which could significantly harm our business.

We have not yet developed a validated methodology for freezing and thawing large quantities of eHSCs or of VCAR33, which we believe will be required for the storage and distribution of our product candidates, and we may face additional logistical challenges in the distribution of our product candidates.

We have not demonstrated that eHSCs or VCAR33, when manufactured for late stage clinical studies or at a commercial scale, can be frozen and thawed without damage in a cost-efficient manner and without degradation. We may encounter difficulties not only in developing freezing and thawing methodologies, but also in obtaining the necessary regulatory approvals for using such methodologies in treatment. If we cannot adequately demonstrate similarity of our frozen product to the unfrozen form to the satisfaction of the FDA, we could face substantial delays in our regulatory approvals. If we are unable to freeze eHSCs or VCAR33 or other cell-based targeted therapeutics we may develop for shipping purposes, our ability to promote adoption and standardization of our products, as well as achieve economies of scale by centralizing production facilities, will be limited.

Even if we are able to successfully freeze and thaw eHSCs or VCAR33 at commercial scale, we will still need to develop a cost-effective and reliable distribution and logistics network, which we may be unable to accomplish. We may face logistical challenges in shipping and tracking, which could increase our costs or result in delayed distribution. For these and other reasons, we may not be able to manufacture and distribute eHSCs, VCAR33 or other cell-based targeted therapeutics we may develop at commercial scale or in a cost-effective manner.

If we or any contract manufacturers and suppliers that we engage 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 any contract manufacturers and suppliers we engage are subject to numerous federal, state and local environmental, health and safety laws, regulations and permitting requirements, including those governing laboratory procedures; the generation, handling, use, storage, treatment and disposal of hazardous and regulated materials and wastes; the emission and discharge of hazardous materials into the ground, air and water; and employee health and safety. Our operations involve the use of hazardous and flammable materials, including chemicals and biological and radioactive materials. Our operations also produce hazardous waste. 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. In the event of contamination or injury resulting from our use of hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. Under certain environmental laws, we could be held responsible for costs relating to any contamination at our current or past facilities and at third-party facilities. We also could incur significant costs associated with civil or criminal fines and penalties.

Compliance with applicable environmental laws and regulations may be expensive, and current or future environmental laws and regulations may impair our product development and research efforts. In addition, we cannot eliminate the risk of accidental injury or contamination from these materials or wastes. 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 carry specific biological or hazardous waste insurance coverage, and our property, casualty and general liability insurance policies specifically exclude coverage for damages and fines arising from biological or hazardous waste exposure or contamination. Accordingly, in the event of contamination or injury, we could be held liable for damages or be penalized with fines in an amount exceeding our resources, and our clinical trials or regulatory approvals could be suspended, which could have a material adverse effect on our business, financial condition, results of operations and prospects.

In addition, we may incur substantial costs to comply with current or future environmental, health and safety laws, regulations and permitting requirements. For example, our products are considered to contain genetically modified organisms or cells, which are regulated in different ways depending upon the country in which preclinical research or clinical trials are conducted. These current or future laws, regulations and permitting requirements may impair our research, development or production efforts. Failure to comply with these laws, regulations and permitting requirements also may result in substantial fines, penalties or other sanctions or business disruption, which could have a material adverse effect on our business, financial condition, results of operations and prospects.

Any third-party contract manufacturers and suppliers we engage will also be subject to these and other environmental, health and safety laws and regulations. Liabilities they incur pursuant to these laws and regulations could result in significant costs or an interruption in operations, which could have a material adverse effect on our business, financial condition, results of operations and prospects.

Success in preclinical studies or clinical trials may not be indicative of results in future clinical trials, particularly for our clinical trials that involve only a small number of patients.

Results from preclinical studies are not necessarily predictive of future clinical trial results, and interim results of a clinical trial are not necessarily indicative of final results. Our clinical trials may involve a small number of patients, which makes it difficult to predict whether early results from these trials will be indicative of the final results of the trials or be replicated in future trials. For example, we are actively recruiting for VBP101, our Phase 1/2a multicenter, open-label, first-in-human trial of trem-cel in combination with Mylotarg in patients with AML, and we released initial clinical data in December 2022 and February 2023 based on two patients. Although we believe the initial clinical data could provide important validating evidence of the potential of trem-cel and our broader eHSC approach, the final results of this trial may not be consistent with our interim results. For that reason, we do not know whether these candidates will be effective for the intended indications or safe in humans. Our product candidates may fail to show the desired safety and efficacy in clinical development despite positive results in preclinical studies or having successfully advanced through initial clinical trials. This failure to establish sufficient efficacy and safety could cause us to abandon clinical development of our product candidates.

Risks Related to Regulatory Review

If clinical trials of any of our product candidates fail to demonstrate safety and efficacy to the satisfaction of regulatory authorities or do not otherwise produce positive results, we may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of such product candidates.

Before obtaining marketing approval from regulatory authorities for the sale of our product candidates, we must complete preclinical development and then conduct extensive clinical trials to demonstrate the safety and efficacy in humans. Clinical testing is expensive, difficult to design and implement, can take many years to complete and is uncertain as to outcome. A failure of one or more clinical trials can occur at any stage of testing. The outcome of preclinical testing and early clinical trials may not be predictive of the success of later clinical trials, and interim results of a clinical trial do not necessarily predict final results.

Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses. Many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their product candidates.

We and our collaborators, if any, may experience numerous unforeseen events during, or as a result of, clinical trials that could delay or prevent our ability to receive marketing approval or commercialize any product candidates, including:

- delays in reaching a consensus with regulators on trial design;
- regulators, IRBs, independent ethics committees or scientific review boards may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;
- delays in reaching or failing to reach agreement on acceptable clinical trial contracts or clinical trial protocols with prospective CROs, and clinical trial sites;
- clinical trials of product candidates may produce negative or inconclusive results, and we may decide, or regulators may require us, to conduct additional clinical trials or abandon product development or research programs;
- difficulty in designing well-controlled clinical trials due to ethical considerations which may render it inappropriate to conduct a trial with a control arm that can be effectively compared to a treatment arm;

- difficulty in designing clinical trials and selecting endpoints for diseases that have not been well-studied and for which the natural history and course of the disease is poorly understood;
- the number of patients required for clinical trials may be larger than we anticipate; enrollment of suitable participants in these clinical trials, which may be particularly challenging for some of the rare diseases we are targeting in our most advanced programs, may be delayed or slower than we anticipate; or patients may drop out of these clinical trials at a higher rate than we anticipate;
- our third-party contractors may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;
- regulators, IRBs or independent ethics committees may require that we or our investigators suspend or terminate clinical research or clinical trials for various reasons, including noncompliance with regulatory requirements, a finding of undesirable side effects or other unexpected characteristics, or that the participants are being exposed to unacceptable health risks or after an inspection of our clinical trial operations or trial sites;
- the cost of clinical trials may be greater than we anticipate;
- the supply or quality of product candidates or other materials necessary to conduct clinical trials may be insufficient or inadequate, including as a result of delays in the testing, validation, manufacturing and delivery of product candidates to the clinical sites by us or by third parties with whom we have contracted to perform certain of those functions;
- delays in having patients complete participation in a trial or return for post-treatment follow-up;
- clinical trial sites dropping out of a trial;
- selection of clinical endpoints that require prolonged periods of clinical observation or analysis of the resulting data;
- occurrence of serious adverse events associated with product candidates that are viewed to outweigh their potential benefits;
- occurrence of serious adverse events in trials of the same class of agents conducted by other sponsors;
- changes in regulatory requirements and guidance that require amending or submitting new clinical protocols; and
- disruption in the supply or availability of Mylotarg or any future targeted therapeutics we use with our eHSCs.

If we or our collaborators are required to conduct additional clinical trials or other testing of product candidates beyond those that we currently contemplate, if we or our collaborators are unable to successfully complete clinical trials or other testing of product candidates, or if the results of these trials or tests are not positive or are only modestly positive or if there are safety concerns, we or our collaborators may:

- be delayed in obtaining marketing approval for any such product candidates or not obtain marketing approval at all;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- obtain approval with labeling that includes significant use or distribution restrictions or 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 or suspend their approval of the product or impose restrictions on its distribution in the form of a REMS or through modification to an existing REMS;
- be sued; or

- experience damage to our reputation.

Product development costs will also increase if we or our collaborators experience delays in clinical trials or other testing or in obtaining marketing approvals. We do not know whether any clinical trials will begin as planned, will need to be restructured or will be completed on schedule, or at all. Significant clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize product candidates, could allow our competitors to bring products to market before we do and could impair our ability to successfully commercialize product candidates, any of which may harm our business, financial condition, results of operations and prospects.

Even if we complete the necessary clinical trials, we cannot predict when, or if, we will obtain regulatory approval to commercialize trem-cel, VCAR33, the trem-cel + VCAR33 Treatment System or any other product candidate we may develop in the United States or any other jurisdiction, and any such approval may be for a more narrow indication than we seek.

We cannot commercialize a product candidate until the appropriate regulatory authorities have reviewed and approved the product candidate. Even if our product candidates meet their safety and efficacy endpoints in clinical trials, the regulatory authorities may not complete their review processes in a timely manner, or we may not be able to obtain regulatory approval. Additional delays may result if an FDA Advisory Committee or other regulatory authority recommends non-approval or restrictions on approval. In addition, we may experience delays or rejections based upon additional government regulation from future legislation or administrative action, or changes in regulatory authority policy during the period of product development, clinical trials and the review process.

Regulatory authorities also may approve a product candidate for more limited indications than requested or they may impose significant limitations in the form of narrow indications, warnings or a REMS. These regulatory authorities may require labeling that includes precautions or contra-indications with respect to conditions of use, or they may grant approval subject to the performance of costly post-marketing clinical trials. In addition, regulatory authorities may not approve the labeling claims that are necessary or desirable for the successful commercialization of our product candidates. Any of the foregoing scenarios could materially harm the commercial prospects for our product candidates and materially adversely affect our business, financial condition, results of operations and prospects.

Marketing approval by the FDA in the United States, if obtained, does not ensure approval by regulatory authorities in other countries or jurisdictions. In addition, clinical trials conducted in one country may not be accepted by regulatory authorities in other countries, and regulatory approval in one country does not guarantee regulatory approval in any other country. Approval processes vary among countries and can involve additional product candidate testing and validation and additional administrative review periods. Seeking foreign regulatory approval could result in difficulties and costs for us and require additional preclinical studies or clinical trials which could be costly and time-consuming. Regulatory requirements can vary widely from country to country and could delay or prevent the introduction of our product candidates in those countries. The foreign regulatory approval process involves all of the risks associated with FDA approval. 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, or if regulatory approvals in international markets are delayed, our target market will be reduced and our ability to realize the full market potential of our product candidates will be unrealized.

Genome engineering technology is subject to a number of challenges and risks. Because genome engineering technology is novel and the regulatory landscape that will govern our product candidates is uncertain and may change, we cannot predict the time and cost of obtaining regulatory approval, if we receive it at all, for our product candidates.

Because our product candidates and technology platform involve genome engineering, we are subject to many of the challenges and risks that other genetically engineered biologics and gene therapies face, including:

- regulatory requirements or guidance regarding the requirements governing genome engineering products have changed and may continue to change in the future;

- to date, only a limited number of products that involve genome engineering have been approved globally;
- improper modulation of a gene sequence, including unintended alterations or insertion of a sequence into certain locations in a patient's chromosomes, could lead to cancer, other aberrantly functioning cells or other diseases, as well as death;
- transient expression of the Cas9 protein could lead to patients having an immunological reaction towards those cells, which could be severe or life-threatening;
- corrective expression of a missing protein, or deletion of an existing protein, in patients' cells could result in the protein or cell being recognized as foreign, and lead to a sustained immunological reaction against the expressed protein or expressing cells, which could be severe or life-threatening;
- regulatory agencies may require extended follow-up observation periods of patients who receive treatment using genome engineering products including, for example, the FDA's recommended 15-year follow-up observation period for these patients, and we will need to adopt such observation periods for our product candidates if required by the relevant regulatory agency, which could vary by country or region; and
- the field of genome engineering is subject to a number of intellectual property disputes.

The regulatory requirements that will govern our novel genetically engineered product candidates are not entirely clear and may change. Moreover, serious adverse events or developments in clinical trials of gene therapy product candidates conducted by others may cause the FDA or other regulatory bodies to initiate a clinical hold on our clinical trials or otherwise change the requirements for approval of any of our product candidates. Although the FDA decides whether individual gene therapy protocols may proceed, the review process and determinations of other reviewing bodies can impede or delay the initiation of a clinical trial, even if the FDA has reviewed the trial and approved its initiation. The same applies in the European Union.

Adverse developments in post-marketing experience or in clinical trials conducted by others of gene therapy products, cell therapy products or products developed through the application of a genome engineering technology may cause the FDA, the EMA and other regulatory bodies to revise the requirements for development or approval of our product candidates or limit the use of products utilizing genome engineering technologies, either of which could materially harm our business. In addition, the clinical trial requirements of the FDA, the EMA and other regulatory authorities 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 trem-cel, can be more expensive and take longer than for other, better known or more extensively studied pharmaceutical or other product candidates. Regulatory agencies administering existing or future regulations or legislation may not allow production and marketing of products utilizing genome engineering technology in a timely manner or under technically or commercially feasible conditions. In addition, regulatory action or private litigation could result in expenses, delays or other impediments to our product candidate development, research programs or the commercialization of resulting products.

The regulatory review committees and advisory groups described above and the new guidelines they promulgate may lengthen the regulatory review process, require us to perform additional studies or trials, increase our development costs, lead to changes in regulatory positions and interpretations, delay or prevent approval and commercialization of these treatment candidates, or lead to significant post-approval limitations or restrictions. Currently, OTAT requires a 15-year follow-up for each patient who receives a genetically engineered cell or gene therapy. This applies to all patients treated in trials during clinical development prior to approval. Following approval, such prolonged follow-up could continue to be required. As we advance our product candidates and research programs, we will be required to consult with these regulatory and advisory groups and to comply with applicable guidelines. If we fail to do so, we may be required to delay or discontinue development of our product candidates.

Because we are developing product candidates using new technologies, as well as potential mechanisms of action for which there are few precedents, there is increased risk that the FDA, the EMA or other regulatory authorities may not consider the endpoints of our clinical trials to provide clinically meaningful results and that these results may be difficult to analyze.

The FDA, EMA and other regulatory authorities typically assess the safety and efficacy of a product with sufficient data to justify marketing authorization. We expect that trem-cel and any other eHSC product candidates we develop will not, by themselves, provide any anti-tumor activity in patients that relapse after HCT, and that our eHSCs could be effective after patients relapse only when administered in combination or sequence with other therapies. There are few precedents for product candidates with this potential mechanism of action. Furthermore, we are employing genome engineering technologies in the creation of our eHSCs that have not yet been clinically validated. During the regulatory review process, we will need to identify success criteria and endpoints such that the FDA, the EMA or other regulatory authorities will be able to determine the clinical efficacy and safety profile of our product candidates. As we are initially seeking to identify and develop product candidates to treat diseases using novel methods of action and new technologies, there is heightened risk that the FDA, the EMA or other regulatory authorities may not consider the clinical trial endpoints that we propose to provide clinically meaningful results (reflecting a tangible benefit to patients). In addition, the resulting clinical data and results may be difficult to analyze. Even if the FDA does find our success criteria to be sufficiently validated and clinically meaningful, we may not achieve the pre-specified endpoints to a degree of statistical significance. Further, even if we do achieve the pre-specified criteria, we may produce results that are unpredictable or inconsistent with the results of the non-primary endpoints or other relevant data. The FDA also weighs the benefits of a product against its risks, and the FDA may view the efficacy results in the context of safety as not being supportive of regulatory approval. Other regulatory authorities in the European Union and other countries may make similar comments with respect to these endpoints and data. Our product candidates are based on a novel technology that makes it difficult to predict the time and cost of development and of subsequently obtaining regulatory approval.

Interim "top-line" and preliminary results from our clinical trials that we may announce or publish from time to time may change as more patient data become available and are subject to audit and verification procedures that could result in material changes in the final data. Investors and analysts may have difficulty analyzing our interim and preliminary results or may not consider them to be meaningful.

From time to time, we may publish interim top-line or preliminary results from our preclinical studies and clinical trials, which are based on a preliminary analysis of then-available data, and the results and related findings and conclusions are subject to change following a more comprehensive review of the data related to the particular study or trial. Interim results from clinical trials that we may complete are subject to the risk that one or more of the clinical outcomes may materially change as patient enrollment continues and more patient data become available. Preliminary or top-line results 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. For example, we released clinical data from VBP101, our Phase 1/2a multicenter, open-label, first-in-human trial of trem-cel in combination with Mylotarg in patients with AML demonstrating neutrophil engraftment and platelet recovery, but these initial engraftment and platelet recovery results may not ultimately lead to efficacy of trem-cel. As a result, interim and preliminary data should be viewed with caution until the final data are available. Differences between preliminary or interim data and final data could significantly harm our business prospects and may cause the trading price of our common stock to fluctuate significantly.

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 investors or others may not agree with what we determine is material or otherwise appropriate information to include in our disclosure, and any information we determine not to disclose may ultimately be deemed significant with respect to future decisions, conclusions, views, activities or otherwise regarding a particular product, product candidate or our business. The information we choose to publicly disclose may also be difficult for investors and analysts to analyze and they may not consider the data to be meaningful. If the interim, top-line or preliminary data that we report differ

from actual results, or if others, including regulatory authorities, investors or analysts, disagree with the conclusions reached, our ability to obtain approval for, and commercialize, our product candidates may be harmed, which could harm our business, operating results, prospects or financial condition.

If we experience significant delays or difficulties in the enrollment of patients in clinical trials, including with respect to completing a complex donor identification and screening process, the cost of developing product candidates could increase and our receipt of necessary regulatory approvals could be delayed or prevented.

Patient enrollment is a significant factor in the timing of clinical trials. The timing of our clinical trials depends, in part, on the speed at which we can recruit patients to participate in our trials. We or our collaborators may not be able to advance clinical trials for our product candidates if we are unable to locate and enroll a sufficient number of eligible patients to participate in these trials as required by the FDA, the EMA or other analogous regulatory authorities outside the United States, or as needed to provide appropriate statistical power for a given trial. Patients may be unwilling to participate in our clinical trials because of negative publicity from adverse events related to the biotechnology, gene therapy or genome engineering fields, competitive clinical trials for similar patient populations, clinical trials in competing products or for other reasons. As a result, the timeline for recruiting patients, conducting trials and obtaining regulatory approval of product candidates be delayed.

Patient enrollment is also affected by other factors, including:

- severity of the disease under investigation;
- size of the patient population and process for identifying patients;
- completion of a complex donor identification and screening process and willingness of a donor to participate;
- prospective donors being registered on the requisite donor registry in order to participate in the trial;
- design of the trial protocol;
- availability and efficacy of approved medications for the disease under investigation;
- availability of genetic testing for potential patients;
- ability to obtain and maintain patient informed consent;
- risk that enrolled patients will drop out before completion of the trial, including due to side effects or characteristics that are unrelated to our product candidate;
- eligibility and exclusion criteria for the trial in question;
- perceived risks and benefits of the product candidate under trial;
- perceived risks and benefits of genome engineering as a treatment approach;
- perceived risks and benefits of the targeted therapeutics that may be administered in combination or in sequence with trem-cel or our other eHSC product candidates;
- efforts to facilitate timely enrollment in clinical trials;
- potential disruptions caused by epidemics or pandemics, including difficulties in initiating clinical sites, enrolling and retaining participants, diversion of healthcare resources away from clinical trials, travel or quarantine policies that may be implemented, and other factors;
- patient referral practices of physicians;
- ability to monitor patients adequately during and after treatment;
- proximity and availability of clinical trial sites for prospective patients, especially for those conditions which have small patient pools;
- the requirement for HCT to be performed in centers that specialize in this procedure; and

- changes to diagnostic technologies, methodologies or criteria used to identify HCT patients at high risk for relapse.

Significant enrollment delays in our clinical trials may result in increased development costs for our product candidates, which would cause the value of our company to decline and limit our ability to obtain additional financing. If we or our collaborators have difficulty enrolling a sufficient number of patients to conduct our clinical trials as planned, we may need to delay, limit or terminate ongoing or planned clinical trials, any of which would have an adverse effect on our business, financial condition, results of operations and prospects.

If we are unable to successfully identify patients who are likely to benefit from our product candidates or eligible donors, or experience significant delays in doing so, we may not realize the full commercial potential of our product candidates.

Trem-cel and any other eHSCs we may develop will require identification of patients that are likely to benefit from administration of our genetically engineered cells in combination with a targeted therapeutic. In addition, VCAR33^{ALLO} and any other targeted therapeutic we develop will require identification of patients with myeloid malignancies that express specific surface targets and a matched healthy donor. If we, or any third parties that we engage to assist us, are unable to successfully identify such patients or eligible donors, or experience delays in doing so, then:

- our ability to develop any product candidates may be adversely affected if we are unable to appropriately select patients for enrollment in our clinical trials; and
- we may not realize the full commercial potential of any product candidates we develop that receive marketing approval if, among other reasons, we are unable to appropriately select patients who are likely to benefit from administration of our genetically engineered cells.

Any product candidates we develop may require use of a companion diagnostic to identify patients who are likely to benefit from genetically engineered cell treatment. If safe and effective use of any of our product candidates depends on a companion diagnostic, we may not receive marketing approval, or marketing approval may be delayed, if we are unable to or are delayed in developing, identifying or obtaining regulatory approval or clearance for the companion diagnostic product for use with our product candidate. Identifying a manufacturer of the companion diagnostic and entering into an agreement with the manufacturer could also delay the development of our product candidates.

As a result of these factors, we may be unable to successfully develop and realize the commercial potential of our product candidates, and our business, financial condition, results of operations and prospects would be materially adversely affected.

Risks Related to Our Relationships with Third Parties

We rely on third parties for some aspects of our research and preclinical testing, and we rely on third parties to conduct our clinical trials, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials, research or testing.

We rely on third parties to conduct some aspects of our research and preclinical testing, and we rely on third parties, such as CROs, clinical data management organizations, medical institutions such as HCT centers, and clinical investigators, to conduct our clinical trials. Any of these third parties may terminate their engagements with us at any time under certain criteria. If we need to enter into alternative arrangements, it may delay our product development activities.

Our reliance on these third parties for research and development and clinical activities will reduce our control over these activities but will not relieve us of our responsibilities. For example, we will remain responsible for ensuring that each of our clinical trials is conducted in accordance with the general investigational plan and protocols for the trial. Moreover, the FDA, EMA and other regulatory authorities require us to comply with standards, commonly referred to as Good Clinical Practices, for conducting, recording and reporting the results of

clinical trials to assure that data and reported results are credible and accurate and that the rights, integrity and confidentiality of trial participants are protected. In the United States, we also are required to register ongoing clinical trials and post the results of completed clinical trials on a government-sponsored database, ClinicalTrials.gov, within certain timeframes. Failure to do so can result in fines, adverse publicity and civil and criminal sanctions.

Although we intend to design the future clinical trials for our product candidates, CROs will conduct some or all of the clinical trials. As a result, many important aspects of our development programs, including their conduct and timing, will be outside of our direct control. Our reliance on third parties to conduct future preclinical studies and clinical trials will also result in less direct control over the management of data developed through preclinical studies and clinical trials than would be the case if we were relying entirely upon our own staff. Communicating with outside parties can also be challenging, potentially leading to mistakes as well as difficulties in coordinating activities. Outside parties may:

- have staffing difficulties;
- fail to comply with contractual obligations;
- experience regulatory compliance issues;
- undergo changes in priorities or become financially distressed; or
- form relationships with other entities, some of which may be our competitors.

These factors may materially adversely affect the willingness or ability of third parties to conduct our preclinical studies and clinical trials and may subject us to unexpected cost increases that are beyond our control. If the CROs and other third parties do not perform preclinical studies and future clinical trials in a satisfactory manner, breach their obligations to us or fail to comply with regulatory requirements, the development, regulatory approval and commercialization of our product candidates may be delayed, we may not be able to obtain regulatory approval and commercialize our product candidates, or our development programs may be materially and irreversibly harmed. If we are unable to rely on preclinical and clinical data collected by our CROs and other third parties, we could be required to repeat, extend the duration of or increase the size of any preclinical studies or clinical trials we conduct and this could significantly delay commercialization and require greater expenditures.

Moreover, principal investigators for our clinical trials may serve as scientific advisors or consultants to us from time to time and receive compensation in connection with such services. Under certain circumstances, we may be required to report some of these relationships to the FDA or comparable foreign regulatory authorities. The FDA or comparable foreign regulatory authority may conclude that a financial relationship between us and a principal investigator has created a conflict of interest or otherwise affected interpretation of the trial. The FDA or comparable foreign regulatory authority may therefore question the integrity of the data generated at the applicable clinical trial site and the utility of the clinical trial itself may be jeopardized. This could result in a delay in approval, or rejection, of our marketing applications by the FDA or comparable foreign regulatory authority, as the case may be, and may ultimately lead to the denial of marketing approval of our product candidates.

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

We have initiated manufacturing at our in-house facility, but until and unless we complete the total transfer of our manufacturing capabilities in-house, we will continue to contract with third parties for the manufacture and supply of materials for development of our product candidates and advancement of our current clinical trials, as well as our research programs and preclinical studies, and we expect to continue to do so for future clinical trials and for commercialization of our product candidates. This reliance on third parties increases the risk that we will not have sufficient quantities of such materials, product candidates or any products that we may develop and commercialize, or that such supply will not be available to us at an acceptable cost, which could delay, prevent or impair our development or commercialization efforts.

Although we have initiated manufacturing at our in-house manufacturing space in our headquarters, we continue to currently rely on third-party manufacturers, pharmaceutical companies and marrow donor programs, including certain single source suppliers, for the manufacture and supply of materials for development of our product candidates and advancement of our current clinical trial, as well as our research programs and preclinical studies, and expect to continue to do so for future clinical testing and for commercial supply of our product candidates and for which we or our collaborators obtain marketing approval. We do not have a long-term agreement with many of these third-party manufacturers or suppliers, and we frequently purchase our required supply on a purchase order basis. We may be unable to establish any agreements with third-party manufacturers or suppliers or to do so on acceptable terms. Even if we are able to establish agreements with third-party manufacturers or suppliers, reliance on third-party manufacturers entails additional risks, including:

- the possible breach of the manufacturing or supply agreement by the third party;
- the possible termination or nonrenewal of the agreement by the third party at a time that is costly or inconvenient for us; and
- reliance on the third party for regulatory compliance, quality assurance, safety and pharmacovigilance and related reporting.

Third-party manufacturers may not be able to comply with cGMP regulations or similar regulatory requirements outside the United States. Our failure, or the failure of our third-party manufacturers or suppliers, to comply with applicable regulations could result in sanctions being imposed on us, including fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocations, seizures or recalls of product candidates or products, operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supplies of our products and harm our business, financial condition, results of operations and prospects.

Our product candidates may compete with other product candidates and products for access to manufacturing facilities and other supplies. There are a limited number of manufacturers that operate under cGMP regulations and that might be capable of manufacturing for us. Also, prior to the approval of our product candidates, we would need to identify a contract manufacturer that could produce our products at a commercial scale and that could successfully complete FDA pre-approval inspection and inspections by other health authorities. Agreements with such manufacturers or suppliers may not be available to us at the time we would need to have that capability and capacity.

Any performance failure on the part of our existing or future manufacturers or suppliers, or any decision by a manufacturer or supplier to remove its products from the market or restrict access to its products, could delay clinical development or marketing approval. We do not currently have arrangements in place for redundant or guaranteed supply for many of the materials we currently use in our preclinical studies and expect to use in our clinical development programs, including for the supply of Mylotarg, donor blood cells, certain apheresis reagents and electroporation machines, and we may have difficulty or be unable to establish alternative sources of these materials. In addition, if any of the manufacturers with whom we have a contractual agreement cannot perform as agreed, we may be required to replace that manufacturer. Although we believe that there are several potential alternative manufacturers who could replace our contract manufacturers, we may incur added costs and delays in identifying and qualifying any such replacement.

Our current and anticipated future dependence upon others for the manufacture of our product candidates and the materials used in our clinical trials may adversely affect our future profit margins and our ability to commercialize any products that receive marketing approval on a timely and competitive basis.

We have and may enter into collaborations with third parties for the research, development and commercialization of our product candidates. If any such collaborations are not successful, we may not be able to capitalize on the market potential of those product candidates.

We have and may seek third-party collaborators for the research, development and commercialization of certain our product candidates. If we enter into any such arrangements with any third parties in the future, we will likely have limited control over the amount and timing of resources that our collaborators dedicate to the development or commercialization our product candidates. 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. We cannot predict the success of collaborations that we have entered into or may enter into in the future.

Collaborations involving our current or future product candidates or research programs pose numerous risks to us, including the following:

- Collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations.
- 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 delay clinical trials, provide insufficient funding for a clinical trial program, stop a clinical trial or abandon a product candidate, repeat or conduct new clinical trials or require a new formulation of a product candidate for clinical testing.
- Collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our 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 with marketing and distribution rights to one or more products may not commit sufficient resources to the marketing and distribution of such products.
- Collaborators may not properly obtain, maintain, enforce or defend our intellectual property or proprietary 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.
- Disputes may arise between the collaborators and us that result in the delay or termination of the research, development or commercialization of our products or product candidates or that result in costly litigation or arbitration that diverts management attention and resources.
- We may lose certain valuable rights under circumstances identified in our collaborations, including if we undergo a change of control.
- Collaborations may be terminated and, if terminated, may result in a need for additional capital to pursue further development or commercialization of the applicable product candidates.
- Collaboration agreements may not lead to development or commercialization of product candidates in the most efficient manner or at all. If a present or future collaborator of ours were to be involved in a business combination, the continued pursuit and emphasis on our product development or commercialization program under such collaboration could be delayed, diminished or terminated.

If our collaborations do not result in the successful development and commercialization of product candidates, or if one of our collaborators terminates its agreement with us, we may not receive any future research funding or

milestone or royalty payments under the collaboration. If we do not receive the funding we expect under these agreements, our development of product candidates could be delayed, and we may need additional resources to develop product candidates. In addition, if one of our collaborators terminates its agreement with us, we may find it more difficult to find a suitable replacement collaborator or attract new collaborators, and our development programs may be delayed or the perception of us in the business and financial communities could be adversely affected. All of the risks relating to product development, regulatory approval and commercialization described in this Annual Report apply to the activities of our collaborators.

These relationships, or those like them, may require us to incur non-recurring and other charges, increase our near- and long-term expenditures, issue securities that dilute our existing stockholders, or disrupt our management and business. In addition, we could face significant competition in seeking appropriate collaborators, and the negotiation process is time-consuming and complex. Our ability to reach a definitive collaboration agreement 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 several factors. If we license rights to our product candidates, 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.

If we are not able to establish collaborations on commercially reasonable terms, we may have to alter our development and commercialization plans.

Our product development and research programs and the potential commercialization of our product candidates will require substantial additional cash to fund expenses. For some of the product candidates, we may decide to collaborate with other pharmaceutical and biotechnology companies for the development and potential commercialization of those product candidates.

We would face significant competition in seeking appropriate collaborators. Whether we reach a definitive agreement for a collaboration will depend, among other things, upon our assessment of the collaborator's resources and expertise, the terms and conditions of the proposed collaboration, and the proposed collaborator's evaluation of a number of factors. Those factors may include the design or results of clinical trials, the likelihood of approval by the FDA, the EMA or similar regulatory authorities outside the United States, the potential market for the subject product candidate, the costs and complexities of manufacturing and delivering such product candidate to patients, the potential of competing products, the existence of uncertainty with respect to our ownership of technology, which can exist if there is a challenge to such ownership without regard to the merits of the challenge, and industry and market conditions generally. 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.

We may also be restricted under existing collaboration agreements from entering into future agreements on certain terms 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.

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 the product candidate for which we are seeking to collaborate, reduce or delay its development program or one or more of our other development programs, delay its potential commercialization or reduce the scope of any sales or marketing activities, or increase our expenditures and undertake development or commercialization activities at our own expense. If we elect to increase our expenditures to fund development 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 develop product candidates or bring them to market and generate product revenue.

Risks Related to Our Intellectual Property

We are highly dependent on intellectual property licensed from third parties and termination of any of these licenses could result in the loss of significant rights, which would harm our business.

In April 2016, we entered into a license agreement with The Trustees of Columbia University in the City of New York ("Columbia") pursuant to which we were granted an exclusive, worldwide license to certain intellectual property rights owned or controlled by Columbia, including patents, patent applications, proprietary information, know-how and other intellectual property related to the inhibition of lineage-specific antigens, to develop, commercialize and sell one or more products in any field of use, including related to eHSCs.

In addition, in October 2020, we entered into a license agreement with the U.S. Department of Health and Human Services as represented by the National Cancer Institute ("NCI") of the NIH, pursuant to which we were granted an exclusive, worldwide license to certain intellectual property rights owned or controlled by the NCI, including patents, patent applications, proprietary information, know-how and other intellectual property related to anti-CD33 CAR-T therapies, to develop, commercialize and sell one or more products for the prophylaxis or treatment of CD33-expressing hematological malignancies, including AML and other myeloid malignancies.

We are dependent on the patents, know-how and proprietary technology, licensed from Columbia and NCI for the development and, if approved, commercialization of trem-cel and VCAR33, respectively. Any termination of these licenses, or a finding that such intellectual property lacks legal effect, could result in the loss of significant rights and could harm our ability to commercialize our current or future product candidates.

Each of the Columbia license agreement and the NCI license agreement imposes certain obligations on us, including obligations to use diligent efforts to meet development thresholds and payment obligations. Non-compliance with such obligations may result in termination of the respective license agreement or in legal and financial consequences. If either Columbia or the NCI terminates its respective license agreement, we may not be able to develop, commercialize or sell our product candidates covered by these agreements. Such an occurrence could materially adversely affect the value of the product candidate being developed under any such agreement or using rights granted under such agreement. Termination of our license agreements or reduction or elimination of our rights under them may result in our having to negotiate a new or reinstated agreement, which may not be available to us on equally favorable terms, or at all, which may mean we are unable to develop, commercialize or sell the affected product candidate or may cause us to lose our rights under the agreement.

In August 2023, we entered into a worldwide non-exclusive license from Editas Medicine for *ex-vivo* Cas9 gene-edited HSC therapies for the treatment and/or prevention of hematological malignancies. The license provides access to key intellectual property for the continued development and commercialization of edited HSCs including trem-cel, with the option to elect additional product candidate targets within the next five years. Failure to maintain this license, or obtain a replacement license for our field of use on commercially reasonable terms or at all, could harm our ability to commercialize our current or future product candidates.

In addition, our licensors may make decisions in prosecuting, maintaining, enforcing and defending any licensed intellectual property rights, for example, any licensed patents or patent applications, that may not be in our best interest. Moreover, if our licensors take any action with respect to any licensed intellectual property rights, for example, any licensed patents or patent applications, that results in a successful challenge to the licensed intellectual property by a third party, such patents may be invalidated or held to be unenforceable, and we may lose our rights under such patents, which could materially harm our business.

Further, the agreements under which we currently license intellectual property from third parties are complex, and certain provisions in such agreements may be susceptible to multiple interpretations. Accordingly, disputes may arise between us and our licensors regarding intellectual property subject to a license agreement, including those relating to:

- the scope of rights, if any, granted under the license agreement and other interpretation-related issues;

- whether and the extent to which our technology and processes infringe on intellectual property of the licensor that is not subject to the license agreement;
- whether our licensor or its licensor had the right to grant the license agreement;
- whether third parties are entitled to compensation or equitable relief, such as an injunction, for our use of the intellectual property without their authorization;
- our right to sublicense patent and other rights to third parties under collaborative development relationships;
- whether we are complying with our obligations with respect to the use of the licensed technology in relation to our development and commercialization of product candidates;
- our involvement in the prosecution and enforcement of the licensed patents and our licensors' overall patent prosecution and enforcement strategy;
- the allocation of ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and by us and any future partners or collaborators; and
- the amounts of royalties, milestones or other payments due under the license agreement.

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.

If disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on acceptable terms, or are insufficient to provide us the necessary rights to use the intellectual property, we may be unable to successfully develop and commercialize the affected product candidates.

If we or any of our licensors fail to adequately protect this intellectual property, our ability to commercialize our products could suffer. Any disputes with our licensors or any termination of the licenses on which we depend could have a material adverse effect on our business, financial condition, results of operations and prospects.

Our commercial success depends on our ability to obtain, maintain and protect our intellectual property and proprietary technology.

Our commercial success depends in large part on our ability to obtain, maintain and protect intellectual property rights through patents, trademarks and trade secrets in the United States and other countries with respect to our proprietary product candidates. If we do not adequately protect our intellectual property rights, competitors may be able to erode, negate or preempt any competitive advantage we may have, which could harm our business and ability to achieve profitability.

To protect our proprietary position, we own and have in-licensed certain intellectual property rights, including certain issued patents and patent applications, and have filed and may file provisional and non-provisional patent applications in the United States or abroad related to our product candidates that are important to our business. Provisional patent applications are not eligible to become issued patents until, among other things, we file a non-provisional patent application within 12 months of the filing of one or more of our related provisional patent applications. If we do not timely file non-provisional patent applications, we may lose our priority date with respect to our provisional patent applications and any patent protection on the inventions disclosed in our provisional patent applications. 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. Moreover, the patent application and approval process is expensive and time-consuming. We may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner.

The patent application, prosecution and enforcement processes are subject to numerous risks and uncertainties, and there can be no assurance that we, our licensors, or any of our current or future collaborators will be successful

in protecting our product candidates by obtaining, defending and/or asserting patent rights. These risks and uncertainties include the following:

- the U.S. Patent and Trademark Office (the "USPTO") and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the patent process. There are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case;
- patent applications may not result in any patents being issued;
- patents that may be issued or in-licensed may be challenged, invalidated, modified, revoked, circumvented, found to be unenforceable or otherwise may not provide any competitive advantage;
- our competitors, many of whom have substantially greater resources and many of whom have made significant investments in competing technologies, may seek or may have already obtained patents that will limit, interfere with or eliminate our ability to make, use, and sell our potential product candidates;
- there may be significant pressure on the U.S. government and international governmental bodies to limit the scope of patent protection both inside and outside the United States for disease treatments that prove successful, as a matter of public policy regarding worldwide health concerns; and
- countries other than the United States may have patent laws less favorable to patentees than those upheld by U.S. courts, allowing foreign competitors a better opportunity to create, develop and market competing product candidates.

In some instances, agreements through which we license intellectual property rights may not give us control over patent prosecution or maintenance, so that we may not be able to control which claims or arguments are presented, how claims are amended, and may not be able to secure, maintain, or successfully enforce necessary or desirable patent protection from those patent rights. We have not had and do not have primary control over patent prosecution and maintenance for certain of the patents and patent applications we license, including under our license agreements with Columbia and NCI, and therefore cannot guarantee that these patents and applications will be prosecuted or maintained in a manner consistent with the best interests of our business. We cannot be certain that patent prosecution and maintenance activities by our licensors have been or will be conducted in compliance with applicable laws and regulations or will result in valid and enforceable patents.

Moreover, some of our in-licensed patents and patent applications may be, and some of our future owned and licensed patents 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.

The patent protection we obtain for our product candidates may not be sufficient to provide us with any competitive advantage or our patents may be challenged.

Our owned and licensed patents and pending patent applications, if issued, may not provide us with any meaningful protection or may not prevent competitors from designing around our patent claims to circumvent our patents by developing similar or alternative technologies or therapeutics in a non-infringing manner. For example, a third party may develop a competitive product that provides benefits similar to one or more of our product candidates but falls outside the scope of our patent protection or license rights. If the patent protection provided by the patents and patent applications we hold or pursue with respect to our product candidates is not sufficiently broad to impede such competition, our ability to successfully commercialize our product candidates could be negatively affected, which would harm our business. Currently, a significant portion of our patents and patent applications are in-licensed, though similar risks would apply to any patents or patent applications that we now own or may own or in-license in the future.

It is possible that defects of form in the preparation or filing of our patents or patent applications may exist, or may arise in the future, for example with respect to proper priority claims, inventorship, claim scope, or requests for patent term adjustments. If we or our partners, collaborators, licensees, or licensors, whether current or future, fail to establish, maintain or protect such patents and other intellectual property rights, such rights may be reduced or eliminated. If our partners, collaborators, licensees, or licensors, are not fully cooperative or disagree with us as to the prosecution, maintenance or enforcement of any patent rights, such patent rights could be compromised. If there are material defects in the form, preparation, prosecution, or enforcement of our patents or patent applications, such patents may be invalid and/or unenforceable, and such applications may never result in valid, enforceable patents. Any of these outcomes could impair our ability to prevent competition from third parties, which may have an adverse impact on our business.

In addition, the determination of patent rights with respect to clinical compositions of matter and treatment methods commonly involves complex legal and factual questions, which are dependent upon the current legal and intellectual property context, extant legal precedent and interpretations of the law by individuals. As a result, the issuance, scope, validity, enforceability and commercial value of our patent rights are characterized by uncertainty.

Changes in either the patent laws or interpretation of the patent laws in the United States and other countries may diminish the value of our patents or narrow the scope of our patent protection. In addition, the laws of foreign countries may not protect our rights to the same extent or in the same manner as the laws of the United States. For example, patent laws in various jurisdictions, including significant commercial markets such as Europe, restrict the patentability of methods of treatment of the human body more than U.S. law does. If these changes were to occur, they could have a material adverse effect on our ability to generate revenue.

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. Assuming the other requirements for patentability are met, currently, the first party to file a patent application is generally entitled to the patent. However, prior to March 16, 2013, in the United States the first party to invent was entitled to the patent. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we were the first to make the inventions claimed in our patents or pending patent applications, or that we were the first to file for patent protection of such inventions. Similarly, we cannot be certain that parties from whom we do or may license or purchase patent rights were the first to make relevant claimed inventions, or were the first to file for patent protection for them. If third parties have filed prior patent applications on inventions claimed in our patents or applications that were filed on or before March 15, 2013, an interference proceeding in the United States can be initiated by such third parties to determine who was the first to invent any of the subject matter covered by the patent claims of our applications. If third parties have filed such prior applications after March 15, 2013, a derivation proceeding in the United States can be initiated by such third parties to determine whether our invention was derived from theirs.

Moreover, because the issuance of a patent is not conclusive as to its inventorship, scope, validity or enforceability, our owned and licensed patents or pending patent applications may be challenged in the courts or patent offices in the United States and abroad. There is no assurance that all of the potentially relevant prior art relating to our patents and patent applications has been found. If such prior art exists, it may be used to invalidate a patent, or may prevent a patent from issuing from a pending patent application. For example, such patent filings may be subject to a third-party submission of prior art to the USPTO, or to other patent offices around the world. Alternately or additionally, we may become involved in post-grant review procedures, oppositions, derivation proceedings, *ex parte* reexaminations, *inter partes* review, supplemental examinations, or interference proceedings or challenges in district court, in the United States or in various foreign patent offices, including both national and regional, challenging patents or patent applications in which we have rights, including patents on which we rely to protect our business. An adverse determination in any such challenges may result in loss of the patent or in patent claims being narrowed, invalidated or held unenforceable, in whole or in part, or in denial of the patent application or loss or reduction in the scope of one or more claims of the patent application, any of 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.

Issued patents that we have or may obtain or license may not provide us with any meaningful protection, prevent competitors from competing with us or otherwise provide us with any competitive advantage. Our competitors may be able to circumvent our patents by developing similar or alternative technologies or products in a non-infringing manner. Our competitors may also seek approval to market their own products similar to or otherwise competitive with our products. Alternatively, our competitors may seek to market generic versions of any approved products, for example, by submitting a Section 351(k) Biologics License Application ("BLA") to the FDA, or pursue similar strategies in the United States or other jurisdictions, in which they claim that patents owned or licensed by us are invalid, unenforceable or not infringed. In these circumstances, we may need to defend or assert our patents, or both, including by filing lawsuits alleging patent infringement. In any of these types of proceedings, a court or other agency with jurisdiction may find our patents invalid or unenforceable, or that our competitors are competing in a non-infringing manner. Thus, even if we have valid and enforceable patents, these patents still may not provide protection against competing products or processes sufficient to achieve our business objectives. Any of the foregoing could have a material adverse effect on our business, financial condition, results of operations and prospects.

Other parties have developed or may develop technologies that may be related to or competitive with our approach, and may have filed or may file patent applications and may have been issued or may be issued patents with claims that overlap or conflict with our patent applications, either by claiming the same materials, formulations or methods, or by claiming subject matter that could dominate our patent position. In addition, certain parts or all of the patent portfolios licensed to us are, or may be, licensed to third parties and such third parties may have or may obtain certain enforcement rights. If the scope of the patent protection we or our licensors obtain is not sufficiently broad, we may not be able to prevent others from developing and commercializing technology and products similar or identical to ours. The degree of patent protection we require to successfully compete in the marketplace may be unavailable or severely limited in some cases and may not adequately protect our rights or permit us to gain or keep any competitive advantage. We cannot provide any assurances that any of our licensed patents have, or that any of our pending owned or licensed patent applications that mature into issued patents will include, claims with a scope sufficient to protect our product candidates or otherwise provide any competitive advantage, nor can we provide any assurance that our licenses will remain in force.

If we are unable to protect the confidentiality of our trade secrets, our business and competitive position may be harmed.

In addition to the protection afforded by patents, we rely upon trade secret protection, know-how and continuing technological innovation to develop and maintain our competitive position. We seek to protect our proprietary technology and processes, in part, by entering into confidentiality agreements with our contractors, collaborators, scientific advisors, employees and consultants and invention assignment agreements with our consultants and employees. However, we may not obtain these agreements in all circumstances, and individuals with whom we have these agreements may not comply with their terms. The assignment of intellectual property rights under these agreements 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. In addition, we may not be able to prevent the unauthorized disclosure or use of our technical know-how or other trade secrets by the parties to these agreements despite the existence of confidentiality agreements and other contractual restrictions. Monitoring unauthorized uses and disclosures is difficult and we do not know whether the steps we have taken to protect our proprietary technologies will be effective. If any of the contractors, collaborators, scientific advisors, employees and consultants who are parties to these agreements breaches or violates the terms of any of these agreements, we may not have adequate remedies for any such breach or violation. As a result, we could lose our trade secrets. Enforcing a claim against a third party that illegally obtained and is using our trade secrets, like patent litigation, is expensive and time-consuming and the outcome is unpredictable. In addition, courts outside the United States are sometimes less willing or unwilling to protect trade secrets. Any of the foregoing could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Moreover, our trade secrets could otherwise become known or be independently discovered by our competitors or other third parties. Competitors and other third parties could attempt to replicate some or all of the competitive advantages we derive from our development efforts, willfully infringe our intellectual property rights, design around our protected technology or develop their own competitive technologies that fall outside of our

intellectual property rights. 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, or those to whom they communicate it, from using that technology or information to compete with us. If our trade secrets are not adequately protected or sufficient to provide an advantage over our competitors, our competitive position could be adversely affected, as could our business. Additionally, if the steps taken to maintain our trade secrets are deemed inadequate, we may have insufficient recourse against third parties for misappropriating our trade secrets.

We may not be successful in acquiring or in-licensing necessary rights to key technologies underlying our product candidates.

We currently have rights to intellectual property, through licenses from third parties, to develop our product candidates, and we expect to seek to expand our intellectual property footprint related to our product candidate pipeline in part by in-licensing the rights to key technologies. The future growth of our business will depend in part on our ability to in-license or otherwise acquire the rights to develop additional product candidates and technologies. Although we have succeeded in licensing technologies from third party licensors, including Columbia and NCI, in the past, we can give no assurance that we will be able to in-license or acquire the rights to other technologies relevant to our product candidates from third parties on acceptable terms or at all.

In order to market our product candidates, we may find it necessary or prudent to obtain licenses from such third party intellectual property holders. However, it may be unclear who owns the rights to intellectual property we wish to obtain, or we may be unable to secure such licenses or otherwise acquire or in-license intellectual property rights from third parties that we identify as necessary for our product candidates and technology we employ. For example, we employ a range of genome engineering technologies that are owned by third parties in our preclinical studies, as well as to manufacture the supply of eHSCs or other cell therapies used for clinical trials and, if approved, for commercialization of our product candidates. In particular, we rely on, and will continue to rely on, CRISPR-Cas9 genome engineering technology to create trem-cel. We currently conduct our preclinical research and clinical trials under 35 U.S.C. § 271(e)(1), which provides a safe harbor from patent infringement for uses of patented technology reasonably related to the development and submission of information under a federal law which regulates the manufacture, use, or sale of drugs. While we have secured a worldwide non-exclusive license from Editas Medicine for *ex vivo* Cas9 gene-edited HSC therapies for the continued development and potential commercialization of edited HSCs including trem-cel, with the option to elect additional product candidate targets within the next five years, failure to maintain this license, or obtain a replacement license for our field of use on commercially reasonable terms or at all, could harm our ability to commercialize our current or future product candidates.

Numerous patents and patent applications directed to genome engineering technology have been filed by third parties. For example, we are aware of a number of patents and patent applications by the University of California, the University of Vienna, and Emmanuelle Charpentier; the Broad Institute, Inc.; the Massachusetts Institute of Technology; the Presidents and Fellows of Harvard College; Sigma-Aldrich Co.; Novartis AG; Vilnius University; Agilent Technologies, Inc.; Cellectis; Sangamo Therapeutics, Inc; The Trustees of Princeton University; Miltenyi Biotec GmbH ("Miltenyi"); Amgen Research (Munich) GmbH; and the University of Pennsylvania, among others. The intellectual property space related to genome engineering, particularly with respect to CRISPR-Cas9, is highly complex and still unsettled. For example, certain CRISPR-Cas9 patents of various parties previously mentioned above are currently subject to interference proceedings before the USPTO and opposition proceedings before the European Patent Office. It is uncertain when and how the USPTO as well as the European Patent Office will decide in the various proceedings, and the decisions of the respective patent offices may significantly affect the scope or may deny the validity of the respective patents involved in these proceedings. Although we recently obtained a license to genome engineering technology, including to CRISPR-Cas9 technology from Editas Medicine, we may be required to obtain licenses from more than one party, or from different parties in different parts of the world. In certain scenarios, it may also be difficult or impossible, at least for a certain time, to identify whether a license, if available at all, would convey sufficient intellectual property rights to us that would allow us to avoid third-party claims of intellectual property infringement, misappropriation or other violations.

The licensing or acquisition of third party intellectual property rights is a highly competitive area, and other companies may pursue strategies to license or acquire third party intellectual property rights that we may consider attractive or necessary. Such companies may have a competitive advantage over us, e.g., 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. We also may be unable to license or acquire third party intellectual property rights on terms that would allow us to make an appropriate return on our investment or at all. 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 program or product candidate, which could have a material adverse effect on our business, financial condition, results of operations and prospects.

Even if we were able to obtain such a license, it could be non-exclusive, thereby giving our competitors and other third parties access to the same technologies licensed to us, and it could require us to make substantial licensing and royalty payments. If we are unable to obtain a necessary license to a third-party patent on commercially reasonable terms, we may be unable to commercialize our product candidates or such commercialization efforts may be significantly delayed, which could in turn significantly harm our business.

Third-party claims of intellectual property infringement, misappropriation or other violations may prevent or delay our product discovery and development efforts and have a material adverse effect on our business.

Our commercial success depends in part on our avoiding infringement, misappropriation and other violations of the patents and proprietary rights of third parties. There is a substantial amount of litigation involving patents and other intellectual property rights in the biotechnology and pharmaceutical industries, as well as administrative proceedings for challenging patents, including interference and reexamination proceedings before the USPTO or oppositions and other comparable proceedings in foreign jurisdictions. Recently, under U.S. patent reform, new procedures including *inter partes* review and post grant review have been implemented. This reform will bring uncertainty to the possibility of challenge to our patents in the future. Numerous U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in the fields in which we are developing our product candidates, and third parties may allege they have patent rights encompassing our product candidates, technologies or methods. Third parties may assert that we are employing their proprietary technology without authorization and may file patent infringement claims or lawsuits against us, and if we are found to infringe such third-party patents, we may be required to pay damages, cease commercialization of the infringing technology or obtain a license from such third parties, which may not be available on commercially reasonable terms or at all.

We are aware of several third-party patents and patent applications that if issued, may be construed to cover eHSC technology. For example, Miltenyi's European patent EP3025719 covers technology related to eHSC products. This patent was subject to opposition proceedings before the European Patent Office Opposition Division (the "Opposition Division") and in March 2021, the Opposition Division revoked the patent. This decision was appealed and reviewed before the Board of Appeal of the European Patent Office. The appeal was subsequently withdrawn, and the patent revoked. Miltenyi also has several issued U.S. patents related to eHSC technology. In addition, the University of Pennsylvania has filed patent applications and has been granted several U.S. and foreign patents covering eHSC technology. These or other third parties owning or controlling patent rights may seek to allege that our development and commercialization of our eHSC products, including trem-cel, infringes such patent rights and file a patent infringement lawsuit against us in the future. While we believe that we have valid defenses against any such allegation or lawsuit, such defenses may ultimately be unsuccessful.

There may also be third-party patents of which we are currently unaware with patent rights to materials, formulations, methods of manufacture or methods of treatment related to the use or manufacture of our product candidates. Because patent applications can take many years to issue, there may be currently pending patent applications which may later result in issued patents that our product candidates may infringe. In addition, third parties may obtain patents in the future and claim that use of our technologies infringes upon these patents. Further, we or our licensors may fail to identify even those relevant third-party patents that have issued or may incorrectly interpret the relevance, scope or expiration of such patents. 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 scope of a patent or a pending application may be incorrect. If any third-party patents were held by a court of competent jurisdiction to cover the manufacturing process of our product candidates, materials used in or formed during the manufacturing process or any final product itself, the holders of any such patents may be able to block our ability to commercialize the product candidate unless we obtained a license under the applicable patents, or until such patents expire or they are finally determined to be held invalid or unenforceable. Similarly, if any third-

party patent were held by a court of competent jurisdiction to cover aspects of our materials, formulations or methods, including without limitation, combination therapy or patient selection methods, the holders of any such patent may be able to block our ability to develop and commercialize the product candidate unless we obtained a license or until such patent expires or is finally determined to be held invalid or unenforceable.

Parties making claims against us may seek and obtain injunctive or other equitable relief, which could effectively block our ability to further develop and commercialize our product candidates. Defense of these claims, regardless of their merit, would involve substantial litigation expense and would involve a substantial diversion of employee resources from our business. We may not have sufficient resources to bring these actions to a successful conclusion, which may result in significant cost and may impede our inability to pursue any affected products or product candidates. 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.

In the event of a successful claim of infringement against us, we may have to pay substantial damages, including treble damages and attorneys' fees for willful infringement, obtain one or more licenses from third parties, pay royalties or redesign our infringing products, which may be impossible or require substantial time and monetary expenditure.

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

Periodic maintenance fees on any issued patent are due to be paid to the USPTO and foreign patent agencies in several stages over the lifetime of the patent. The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process. While an inadvertent lapse 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. Noncompliance 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. In such an event, our competitors might be able to enter the market earlier than would otherwise have been the case, which would have a material adverse effect on our business.

Some intellectual property that we have in-licensed may have been discovered through government funded programs and thus may be subject to federal regulations such as "march-in" rights, certain reporting requirements and a preference for U.S.-based companies. Compliance with such regulations may limit our exclusive rights and limit our ability to contract with non-U.S. manufacturers.

Any of the intellectual property rights that we have licensed or we may license in the future and that have been generated through the use of U.S. government funding are subject to certain federal regulations. As a result, the U.S. government may have certain rights to intellectual property embodied in our current or future product candidates pursuant to the Bayh-Dole Act of 1980 (the "Bayh-Dole Act"). These U.S. government rights in certain inventions developed under a government-funded program include a non-exclusive, non-transferable, irrevocable worldwide license to use inventions for any governmental purpose. In addition, the U.S. government has the right to require us to grant exclusive, partially exclusive, or non-exclusive licenses to any such intellectual property rights to a third party if it determines that: (i) adequate steps have not been taken to commercialize the invention; (ii) government action is necessary to meet public health or safety needs; or (iii) government action is necessary to meet requirements for public use under federal regulations (also referred to as "march-in rights"). The U.S. government also has the right to take title to such intellectual property rights if we, or the applicable licensor, fail to disclose the invention to the government and fail to file an application to register the intellectual property within specified time limits. Intellectual property generated under a government funded program is also subject to certain reporting requirements, compliance with which may require us or the applicable licensor to expend substantial resources. We cannot be certain that our current or future licensors will comply with the disclosure or reporting requirements of the Bayh-Dole Act at all times, or be able to rectify any lapse in compliance with these requirements.

In addition, the U.S. government requires that any products embodying the subject invention or produced through the use of the subject invention be manufactured substantially in the United States. The manufacturing preference requirement can be waived if the owner of the intellectual property can show that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible. This preference for U.S. manufacturers may limit our ability to contract with non-U.S. product manufacturers for products covered by such intellectual property. To the extent any of our current or future intellectual property is generated through the use of U.S. government funding, the provisions of the Bayh-Dole Act may similarly apply.

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

Competitors may infringe our patents, trademarks, copyrights or other intellectual property. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time-consuming and divert the time and attention of our management and scientific personnel. Any claims we assert against perceived infringers could provoke these parties to assert counterclaims against us alleging that we infringe their patents, in addition to counterclaims asserting that our patents are invalid or unenforceable, or both. 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. 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, there can be no assurance that we will have sufficient financial or other resources to file and pursue such infringement claims, which typically last for years before they are concluded. Even if we ultimately prevail in such claims, the monetary cost of such litigation and the diversion of the attention of our management and scientific personnel could outweigh any benefit we receive as a result of the proceedings. Any of the foregoing may have a material adverse effect on our business, financial condition, results of operations and prospects.

Changes to 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. In addition, the United States has recently enacted and is currently implementing wide-ranging patent reform legislation. Recent U.S. Supreme Court rulings have narrowed the scope of patent protection available in certain circumstances and weakened the rights of patent owners in certain situations. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents, once obtained. Depending on decisions by the Congress, the federal courts, and the USPTO, 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 case,

Assoc. for Molecular Pathology v. Myriad Genetics, Inc., the Supreme Court held that certain claims to DNA molecules are not patentable. In addition, the case *Amgen Inc. v. Sanofi* affects the way antibody claims are examined and litigated. While we do not believe that any of the patents owned or licensed by us will be found invalid based on these decisions, we cannot predict how future decisions by the courts, the Congress or the USPTO may impact the value of our patents.

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

Filing, prosecuting, maintaining, defending and enforcing patents on our product candidates in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. In addition, the laws of some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the United States. Consequently, we may not be able to prevent third parties from practicing our inventions in all countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own drugs and may export otherwise infringing drugs to territories where we have patent protection, but enforcement rights are not as strong as those in the United States. These drugs may compete with our product candidates and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of some countries do not favor the enforcement of patents and other intellectual property protection, which could make it difficult for us to stop the infringement of our patents generally. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business, could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate, and the damages or other remedies awarded, if any, may not be commercially meaningful.

Many countries have compulsory licensing laws under which a patent owner may be compelled under specified circumstances to grant licenses to third parties. In addition, many countries limit the enforceability of patents against government agencies or government contractors. In those countries, we may have limited remedies if patents are infringed or if we are compelled to grant a license to a third party, which could materially diminish the value of those patents. 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, which could adversely affect 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.

Patents have a limited lifespan. In the United States, if all maintenance fees are timely paid, the natural expiration of a patent is generally 20 years from its earliest filing date of a non-provisional application to which the patent claims priority. Various extensions may be available, but the life of a patent, and the protection it affords, is limited. Even if patents covering our product candidates are obtained, once the patent life has expired for a product candidate, we may be open to competition from competitive medications, including generic medications. Given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting such product candidates might expire before or shortly after such product candidates are commercialized. As a result, our owned and licensed patent portfolio may not provide us with sufficient rights to exclude others from commercializing product candidates similar or identical to ours.

If we do not obtain patent term extension and data exclusivity for trem-cel or any other product candidates, our business may be materially harmed.

Depending upon the timing, duration and conditions of any FDA marketing approval of our product candidates, one or more of our U.S. patents may be eligible for limited patent term extension under the Drug Price

Competition and Patent Term Restoration Act of 1984, referred to as the Hatch-Waxman Amendments, and similar legislation in the European Union. The Hatch-Waxman Amendments permit a patent term extension of up to five years for a patent covering an approved product as compensation for effective patent term lost during product development and the FDA regulatory review process. However, we may not receive an extension if we fail to exercise due diligence during the testing phase or regulatory review process, fail to apply within applicable deadlines, fail to apply prior to expiration of relevant patents or otherwise fail to satisfy applicable requirements. Moreover, the length of the extension could be less than we request. Only one patent per approved product can be extended, the extension cannot extend the total patent term beyond 14 years from approval and only those claims covering the approved drug, a method for using it or a method for manufacturing it may be extended. If we are unable to obtain patent term extension or the term of any such extension is less than we request, the period during which we can enforce our patent rights for the applicable product candidate will be shortened and our competitors may obtain approval to market competing products sooner. As a result, our revenue from applicable products could be reduced. Further, if this occurs, our competitors may take advantage of our investment in development and trials by referencing our clinical and preclinical data and launch their product earlier than might otherwise be the case, and our competitive position, business, financial condition, results of operations, and prospects could be materially harmed.

Third parties may assert that our employees or consultants have wrongfully used or disclosed confidential information or misappropriated trade secrets.

We employ individuals who were previously employed at universities or other biopharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that our employees and consultants do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or our employees, consultants or independent contractors have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of a former employer or other third parties. We may also be subject to claims that patents and applications that we may file to protect inventions of our employees or consultants are rightfully owned by their former employers or other third parties. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees. Any of the foregoing would harm our business, financial condition, results of operations, and prospects.

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 registered or unregistered trademarks or trade names may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. We may not be able to protect our rights to these trademarks and trade names, which we need to build name recognition among potential partners or customers in our markets of interest. 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. Over the long term, if we are unable to establish name recognition based on our trademarks and trade names, then we may not be able to compete effectively and our business may be adversely affected. Our efforts to enforce or protect our proprietary rights related to trademarks, trade secrets, domain names, copyrights or other intellectual property may be ineffective and could result in substantial costs and diversion of resources and could adversely affect our business, financial condition, results of operations and growth prospects.

Intellectual property rights do not necessarily address all potential threats.

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:

- Our product candidates may eventually become available in generic or biosimilar product forms;

- others may be able to make products that are similar to our product candidates or utilize similar technology but that are not covered by the claims of the patents that we license or own;
- we, or our current or future licensors might not have been the first to make the inventions covered by the issued patent or pending patent application that we license or own;
- we, or our current or future licensors might not have been the first to file patent applications covering certain of our or their inventions;
- we, or our license partners or current or future collaborators, may fail to meet our obligations to the U.S. government regarding any in-licensed patents and patent applications funded by U.S. government grants, leading to the loss or unenforceability of patent rights;
- others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our owned or licensed intellectual property rights;
- it is possible that our pending, owned or licensed patent applications or those that we may own in the future will not lead to issued patents;
- it is possible that there are prior public disclosures that could invalidate our owned or in-licensed patents, or parts of our owned or in-licensed patents;
- it is possible that there are unpublished applications or patent applications maintained in secrecy that may later issue with claims covering our product candidates or technology similar to ours;
- it is possible that our owned or in-licensed patents or patent applications omit individual(s) that should be listed as inventor(s) or include individual(s) that should not be listed as inventor(s), which may cause these patents or patents issuing from these patent applications to be held invalid or unenforceable;
- it is possible that our pending owned or licensed patent applications or those that we may own or license in the future will not lead to issued patents;
- issued patents that we hold rights to may be held invalid or unenforceable, including as a result of legal challenges by our competitors;
- the claims of our owned or in-licensed issued patents or patent applications, if and when issued, may not cover our product candidates;
- the laws of foreign countries may not protect our proprietary rights or the proprietary rights of license partners or current or future collaborators to the same extent as the laws of the United States;
- the inventors of our owned or in-licensed patents or patent applications may become involved with competitors, develop products or processes that design around our patents or become hostile to us or the patents or patent applications on which they are named as inventors;
- 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 have engaged in scientific collaborations in the past and will continue to do so in the future and our collaborators may develop adjacent or competing products that are outside the scope of our patents;
- we may not develop additional proprietary technologies that are patentable;
- any product candidates we develop may be covered by third parties' patents or other exclusive rights;
- the patents of others may harm our business; and
- 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.

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

Risks Related to Regulatory and Other Legal Compliance Matters

Failure to obtain marketing approval in foreign jurisdictions would prevent product candidates from being marketed in such jurisdictions, which, in turn, would materially impair our ability to generate revenue.

In order to market and sell product candidates in the European Union and other foreign jurisdictions, we or our third-party collaborators must obtain separate marketing approvals (a single one for the European Union) and comply with numerous and varying regulatory requirements. The approval procedure varies among countries and can involve additional testing. The time required to obtain approval may differ substantially from that required to obtain FDA approval. The regulatory approval process outside the United States generally includes all of the risks associated with obtaining FDA approval. In addition, in many countries outside the United States, it is required that the product candidate be approved for reimbursement before the product candidate can be approved for sale in that country. We or these third parties may not obtain approvals from regulatory authorities outside the United States on a timely basis, if at all. Approval by the FDA does not ensure approval by regulatory authorities in other countries or jurisdictions, and approval by one regulatory authority outside the United States does not ensure approval by regulatory authorities in other countries or jurisdictions or by the FDA. We may not be able to file for marketing approvals and may not receive necessary approvals to commercialize our products in any jurisdiction, which would materially impair our ability to generate revenue.

Even if we, or any collaborators we may have, obtain marketing approvals for our product candidates, the terms of approvals and ongoing regulation of our product candidates could require the substantial expenditure of resources and may limit how we, or they, manufacture and market our product candidates, which could materially impair our ability to generate revenue.

Any product candidate for which we obtain marketing approval, along with the manufacturing processes, post-approval clinical data, labeling, advertising and promotional activities for such product, will be subject to continual requirements of and review by the FDA, EMA, the Competent Authorities of the Member States of the European Union and other regulatory authorities. These requirements include submissions of safety and other post-marketing information and reports, facility registration and drug listing requirements, cGMP requirements relating to quality control, quality assurance and corresponding maintenance of records and documents, and requirements regarding the distribution of samples to physicians and recordkeeping. Even if marketing approval of a product candidate is granted, the approval may be subject to limitations on the indicated uses for which the product may be marketed or to the conditions of approval, or contain requirements for costly post-marketing testing and surveillance to monitor the safety or efficacy of the product. The FDA and other regulatory authorities may restrict the use of our products to certain specialists and/or institutions and require formal reporting and approval of a REMS program. Such restrictions or requirements could deter use of our products by certain individuals or institutions.

Accordingly, assuming we, or any of our collaborators, receive marketing approval for one or more product candidates, we, such collaborators and our and their contract manufacturers will continue to expend time, money, and effort in all areas of regulatory compliance, including manufacturing, production, product surveillance and quality control. If we and such collaborators are not able to comply with post-approval regulatory requirements, we and such collaborators could have the marketing approvals for our products withdrawn by regulatory authorities and our, or such collaborators', ability to market any future products could be limited, which could adversely affect our ability to achieve or sustain profitability. Further, the cost of compliance with post-approval regulations may have a negative effect on our business, operating results, financial condition and prospects.

Any product candidate for which we obtain marketing approval could be subject to restrictions or withdrawal from the market, and we may be subject to substantial penalties if we fail to comply with regulatory requirements or if we experience unanticipated problems with our products, when and if any of them are approved.

The FDA, the EMA, the Competent Authorities of the Member States of the European Union and other regulatory agencies closely regulate the post-approval marketing and promotion of products to ensure that they are marketed only for the approved indications and in accordance with the provisions of the approved labeling. The FDA, the Competent Authorities of the Member States of the European Union and other regulatory agencies impose stringent restrictions on manufacturers' communications regarding off-label use, and if we market our products for

off-label use, we may be subject to enforcement action for off-label marketing by the FDA and other federal and state enforcement agencies, including the Department of Justice. While physicians may prescribe products for off-label uses as the FDA and other U.S. regulatory agencies do not regulate a physician's choice of drug treatment made in the physician's independent medical judgment, they do restrict promotional communications from companies or their sales force with respect to off-label uses of products for which marketing clearance has not been issued. Companies may only share truthful and not misleading information that is otherwise consistent with a product's FDA approved labeling. Violation of the Federal Food, Product, and Cosmetic Act and other statutes, including the False Claims Act and equivalent legislation in other countries relating to the promotion and advertising of prescription products may also lead to investigations or allegations of violations of federal and state and other countries' health care fraud and abuse laws and state consumer protection laws. Even if it is later determined we were not in violation of these laws, we may be faced with negative publicity, incur significant expenses defending our actions and have to divert significant management resources from other matters.

In addition, later discovery of previously unknown problems with our products, manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may yield various negative consequences, including:

- restrictions on such products, manufacturers or manufacturing processes;
- restrictions on the labeling or marketing of a product;
- restrictions on the distribution or use of a product;
- requirements to conduct post-marketing clinical trials;
- receipt of warning or untitled letters;
- withdrawal of the products from the market;
- refusal to approve pending applications or supplements to approved applications that we submit;
- recall of products;
- fines, restitution or disgorgement of profits or revenue;
- restrictions on future procurements with governmental authorities;
- suspension or withdrawal of marketing approvals;
- suspension of any ongoing clinical trials;
- refusal to permit the import or export of our products;
- product seizure; and
- injunctions or the imposition of civil or criminal penalties.

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 ability to commercialize any of our product candidates, if approved, and adversely affect our business, financial condition, results of operations and prospects.

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, 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 or modifications to cleared or approved 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.

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

Healthcare providers and third-party payors play a primary role in the recommendation and prescription of any product candidates for which we obtain marketing approval. Our current and future arrangements with healthcare providers, third-party payors and customers may expose us to broadly applicable federal and state fraud and abuse, transparency, health data privacy, and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we research as well as market, sell and distribute our products for which we obtain marketing approval.

If we are found to be in violation of any of any healthcare laws or any other federal or state regulations, we may be subject to significant administrative, civil and/or criminal penalties, damages, fines, disgorgement, imprisonment, exclusion from federal health care programs, additional reporting requirements and/or oversight, and the curtailment or restructuring of our operations. Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. Given the breadth of the laws and regulations and evolving government interpretations of the laws and regulations, governmental authorities may possibly conclude that our business practices, including certain of our advisory board arrangements with physicians, some of whom are compensated in the form of stock or stock options, may not comply with healthcare laws and regulations. If our operations are found to be in violation of any of the laws described above or any other government regulations that apply to us, we may be subject to significant penalties, including administrative, civil and criminal penalties, damages, fines, disgorgement, exclusion from participation in government health care programs, such as Medicare and Medicaid, imprisonment, integrity oversight and reporting obligations, contractual damages, reputational harm, diminished profits and future earnings, and the curtailment or restructuring of our operations, any of which could adversely affect our business, financial condition, results of operations, and prospects.

For a more detailed discussion of U.S. healthcare laws that may affect our business, see "Business—Healthcare Laws and Regulations" in Part I, Item 1 of this Annual Report.

Healthcare and other reform legislation, may increase the difficulty and cost for us and any collaborators we may have to obtain marketing approval of and commercialize our product candidates, if approved, and affect the prices we, or they, may obtain.

In the United States and some foreign jurisdictions, there have been and continue to be ongoing efforts to implement legislative and regulatory changes regarding the healthcare system. Such changes 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. Although we cannot predict what healthcare or other reform efforts will be successful, such efforts may result in more rigorous coverage criteria, in additional downward pressure on the price that we, or our future collaborators, may receive for any approved products or in other consequences that may adversely affect our ability to achieve or maintain profitability.

Within the United States, the federal government and individual states have aggressively pursued healthcare reform, as evidenced by the passing of the ACA. The ACA substantially changed the way healthcare is financed by both governmental and private insurers and contains a number of provisions that affect coverage and reimbursement of drug products and/or that could potentially reduce the demand for pharmaceutical products. There have been executive, judicial and Congressional challenges, to certain aspects of the ACA. For example, on June 17, 2021, the United States 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. In addition, 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 ACA 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 creating a new manufacturer discount program. It is possible that the ACA will be subject to judicial or Congressional challenges in the future. We cannot predict the ultimate content, timing or effect of any such challenges or changes to the ACA or other federal and state reform efforts. There is no assurance that federal or state health care reform will not adversely affect our future business and financial results, and we cannot predict how future federal or state legislative, judicial or administrative changes relating to healthcare reform will affect our business.

Federal and state governments have shown significant interest in implementing cost-containment programs to limit the growth of government-paid healthcare costs. At the federal level, in July 2021, the Biden administration released an executive order that included multiple provisions aimed at prescription drugs. In response to Biden's executive order, on September 9, 2021, the U.S. department of Health and Human Services ("HHS") released a Comprehensive Plan for Addressing High Drug Prices that outlines principles for drug pricing reform. The plan sets out a variety of potential legislative policies that Congress could pursue as well as potential administrative actions HHS can take to advance these principles. In addition, the IRA also, among other things, (1) directs HHS to negotiate the price of certain single-source drugs and biologics covered under Medicare and (2) imposes rebates under Medicare Part B and Medicare Part D to penalize price increases that outpace inflation. These provisions take effect progressively starting in fiscal year 2023. On August 29, 2023, HHS announced the list of the first ten drugs that will be subject to price negotiations, although the Medicare drug price negotiation program is currently subject to legal challenges. It is unclear how the IRA will be implemented but is likely to have a significant impact on the pharmaceutical industry. In response to the Biden administration's October 2022 executive order, on February 14, 2023, HHS released a report outlining three new models for testing by the CMS Innovation Center which will be evaluated on their ability to lower the cost of drugs, promote accessibility, and improve quality of care. It is unclear whether the models will be utilized in any health reform measures in the future. Further, on December 7, 2023, the Biden administration announced an initiative to control the price of prescription drugs through the use of march-in rights under the Bayh-Dole Act. On December 8, 2023, the National Institute of Standards and Technology published for comment a Draft Interagency Guidance Framework for Considering the Exercise of March-In Rights which for the first time includes the price of a product as one factor an agency can use when deciding to exercise march-in rights. While march-in rights have not previously been exercised, it is uncertain if that will continue under the new framework.

We are unable to predict what additional legislation, regulations or policies, if any, relating to the healthcare industry or third party coverage and reimbursement may be enacted in the future or what effect such legislation, regulations or policies would have on our business. Any cost containment measures could significantly decrease the available coverage and the price we might establish for our potential products, which would have an adverse effect on our net revenues and operating results. For a more detailed discussion of U.S. healthcare reforms that may affect our business, see "Business—Healthcare Reform" in Part I, Item 1 of this Annual Report.

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, consultants and commercial partners, and, if we commence clinical trials, our principal investigators. Misconduct by these parties could include intentional failures to comply with FDA regulations or the regulations applicable in the European Union and other jurisdictions, provide accurate information to the FDA, the EMA and other regulatory authorities, 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 restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Such misconduct also could involve the improper use of information obtained in the course of clinical trials or interactions with the FDA, the EMA or other regulatory authorities, which could result in regulatory sanctions and cause serious harm to our reputation. We have adopted a code of conduct applicable to all of our

employees, but 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 government 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, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, financial condition, results of operations, and prospects, including the imposition of significant fines or other sanctions.

Laws and regulations governing any international operations we may have in the future may preclude us from developing, manufacturing and selling certain product candidates outside of the United States and require us to develop and implement costly compliance programs.

We may be subject to numerous laws and regulations in each jurisdiction outside the United States in which we may operate. The creation, implementation and maintenance of international business practices compliance programs is costly and such programs are difficult to enforce, particularly where reliance on third parties is required.

The Foreign Corrupt Practices Act (the "FCPA") prohibits any U.S. individual or business from paying, offering, 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 certain accounting provisions requiring the company 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. The anti-bribery provisions of the FCPA are enforced primarily by the Department of Justice. The SEC is involved with enforcement of the books and records provisions of the FCPA.

Similarly, the U.K. Bribery Act 2010 has extra-territorial effect for companies and individuals having a connection with the United Kingdom. The U.K. Bribery Act prohibits inducements both to public officials and private individuals and organizations. Compliance with the FCPA and the U.K. Bribery Act is expensive and difficult, particularly in countries in which corruption is a recognized problem. In addition, the FCPA presents particular challenges in the pharmaceutical industry, because, in many countries, hospitals are operated by the government, and doctors and other hospital employees are considered foreign officials. Certain payments to hospitals in connection with clinical trials and other work have been deemed to be improper payments to government officials and have led to FCPA enforcement actions.

Various laws, regulations and executive orders also restrict the use and dissemination outside of the United States, or the sharing with certain non-U.S. nationals, of information classified for national security purposes, as well as certain products and technical data relating to those products. Our expansion outside of the United States has required, and will continue to require, us to dedicate additional resources to comply with these laws, and these laws may preclude us from developing, manufacturing or selling certain product candidates outside of the United States, which could limit our growth potential and increase our development costs. The failure to comply with laws governing international business practices may result in substantial penalties, including suspension or debarment from government contracting. Violation of the FCPA can result in significant civil and criminal penalties. Indictment alone under the FCPA can lead to suspension of the right to do business with the U.S. government until the pending claims are resolved. Conviction of a violation of the FCPA can result in long-term disqualification as a government contractor. The termination of a government contract or relationship as a result of our failure to satisfy any of our obligations under laws governing international business practices would have a negative impact on our operations and harm our reputation and ability to procure government contracts. The SEC also may suspend or bar issuers from trading securities on U.S. exchanges for violations of the FCPA's accounting provisions.

We are subject to stringent and evolving privacy and information security laws, regulations, industry standards, policies and contractual obligations and our actual or perceived failure to comply with such obligations could adversely affect 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") personal data and other sensitive

information, including proprietary and confidential business data, trade secrets, intellectual property, sensitive third-party data, business plans, transactions, information about patients and clinical trial data (collectively, sensitive data).

Our data processing activities subject us to numerous data privacy and security laws and regulations, which among other things, impose certain requirements relating to the privacy, security and transmission of personal information. The legislative and regulatory landscape for privacy and data protection continues to evolve in jurisdictions worldwide, and there has been an increasing focus on privacy and data protection issues with the potential to affect our business. Failure to comply with any of these laws and regulations could result in enforcement action against us, including fines, imprisonment of company officials and public censure, claims for damages by affected individuals, damage to our reputation and loss of goodwill, any of which could have a material adverse effect on our business, financial condition, results of operations or prospects.

In the United States, federal, state, and local governments have enacted numerous data privacy and security laws, including data breach notification laws, personal data privacy laws, consumer protection laws (e.g., Section 5 of the Federal Trade Commission Act), and other similar laws (e.g., wiretapping laws). For example, the federal Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), as amended by the Health Information Technology for Economic and Clinical Health Act ("HITECH"), imposes specific requirements relating to the privacy, security, and transmission of individually identifiable protected health information. In addition, in the past few years, numerous U.S. states—including California, Virginia, Colorado, Connecticut, and Utah—have enacted comprehensive privacy laws that impose certain obligations on covered businesses, including providing specific disclosures in privacy notices and affording residents with certain rights concerning their personal data. These state laws allow for statutory fines for noncompliance. For example, the California Consumer Privacy Act of 2018, as amended by the California Privacy Rights Act of 2020 (collectively, "CCPA"), applies to personal data of consumers, business representatives, and employees who are California residents, and requires businesses to provide specific disclosures in privacy notices and honor requests of such individuals to exercise certain privacy rights. Although there are minimum revenue thresholds for companies to be subject to these laws and there are limited exemptions for clinical trial data under the CCPA and similar state comprehensive privacy laws, such laws may impact (possibly significantly) our business activities depending on how they are interpreted, should we become subject to the CCPA or such state comprehensive privacy laws in the future. Similar laws are being considered in several other states, as well as at the federal and local levels, and we expect more states to pass similar laws in the future. These developments may further complicate compliance efforts and increase legal risk and compliance costs for us and the third parties upon whom we rely.

In addition to data privacy and security laws, we are bound by other contractual obligations related to data privacy and security, and our efforts to comply with such obligations may not be successful. We also publish privacy policies, marketing materials, and other statements regarding data privacy and security and 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 (and consumers' data privacy expectations) are quickly changing, becoming increasingly stringent, and creating uncertainty. Additionally, these obligations may be subject to differing applications and interpretations, which may be inconsistent or conflict among jurisdictions. We may at times fail (or be perceived to have failed) in our efforts to comply with our data privacy and security obligations. Moreover, despite our efforts, our personnel or third parties on whom we rely may fail to comply with such obligations, which could negatively impact our business operations. If we are unable to properly protect the privacy and security of sensitive data in our possession, we could be found to have breached our contracts. Further, if we fail to comply with applicable privacy and security laws, including applicable HIPAA privacy and security standards, we could face significant consequences, including but not limited to: government enforcement actions (e.g., administrative, civil and criminal penalties, investigations, audits, inspections, and similar); litigation (including class-action claims); additional reporting requirements and/or oversight; bans on processing personal data (including clinical trial data); and orders to destroy or not use personal data. In addition, our ongoing efforts to comply with evolving laws and regulations at the federal and state level may be costly and require ongoing modifications to our policies, procedures and systems.

Risks Related to Employee Matters, Managing Growth and Information Technology

Our future success depends on our ability to retain our Chief Executive Officer and other key executives and to attract, retain and motivate qualified personnel.

We are highly dependent on Robert Ang, M.B.B.S., M.B.A., our Chief Executive Officer, as well as the other principal members of our management and scientific teams. Dr. Ang and such other principal members are employed "at will," meaning we or they may terminate the employment at any time. We do not maintain "key person" insurance for any of our executives or other employees. The loss of the services of any of these persons could impede the achievement of our research, development and commercialization objectives.

Recruiting and retaining qualified scientific and clinical personnel and, if we progress the development of our product candidates toward scaling up for commercialization, manufacturing and sales and marketing personnel will also be critical to our success. We may not be able to attract and retain these personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for similar personnel. We also experience competition for the hiring of scientific and clinical personnel from universities and research institutions. In addition, we rely on consultants and advisors, including scientific and clinical advisors, to assist us in formulating our research and development and commercialization strategy. Our consultants and advisors, including our scientific founder, may be employed by employers other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us. The inability to recruit, or loss of services of certain executives, key employees, consultants or advisors, may impede the progress of our research, development and commercialization objectives and have a material adverse effect on our business, financial condition, results of operations and prospects.

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

In connection with the growth and advancement of our pipeline, we expect to increase the number of our employees and the scope of our operations, particularly in the areas of drug development, regulatory affairs, manufacturing and, as our product candidates advance through later stages of clinical development, sales and marketing. To manage our anticipated future growth, we must continue to implement and improve our managerial, operational and financial systems, expand our facilities and continue to recruit and train additional qualified personnel. Due to our limited financial resources and the limited experience of our management team in managing a company with such anticipated growth, we may not be able to effectively manage the expected expansion of our operations or recruit and train additional qualified personnel. Moreover, the expected physical expansion of our operations may lead to significant costs and may divert our management and business development resources. Any inability to manage growth could delay the execution of our business plans or disrupt our operations.

As a growing biotechnology company, we are actively pursuing new platforms and product candidates in many therapeutic areas and across a wide range of diseases. Successfully developing product candidates for and fully understanding the regulatory and manufacturing pathways to all of these therapeutic areas and disease states requires a significant depth of talent, resources and corporate processes in order to allow simultaneous execution across multiple areas. Due to our limited resources, we may not be able to effectively manage this simultaneous execution and the expansion of our operations or recruit and train additional qualified personnel. This may result in weaknesses in our infrastructure, give rise to operational mistakes, legal or regulatory compliance failures, loss of business opportunities, loss of employees and reduced productivity among remaining employees. The physical expansion of our operations may lead to significant costs and may divert financial resources from other projects, such as the development of our product candidates. If our management is unable to effectively manage our expected development and expansion, our expenses may increase more than expected, our ability to generate or increase our revenue could be reduced and we may not be able to implement our business strategy. Our future financial performance and our ability to compete effectively and commercialize our product candidates, if approved, will depend in part on our ability to effectively manage the future development and expansion of our company.

Our insurance policies may be inadequate and potentially expose us to unrecoverable risks.

We have limited director and officer insurance and commercial insurance policies. Any significant insurance claims would have a material adverse effect on our business, financial condition and results of operations. Insurance availability, coverage terms and pricing continue to vary with market conditions. We endeavor to obtain appropriate insurance coverage for insurable risks that we identify; however, we may fail to correctly anticipate or quantify insurable risks, we may not be able to obtain appropriate insurance coverage, and insurers may not respond as we intend to cover insurable events that may occur. We have observed rapidly changing conditions in the insurance markets relating to nearly all areas of traditional corporate insurance. Such conditions have resulted in higher premium costs, higher policy deductibles and lower coverage limits. For some risks, we may not have or maintain insurance coverage because of cost or availability.

If our information technology systems, or those of our third-party vendors, collaborators or other contractors or consultants, or our data are or were compromised, we could experience adverse consequences resulting from such compromise, including but not limited to a material disruption of our product development programs, regulatory investigations or actions, litigation, fines and penalties, reputational harm and other adverse consequences.

In the ordinary course of our business, we and the third parties upon which we rely process sensitive data, and, as a result, we and the third parties upon which we rely face a variety of evolving threats that could cause security incidents. Our information technology systems and those of our current and any future third-party vendors, collaborators and other contractors or consultants are subject to damage or interruption from a variety of evolving threats, including but not limited to social-engineering attacks (including through deep fakes, which may be increasingly more difficult to identify as fake, and phishing attacks), computer viruses, computer hackers, malicious code (such as viruses and worms), malware (including as a result of advanced persistent threat intrusions), employee theft or misuse, denial-of-service attacks, credential stuffing, credential harvesting, ransomware attacks, adware, attacks enhanced or facilitated by AI, sophisticated nation-state and nation-state-supported actors, unauthorized access, natural disasters, terrorism, war and telecommunication and electrical failures. In particular, severe ransomware attacks are becoming increasingly prevalent and can lead to significant interruptions in our operations, ability to provide our products or services, loss of sensitive 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.

Remote work has become more common and has increased risks to our information technology systems and data, as more of our employees utilize network connections, computers, and devices outside our premises or network, including working at home, while in transit and in public locations. Additionally, 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.

While we seek to protect our information technology systems from system failure, accident and security breach, if such an event were to occur and cause interruptions in our operations, it could result in a disruption of our development programs and our business operations, whether due to a loss of our trade secrets or other sensitive data or other disruptions. For example, the loss of clinical trial data from future clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. If we were to experience a significant cybersecurity breach of our information systems or sensitive data, the costs associated with the investigation, remediation and potential notification of the breach to counterparties and data subjects could be material. In addition, our remediation efforts may not be successful. If we are unable to build and sustain the proper technology and cybersecurity infrastructure, we could suffer significant business disruption, including transaction errors, supply chain or manufacturing interruptions, processing inefficiencies, or the loss of or damage to sensitive data.

Although we have implemented security measures designed to help protect sensitive data from unauthorized access or disclosure, our information technology and infrastructure may be vulnerable in the future to attacks by hackers or viruses, failures, or breaches due to third-party action, employee negligence or error, malfeasance, or other incidents or disruptions. For example, we could be the target of phishing attacks seeking confidential information regarding our employees. Furthermore, while we have implemented data privacy and security measures that are designed to comply with applicable laws and regulations relating to privacy and data protection, some health-related and other personal information or confidential information may be transmitted to us or processed by third parties, who may not implement adequate security and privacy measures, and it is possible that laws, rules and regulations relating to privacy, data protection, or information security may be interpreted and applied in a manner that is inconsistent with our practices or those of third parties who transmit health-related and other personal information or confidential information to us or process such information on our behalf. 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 take steps designed to detect, mitigate, and remediate vulnerabilities in our information systems (such as our hardware and/or software, including that of third parties upon which we rely). We may not, however, detect and remediate all such vulnerabilities including on a timely basis. Further, we may experience delays in deploying remedial measures and patches designed to address identified vulnerabilities. Vulnerabilities could be exploited and result in a security incident. We may expend significant resources or modify our business activities to try to protect against security incidents. Additionally, certain data privacy and security obligations may require us to implement and maintain specific security measures or industry-standard or reasonable security measures to protect our information technology systems and sensitive data.

To the extent that we or third parties upon which we rely are found to have violated data security laws, rules or regulations or if we (or a third party upon whom we rely) experience a security incident or are perceived to have experienced a security incident, including an incident that results in a loss of, or damage to, our or our third-party vendors', collaborators' or other contractors' or consultants' data or applications, or inappropriate disclosure of confidential or proprietary information, we could experience adverse consequences including but not limited to litigation exposure, penalties and fines, regulatory actions or investigations, restrictions on processing sensitive data (including clinical trial data), reputational harm; monetary fund diversions, diversion of management attention, our competitive position could be harmed and the further development and commercialization of our product candidates could be delayed. Any of the above could have a material adverse effect on our business, financial condition, results of operations or prospects.

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 to 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.

In addition to experiencing a security incident, third parties may gather, collect, or infer sensitive data about us from public sources, data brokers, or other means that reveals competitively sensitive details about our organization and could be used to undermine our competitive advantage or market position.

Risks Related to the Ownership of Our Common Stock

An active trading market for our common stock may not be sustained.

Our shares of common stock began trading on the Nasdaq Global Select Market on February 5, 2021. Given the limited trading history of our common stock, there is a risk that an active trading market for our shares will not be sustained, which could put downward pressure on the market price of our common stock and thereby affect the ability of our stockholders to sell their shares.

The market price of our common stock may be volatile.

Our stock price is, and is likely to continue to be, volatile. For example, our stock traded within a range of a high price of $63.62 and a low price of $1.62 per share for the period of February 5, 2021, our first day of trading on the Nasdaq Global Select Market, through March 1, 2024. As a result of volatility, our stockholders may not be able to sell their common stock at or above the prices at which they purchased their shares. Some of the factors that may cause the market price of our common stock to fluctuate include:

- the success of existing or new competitive product candidates or technologies;
- the timing and results of preclinical studies and clinical trials for our product candidates;
- failure or discontinuation of any of our product development and research programs;
- results of preclinical studies, clinical trials or regulatory approvals of product candidates of our competitors, or announcements about new research programs or product candidates of our competitors;
- developments or changing views regarding the use of genetic medicines, including those that involve genome engineering;
- commencement or termination of collaborations for our product development and research programs;
- regulatory or legal developments in the United States and other countries;
- developments or disputes concerning patent applications, issued patents or other proprietary rights;
- the recruitment or departure of key personnel;
- the level of expenses related to any of our research programs, product candidates or clinical development programs;
- the results of our efforts to develop additional product candidates or products;
- actual or anticipated changes in estimates as to financial results, development timelines or recommendations by securities analysts;
- announcement or expectation of additional financing efforts;
- sales of our common stock by us, our insiders or other stockholders;
- variations in our financial results or those of companies that are perceived to be similar to us;
- changes in estimates or recommendations by securities analysts, if any, that cover our stock;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors;
- global or regional public health emergencies, and political instability, including terrorist attacks, civil unrest and actual or threatened armed conflict, such as the Russia-Ukraine and Israel-Hamas wars;
- general economic, industry and market conditions, including heighted interest rates and inflation; and
- the other factors described in this “Risk Factors” section.

In recent years, the stock market in general, and the market for pharmaceutical and biotechnology companies in particular, has experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to changes in the operating performance of the companies whose stock is experiencing those price and volume fluctuations. Broad market and industry factors may seriously affect the market price of our common stock, regardless of our actual operating performance. Following periods of such volatility in the market price of a company’s securities, securities class action litigation has often been brought against that company. Because of the potential volatility of our stock price, we may become the target of securities litigation in the future, which could result in substantial costs and divert management’s attention and resources from our business.

If securities analysts do not publish research or reports about our business or if they publish negative evaluations of our stock, the price of our stock could decline.

The trading market for our common stock will be influenced by the research and reports that industry or financial analysts publish about us or our business. If one or more of the analysts covering our business downgrade their evaluations of our stock, the price of our stock could decline. If one or more of these analysts cease to cover our stock, we could lose visibility in the market for our stock, which in turn could cause our stock price to decline.

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

Sales of a substantial number of shares of our common stock in the public market could occur at any time. These sales, or the perception in the market that the holders of a large number of shares of common stock intend to sell shares, could reduce the market price of our common stock. Our outstanding shares of common stock may be freely sold in the public market at any time to the extent permitted by Rules 144 and 701 under the Securities Act of 1933, as amended (the "Securities Act"), or to the extent such shares have already been registered under the Securities Act and are held by non-affiliates.

Moreover, holders of a substantial number of shares of our common stock have rights, subject to conditions, to require us to file registration statements covering their shares or to include their shares in registration statements that we may file for ourselves or other stockholders. For example, in December 2022 we filed a registration statement on Form S-3 to register the resale of up to 11,627,907 shares of common stock held by RA Capital Healthcare Fund L.P. which were purchased from us in a private placement.

We have also registered all shares of common stock that we may issue under our equity compensation plans or that are issuable upon exercise of outstanding options on a registration statement on Form S-8 and will continue to register any additional shares that become available under such plans due to any annual, automatic increases under the terms of those plans. These shares can be freely sold in the public market upon issuance and once vested, subject to volume limitations applicable to affiliates. If any of these additional shares are sold, or if it is perceived that they will be sold, in the public market, the market price of our common stock could decline.

Insiders have substantial control over our company, which could limit the ability of our other stockholders to affect the outcome of key transactions, including a change of control.

Our executive officers and directors, combined with our stockholders who own more than 5% of our outstanding common stock, and their affiliates, in the aggregate, beneficially own shares representing a substantial amount of our outstanding common stock. As a result, these stockholders, if they act together, may be able to influence our management and affairs and all matters requiring stockholder approval, including the election of directors and approval of significant corporate transactions, such as a merger or other sale of our company or its assets. This concentration of ownership may have the effect of delaying or preventing a change in control of our company or discouraging a potential acquirer from making a tender offer or otherwise attempting to obtain control, even if that change in control would benefit our other stockholders. This significant concentration of ownership may also adversely affect the trading price for our common stock because investors often perceive disadvantages in owning stock in companies with controlling stockholders.

If we fail to establish and maintain proper and effective internal control over financial reporting, our operating results and our ability to operate our business could be harmed.

Ensuring that we have adequate internal financial and accounting controls and procedures in place so that we can produce accurate financial statements on a timely basis is a costly and time-consuming effort that needs to be re-evaluated frequently. Our internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements in accordance with generally accepted accounting principles.

Implementing any appropriate changes to our internal controls may distract our officers and employees, entail substantial costs to modify our existing processes and take significant time to complete. These changes may not, however, be effective in maintaining the adequacy of our internal controls, and any failure to maintain that adequacy, or consequent inability to produce accurate financial statements on a timely basis, could increase our operating costs and harm our business. In addition, investors' perceptions that our internal controls are inadequate or that we are unable to produce accurate financial statements on a timely basis may harm our common share price.

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

We are an "emerging growth company," as defined in the Jumpstart Our Business Startups Act of 2012 (the "JOBS Act"). We will be an emerging growth company during this year and may remain an emerging growth company until 2026. For so long as we remain an emerging growth company, we are permitted and plan to rely on exemptions from certain disclosure requirements that are applicable to other public companies that are not emerging growth companies. These exemptions include not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002 ("SOX"), 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, exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved, and being permitted to provide only two years of audited financial statements. As a result, the information we provide stockholders will be different than the information that is available with respect to other public companies. For example, we did not include all of the executive compensation related information in this Annual Report that would be required if we were not an emerging growth company. We cannot predict whether investors will find our common stock less attractive if we 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.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. This allows an emerging growth company to delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have availed ourselves of this extended transition period and we cannot predict whether investors will find our common stock less attractive due to this election.

We are also a "smaller reporting company" and we may continue to be a smaller reporting company if either (i) the market value of our stock held by non-affiliates is less than $250 million or (ii) our annual revenue is less than $100 million during the most recently completed fiscal year and the market value of our stock held by non-affiliates is less than $700 million. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, as a smaller reporting company we may choose to present only the two most recent fiscal years of audited financial statements in our Annual Report on Form 10-K and, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation.

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

As a public company, and particularly after we are no longer an "emerging growth company," we will continue to incur significant legal, accounting and other expenses that we did not incur as a private company. The Sarbanes-Oxley Act of 2002, the Dodd-Frank Wall Street Reform and Consumer Protection Act, the listing requirements of the Nasdaq Global Select Market and other applicable securities rules and regulations impose various requirements on public companies, including establishment and maintenance of effective disclosure and financial controls and corporate governance practices. We expect that we will need to continue to hire additional accounting, finance and other personnel in connection with our efforts to comply with the requirements of being, a public company, and our management and other personnel will need to continue to devote a substantial amount of

time towards maintaining compliance with these requirements. These requirements have increased and will continue to increase our legal and financial compliance costs and make some activities more time-consuming and costly. These rules and regulations are often subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices.

Pursuant to SOX Section 404, we are required to furnish a report by our management on our internal control over financial reporting, but while we remain an emerging growth or a smaller reporting company with less than $100 million in annual revenue, we will not be required to include an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. To maintain compliance with SOX Section 404 and achieve compliance within the prescribed period for the attestation report by our independent registered public accounting firm, we have and will be engaged in a process to document and evaluate our internal control over financial reporting, which is both costly and challenging. In this regard, we will need to continue to dedicate internal resources, potentially engage outside consultants, adopt a detailed work plan to assess and document the adequacy of internal control over financial reporting, continue steps to improve control processes as appropriate, validate through testing that controls are functioning as documented and implement a continuous reporting and improvement process for internal control over financial reporting. Despite our efforts, there is a risk that we will not be able to conclude, within the prescribed timeframe or at all, that our internal control over financial reporting is effective as required by SOX Section 404. If we identify one or more material weaknesses, it could result in an adverse reaction in the financial markets due to a loss of confidence in the reliability of our financial statements.

Our management team has broad discretion in the use of our cash reserves and may not use them effectively.

Our management has broad discretion to use our cash reserves and could use our cash reserves in ways that do not improve our results of operations or enhance the value of our common stock. The failure by our management to apply these funds effectively could harm our business, financial condition, results of operations and prospects. Pending their use, we may invest our cash reserves in a manner that does not produce income or that loses value.

We do not expect to pay any dividends for the foreseeable future. Accordingly our stockholders must rely on capital appreciation, if any, for any return on their investment.

We have never declared or paid any cash dividends on our equity securities. We do not anticipate that we will pay any dividends to holders of our common stock in the foreseeable future. Instead, we plan to retain any earnings to maintain and expand our existing operations. In addition, any future credit facility that we enter into may contain terms prohibiting or limiting the amount of dividends that may be declared or paid on our common stock. As a result, capital appreciation, if any, of our common stock will be stockholders' sole source of gain for the foreseeable future.

Unfavorable global economic conditions or bank closures could adversely affect our business, financial condition or results of operations.

Our results of operations could be adversely affected by general conditions in the global economy and in the global financial markets, including as a result of heightened inflation and interest rates.A severe or prolonged economic downturn, or additional global financial crises, including related to potential future pandemics or the Russia-Ukraine and Israel-Hamas armed conflicts, could result in a variety of risks to our business, including weakened demand for our product candidates, if approved, or our ability to raise additional capital when needed on acceptable terms, if at all. A weak or declining economy could also strain our suppliers, possibly resulting in supply disruption. Any of the foregoing could harm our business and we cannot anticipate all of the ways in which the current economic climate and financial market conditions could adversely impact our business.

In addition, our available cash and cash equivalents are held in accounts managed by third party financial institutions and consist of cash in our operating accounts and cash invested in money market funds. At any point in time, the funds in our operating accounts may exceed the Federal Deposit Insurance Corporation insurance limits. While we monitor the cash balances in our operating accounts and adjust the cash balances as appropriate, these

cash balances could be impacted if the underlying financial institutions fail. We can provide no assurances that access to our operating cash or invested cash and cash equivalents will not be impacted by adverse conditions in the financial markets.

Provisions in our certificate of incorporation and bylaws and under Delaware law could make a change in control of us, which may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management.

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

- establish a classified board of directors such that not all members of the board are elected at one time;
- allow the authorized number of our directors to be changed only by resolution of our board of directors;
- limit the manner in which stockholders can remove directors from the board;
- establish advance notice requirements for stockholder proposals that can be acted on at stockholder meetings and nominations to our board of directors;
- require that stockholder actions must be effected at a duly called stockholder meeting and prohibit actions by our stockholders by written consent;
- limit who may call stockholder meetings;
- authorize our board of directors to issue preferred stock without stockholder approval, which could be used to institute a stockholder rights plan, or so-called "poison pill," that would work to dilute the stock ownership of a potential hostile acquirer, effectively preventing acquisitions that have not been approved by our board of directors; and
- require the approval of the holders of at least 66⅔% of the votes that all our stockholders would be entitled to cast to amend or repeal certain provisions of our charter or bylaws.

Moreover, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law (the "DGCL"), which prohibits a person who owns in excess of 15% of our outstanding voting stock from merging or combining with us for a period of three years after the date of the transaction in which the person acquired in excess of 15% of our outstanding voting stock, unless the merger or combination is approved in a prescribed manner. We have not elected to opt out of DGCL Section 203. These provisions could discourage potential acquisition proposals and could delay or prevent a change in control transaction. They could also have the effect of discouraging others from making tender offers for our common stock, including transactions that may be in our stockholders' best interests. These provisions may also prevent changes in our management or limit the price that investors are willing to pay for our common stock.

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware and the federal district courts of the United States of America will be the exclusive forums for substantially all disputes between us and our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers or employees.

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware is the exclusive forum for the following types of actions or proceedings under Delaware statutory or common law:

- any derivative action or proceeding brought on our behalf;

- any action asserting a breach of fiduciary duty;
- any action asserting a claim against us arising under the DGCL, our amended and restated certificate of incorporation or our amended and restated bylaws; and
- any action asserting a claim against us that is governed by the internal-affairs doctrine.

This provision would not apply to suits brought to enforce a duty or liability created by the Securities Exchange Act of 1934, as amended. 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 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 additional costs associated with resolving the dispute in other jurisdictions, which could seriously harm our business.

Item 1B. Unresolved Staff Comments.

Not applicable.

Item 1C. Cybersecurity

Risk management and strategy

We have implemented and maintain various information security processes designed to identify, assess and manage material risks from cybersecurity threats to our critical computer networks, third party hosted services, communications systems, hardware and software, and our critical data, including intellectual property, confidential information that is proprietary, and strategic or competitive in nature, and our clinical trial and related data ("Information Systems and Data").

The Company's Vice President, Head of IT, Senior Manager of IT Infrastructure, Systems, and Security, the Company's Information Security Management System ("ISMS") Management Review Team, and third-party service providers (collectively, the "Information Security Function") help identify, assess, and manage the Company's cybersecurity threats and risks. The Information Security Function identifies and assesses risks from cybersecurity threats by monitoring and evaluating the Company's threat environment and risk profile using various methods and tools including, for example: subscribing to reports and services that identify cybersecurity threats, analyzing reports of threats and bad actors, conducting scans of the threat environment, and evaluating our industry's risk profile and threats reported to us. We also complete internal and external security audits, third party threat assessments, and vulnerability assessments.

The Company implements and maintains technical, physical, and organizational measures designed to manage and mitigate material risks from cybersecurity threats to our Information Systems and Data. These measures include, for example: risk assessments, implementation of certain security standards and certifications, encryption of certain data, access and network security controls, physical security, asset management, tracking and disposal, systems monitoring, employee training, penetration testing, cybersecurity insurance, and an incident response plan. Our assessment and management of material risks from cybersecurity threats are integrated into the Company's overall risk management processes. For example, the ISMS maintains a risk register related to information and security threats and evaluates and manages material risks from cybersecurity threats against our overall business objectives. This information is communicated to the audit committee of the board of directors, which evaluates the Company's risks relating to data privacy, technology and information security, including cybersecurity.

We use third-party service providers to assist us from time to time to identify, assess, and manage material risks from cybersecurity threats, including cybersecurity software providers, managed cybersecurity service providers, penetration testing firms, external legal counsel, and dark web monitoring services. We also use third-party service providers to perform a variety of functions throughout our business, such as application providers and hosting companies. We have a vendor management program to manage cybersecurity risks associated with our use of these providers, which includes reviewing vendor security audits and reports.

For a description of the risks from cybersecurity threats that may materially affect the Company and how they may do so, see our risk factors under Part 1. Item 1A. Risk Factors in this Annual Report on Form 10-K, including "If our information technology systems, or those of our third-party vendors, collaborators or other contractors or consultants, or our data are or were compromised, we could experience adverse consequences resulting from such compromise, including but not limited to a material disruption of our product development programs, regulatory investigations or actions, litigation, fines and penalties, reputational harm and other adverse consequences."

Governance

Our board of directors addresses the Company's cybersecurity risk management as part of its general oversight function. The board of directors' audit committee is responsible for overseeing Company's cybersecurity risk management processes, including oversight of mitigation of risks from cybersecurity threats.

Our cybersecurity risk assessment and management processes are implemented and maintained by certain Company management, including the Senior Manager of IT Infrastructure, Systems and Security, who oversees the ISMS Management Review Team and reports to the Vice President, Head of IT. The Vice President, Head of IT is responsible for strategic leadership of our cybersecurity risk management program. The Vice President, Head of IT is responsible for hiring appropriate personnel, approving budgets, helping to integrate cybersecurity risk considerations into the Company's overall risk management strategy, and communicating key priorities to relevant personnel. The Head of IT role is currently held by an individual who has approximately 35 years of professional IT management experience. The Senior Manager of IT Infrastructure, Systems and Security leads the operational and ISMS oversight of company-wide cybersecurity strategy, policy, standards and processes and works across relevant departments to assess and help prepare employees and third-party service providers to address cybersecurity risks. The Senior Manager of IT Infrastructure, Systems, and Security has approximately 10 years of experience in IT including infrastructure and cloud administration, participation in risk management and incident response activities, vendor management, and ensuring information security policy compliance.

Our cybersecurity incident response plan is designed to escalate certain cybersecurity incidents to members of management depending on the circumstances, including the Chief Financial Officer, and the Chief Executive Officer. The Company's information technology department and managed service partners work with the Company's incident response team to help the Company mitigate and remediate cybersecurity incidents of which they are notified. In addition, the Company's incident response plan includes reporting to the audit committee of the board of directors and the chair of the board of directors for certain cybersecurity incidents. The audit committee of the board of directors receives summaries or presentations from the Vice President, Head of IT concerning the Company's significant cybersecurity threats and risk and the processes the Company has implemented to address them.

Item 2. Properties.

Our principal executive office is located at 100 Cambridgepark Drive, Suite 101 Cambridge, Massachusetts where we lease approximately 73,235 square feet of office, laboratory and manufacturing space pursuant to a lease that expires in August 2030. We believe that these facilities will be adequate for our near-term needs. If required, we believe that suitable additional or alternative space would be available in the future on commercially reasonable terms.

Item 3. Legal Proceedings.

From time to time, we may become involved in legal proceedings arising in the ordinary course of our business. We are not currently subject to any material legal proceedings. Regardless of outcome, such proceedings or claims can have an adverse impact on us because of defense and settlement costs, diversion of resources and other factors, and there can be no assurances that favorable outcomes will be obtained.

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 trades on the Nasdaq Global Select Market under the symbol "VOR". Trading of our common stock commenced on February 5, 2021 in connection with our initial public offering ("IPO"). Prior to that time, there was no established public trading market for our common stock.

Holders

As of March 1, 2024, we had approximately 16 holders of record of our common stock. This number does not include beneficial owners whose shares were held in street name.

Dividend Policy

We have never declared or paid any cash dividends on our common stock. We currently intend to retain future earnings to fund the development and growth of our business. We do not expect to pay any cash dividends in the foreseeable future. In addition, the terms of any future debt agreements that we may enter into, may preclude us from paying dividends without the lenders' consent or at all.

Use of Proceeds from Registered Securities

On February 9, 2021, we closed our initial public offering of our common stock pursuant to a registration statement on Form S-1 (File No. 333-252175), which was declared effective by the SEC on February 4, 2021, and a registration statement on Form S-1 (File No. 333-252766), which was deemed effective on February 5, 2021.

We received aggregate net proceeds from the offering of $186.3 million, after deducting underwriting discounts and commissions and other offering expenses payable by us. As of December 31, 2023, we have used $173.0 million of the net proceeds from our IPO primarily to fund the development of trem-cel, VCAR33^{ALLO}, and the trem-cel + VCAR33 Treatment System and continued expansion of our pipeline and platform technology, as well as for working capital and general corporate purposes.

There has been no material change in our planned use of the net proceeds from the offering as described in the final prospectus for our IPO filed with the SEC pursuant to Rule 424(b) under the Securities Act.

Item 6. [Reserved]

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

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

Overview

Vor Bio is a clinical-stage company harnessing the power of cell and genome engineering to develop potentially transformative therapies in acute myeloid leukemia ("AML"), a devastating disease with few treatment options. AML is the most common type of acute leukemia in adults and one of the deadliest and most aggressive blood cancers, affecting approximately 20,000 newly diagnosed patients each year in the United States.

Leveraging our expertise in HSC biology and genome engineering, we genetically modify HSCs to remove surface targets and then provide these cells as HCTs to patients. Once these cells engraft into bone marrow, the patient's healthy cells are shielded because they no longer express the surface target, leaving only the cancerous cells exposed. We believe this will unlock the potential of targeted therapies to selectively destroy cancerous cells while shielding healthy cells. As a result, our shielded transplants are designed to limit the on-target toxicities associated with these targeted therapies, thereby enhancing their utility, and broadening their applicability. We intend to pair our shielded transplants with targeted therapeutics such as VCAR33^{ALLO}, a chimeric antigen receptor ("CAR")-T therapy designed to target CD33, to bring potentially transformative outcomes to patients and establish a new standard of care Treatment System in AML.

We are developing trem-cel, a shielded transplant, which we believe has the potential to transform the treatment for AML. Trem-cel is created by genetically modifying healthy donor HSCs in order to remove the CD33 surface target. We intend to develop trem-cel as a HCT product candidate to replace the standard of care in transplant settings. We are actively enrolling and treating patients in VBP101, our first-in-human Phase 1/2a trial of trem-cel in combination with Mylotarg. We released clinical data for this trial most recently in December 2023. The data showed that primary neutrophil engraftment occurred in all eight patients treated with trem-cel. Three out of three patients treated with Mylotarg experienced hematologic protection from deep cytopenias through repeat doses, suggesting that trem-cel transplants shielded patients' healthy cells from the on-target toxicity typically seen with Mylotarg treatment. We expect to release additional engraftment and hematologic protection data in the second half of 2024. If successful, this trial will provide important validating evidence of the potential of trem-cel and our broader approach.

VCAR33^{ALLO} is manufactured from lymphocytes collected from the patient's original transplant donor, generating a CAR-T cell product that is exactly matched to the recipient's engrafted blood system. By using healthy transplant donor cells as the starting material to produce VCAR33^{ALLO}, the CAR-T cells have a more stem-like phenotype, leading to greater potential for expansion, persistence, and anti-leukemia activity compared to a product derived from a patient's own lymphocytes. In January 2024 we dosed the first patient with VCAR33^{ALLO} in VBP301 and expect to treat multiple additional patients in the first half of 2024. We expect to report initial data in the second half of 2024.

We believe that the combination of trem-cel followed by treatment with VCAR33^{ALLO} in the post-transplant setting, which we refer to as the trem-cel + VCAR33 Treatment System, may transform patient outcomes and offer the potential for cures for patients that have limited treatment options. The trem-cel + VCAR33 Treatment System would utilize the same healthy donor allogenic cell source for both trem-cel and VCAR33^{ALLO}. We plan to collect initial data on trem-cel from the VBP101 clinical trial and initial clinical data from the VCAR33^{ALLO} program prior to IND submission for the trem-cel + VCAR33 Treatment System. However, the VBP301 protocol allows for patients who have received a trem-cel transplant on the VBP101 study to enroll in VBP301 and receive VCAR33^{ALLO}. This may provide valuable early insights into the potential of the trem-cel + VCAR33 Treatment System to enable a more potent therapy and durable responses post-transplant.

We operate an in-house clinical manufacturing facility in Cambridge, Massachusetts to support development of our shielded transplants and CAR-T therapeutic candidates for patients with blood cancers. While this facility is now operational, we continue to rely on third-party contract manufacturers for our required raw materials, manufacturing devices, active pharmaceutical ingredients and finished product for our research and clinical manufacturing. Since our inception in December 2015, we have devoted substantially all of our resources to raising capital, organizing and staffing our company, business and scientific planning, conducting discovery and research activities, acquiring or discovering product candidates, establishing and protecting our intellectual property portfolio, developing and progressing our product candidates and preparing for clinical trials, establishing arrangements with third parties for the manufacture of our product candidates and component materials, building out our internal clinical manufacturing facility and providing general and administrative support for these operations. We do not have any product candidates approved for sale and have not generated any revenue from product sales. Through December 31, 2023, we funded our operations primarily through the sale of equity securities and debt financings and have received aggregate net proceeds from these transactions of approximately $464.0 million.

We have incurred significant operating losses since inception, including net losses of $117.9 million and $92.1 million for the years ended December 31, 2023 and 2022, respectively. As of December 31, 2023, we had an accumulated deficit of $340.1 million.

As of December 31, 2023, we had cash, cash equivalents and marketable securities of $137.2 million. We expect that our cash, cash equivalents and marketable securities at December 31, 2023 will enable us to fund our operating expenses and capital expenditure requirements into the second half of 2025.

Financial Operations Overview

Revenue

We have not generated any revenue since our inception and do not expect to generate any revenue from the sale of products in the near future, if at all. If our development efforts for our product candidates are successful and result in marketing approval, or if we enter into collaboration or license agreements with third parties, we may generate revenue in the future from a combination of product sales or payments from such agreements.

Expenses

Research and Development Expenses

Research and development expenses consist primarily of external and internal expenses incurred in connection with our research and development activities, including our drug discovery efforts and the development of our product candidates.

External expenses include:

- research and development expenses incurred under agreements with CROs and other scientific development services;
- costs of consultants, including their fees and related travel expenses;
- costs related to compliance with quality and regulatory requirements;
- costs of laboratory supplies and acquiring and developing preclinical and clinical trial materials, including expenses associated with our CMOs; and
- payments made under third party licensing agreements.

Internal expenses include:

- personnel-related expenses, including salaries, bonuses, benefits and stock-based compensation expenses, for employees involved in research and development activities; and
- facilities, depreciation and other allocated expenses, which include direct and allocated expenses for rent, insurance and other internal operating costs, and internal manufacturing expenses.

We expense research and development costs as incurred. We recognize external development costs based on an evaluation of the progress to completion of specific tasks using information provided to us by our vendors.

Payments for these activities are based on the terms of the individual agreements, which may differ from the pattern of costs incurred, and are reflected in our consolidated financial statements as prepaid expenses or accrued research and development expenses. Nonrefundable advance payments for goods or services to be received in the future for use in research and development activities are deferred and capitalized, even when there is no alternative future use for the research and development. The capitalized amounts are expensed as the related goods are delivered or the services are performed.

A significant portion of our research and development costs have been external costs, which we track by stage of development, preclinical or clinical. However, we do not track our internal research and development expenses on a program specific basis because these costs are deployed across multiple projects and, as such, are not separately classified.

Research and development activities are central to our business model. We expect that our research and development expenses will increase significantly for the foreseeable future as we continue to identify and develop product candidates, particularly as more of our product candidates move into clinical development and later stages of clinical development.

The successful development of our product candidates in the future is highly uncertain. Therefore, we cannot reasonably estimate or know the nature, timing and estimated costs of the efforts that will be necessary to complete the development and commercialization of any of our product candidates. We are also unable to predict when, if ever, material net cash inflows will commence from the sale of our product candidates, if approved. This is due to the numerous risks and uncertainties associated with developing product candidates, many of which are outside of our control, including the uncertainty of:

- the timing and progress of preclinical and clinical development activities;
- the number and scope of preclinical and clinical programs we decide to pursue;
- our ability to maintain our current research and development programs and to establish new ones;
- establishing an appropriate safety profile with IND-enabling studies;
- the number of sites and patients included in the clinical trials;
- the countries in which the clinical trials are conducted;
- per patient trial costs;
- successful patient enrollment in, and the initiation of, clinical trials, as well as drop out or discontinuation rates or complications with donors;
- the successful completion of clinical trials with safety, tolerability and efficacy profiles that are satisfactory to the FDA or any comparable foreign regulatory authority;
- the number of trials required for regulatory approval;
- the timing, receipt and terms of any regulatory approvals from applicable regulatory authorities;
- our ability to establish new licensing or collaboration arrangements;
- the performance of our current and future collaborators, if any;
- establishing commercial manufacturing capabilities or making arrangements with third-party manufacturers;
- significant and changing government regulation and regulatory guidance;
- the impact of any business interruptions to our operations or to those of the third parties with whom we work;
- obtaining, maintaining, defending and enforcing patent claims and other intellectual property rights;
- launching commercial sales of our product candidates, if approved, whether alone or in collaboration with others; and

- maintaining a continued acceptable safety profile of the product candidates following approval.

Any changes in the outcome of any of these variables could mean a significant change in the costs and timing associated with the development of our product candidates.

General and Administrative Expenses

General and administrative expenses consist primarily of personnel-related costs, including salaries, bonuses, benefits and stock-based compensation expenses for employees involved in our executive, finance, corporate, business development and administrative functions, as well as expenses for outside professional services, including legal, audit, accounting and tax-related services and other consulting fees, facility-related expenses, which include depreciation costs and other allocated expenses for rent and maintenance of facilities, insurance costs, recruiting costs, travel expenses and other general administrative expenses.

We expect that our general and administrative expenses will increase as our business expands and we hire additional personnel to support our continued research and development activities, including our clinical programs. We also anticipate continued increased expenses associated with being a public company, including costs for legal, audit, accounting, investor and public relations, regulatory and tax-related services related to compliance with the rules and regulations of the Securities and Exchange Commission (the "SEC"), Nasdaq listing standards and director and officer insurance premiums.

Other Income

Interest Income

Interest income consists of interest income earned on our cash, cash equivalents and marketable securities held in financial institutions.

Results of Operations

Comparison of Years Ended December 31, 2023 and 2022

The following table summarizes our results of operations for the years ended December 31, 2023 and 2022 (in thousands):

	Year Ended December 31,		
	2023	2022	Change
Operating expenses:			
Research and development	$ 94,315	$ 64,550	$ 29,765
General and administrative	31,721	28,868	2,853
Total operating expenses	126,036	93,418	32,618
Loss from operations	(126,036)	(93,418)	(32,618)
Other income:			
Interest income	8,173	1,324	6,849
Total other income	8,173	1,324	6,849
Net loss	$ (117,863)	$ (92,094)	$ (25,769)

Research and Development Expenses

The following table summarizes our research and development expenses incurred for the years ended December 31, 2023 and 2022 (in thousands):

	Year Ended December 31,		
	2023	2022	Change
External expenses	$ 39,051	$ 23,535	$ 15,516
Internal expenses:			
Manufacturing expenses	4,372	—	4,372
Personnel expenses (including stock-based compensation)	35,727	29,955	5,772
Facilities and other expenses	15,165	11,060	4,105
Total research and development expenses	$ 94,315	$ 64,550	$ 29,765

Research and development expenses were $94.3 million for the year ended December 31, 2023, compared to $64.6 million for the year ended December 31, 2022. The increase of $29.8 million was primarily attributable to an increase of $19.9 million driven by clinical trial and manufacturing activities for our trem-cel and VCAR33^{ALLO} programs, external research and development costs related to the continued development of our platform studies, and the execution of our non-exclusive license with Editas Medicine. In addition, personnel-related costs increased $5.8 million driven by an increase in share-based compensation expense and additional headcount to support our research and development activities, and facilities and other expenses increased by $4.1 million driven by our laboratory and cGMP manufacturing facility expansion.

General and Administrative Expenses

General and administrative expenses were $31.7 million for the year ended December 31, 2023, compared to $28.9 million for the year ended December 31, 2022. The increase of $2.8 million was attributable to an increase in personnel expenses driven by an increase in share-based compensation expense.

Other Income

Other income increased by $6.8 million for the year ended December 31, 2023, compared to the year ended December 31, 2022. The increase in interest income was due to increases in interest received from our cash, cash equivalents and marketable securities.

Liquidity and Capital Resources

Sources of Liquidity

Since our inception, we have not recognized any revenue and have incurred operating losses and negative cash flows from our operations. We have not yet commercialized any product and we do not expect to generate revenue from sales of any products for several years, if at all. We have funded our operations primarily through the sale of equity securities and debt financings and have received aggregate net proceeds from these transactions of approximately $464.0 million as of December 31, 2023.

In order to fund our future operations, including our planned clinical trials, on March 14, 2022, we filed a universal shelf registration statement (the "Shelf Registration Statement"), to provide for aggregate offerings of up to $350.0 million of common stock, preferred stock, debt securities, warrants or any combination thereof. As of December 31, 2023, $274.8 million remains available under this Shelf Registration Statement, including $120.1 million reserved for at-the market offerings discussed below.

At-the-Market Sales Agreements

In March 2022, we entered into an open market sale agreement with Jefferies LLC ("Jefferies") as the sales agent pursuant to which we could issue and sell common stock with an aggregate value of up to $125.0 million in one or more at-the-market offerings (the "Jefferies ATM Facility"). Jefferies acted as the sole sales agent for any sales made under the Jefferies ATM Facility for a commission up to 3.0% on gross proceeds. The common stock was sold at prevailing market prices at the time of the sale. We sold 856,030 shares of common stock under the

Jefferies ATM Facility during the year ended December 31, 2022 at a weighted average price per share of $5.23 for aggregate net proceeds of $4.3 million, after deducting commissions.

In December 2022, we terminated the Jefferies ATM Facility and entered into a Sales Agreement with Stifel, Nicolaus & Company, Incorporated ("Stifel") as the agent (the "Stifel ATM Facility"). Pursuant to the Stifel ATM Facility, we may offer and sell shares of common stock with an aggregate value of up to $125.0 million. We will pay Stifel a commission of up to 3.0% of the gross proceeds of any common stock sold through Stifel. We sold 1,016,662 and 10,000 shares of common stock under the Stifel ATM Facility during the years ended December 31, 2023 and 2022 at a weighted average price per share of $4.75 and $6.67, respectively, for aggregate net proceeds of $4.7 million and less than $0.1 million, respectively after deducting commissions and issuance costs payable by us. As of December 31, 2023, $120.1 million remained available to be sold under the Stifel ATM Facility.

Offering and Concurrent Private Placement

In December 2022, we issued 15,302,267 shares of common stock in an underwritten public offering under our Shelf Registration Statement at a price per share of $4.30 for proceeds of $61.3 million, after deducting underwriting discounts, commissions, and offering expenses payable by us. In a separate concurrent private placement, we sold 11,627,907 shares of common stock at a price of $4.30 per share to RA Capital Healthcare Fund, L.P. for proceeds of $49.5 million, after deducting related placement fees payable by us.

Cash Requirements

As of December 31, 2023, we had cash, cash equivalents and marketable securities of $137.2 million. We will need to raise additional capital in the future to fund our future operations. However, we cannot guarantee that we will be able to obtain sufficient additional funding or that if we do obtain additional funding, that such funding, will be obtainable on terms satisfactory to us. In the event that we are unable to obtain sufficient additional funding, there can be no assurance that we will be able to continue as a going concern.

We expect that our existing cash, cash equivalents and marketable securities at December 31, 2023 will enable us to fund our operating expenses and capital expenditure requirements into the second half of 2025. We have based this estimate on assumptions that may prove to be wrong and we could exhaust our capital resources sooner than we expect.

We expect our expenses to increase substantially if, and as, we:

- continue research and preclinical and clinical development of our product candidates, including in particular the expenses associated with our clinical trials;
- incur both internal and third party manufacturing costs to support our preclinical studies and clinical trials of our product candidates and, if approved, their commercialization;
- seek to identify and develop additional product candidates;
- make investments in our platform, including the continuing costs of developing and maintaining our internal manufacturing capabilities;
- seek regulatory and marketing approvals for our product candidates;
- establish a sales, marketing and distribution infrastructure to commercialize any approved product candidates;
- adapt our regulatory compliance efforts to incorporate requirements to applicable marketed products;
- acquire or in-license products, product candidates, technologies;
- maintain, expand, enforce, defend and protect our intellectual property;
- hire additional clinical, quality control, manufacturing and other scientific personnel;
- add operational, financial and management information systems and personnel;
- expand our office, laboratory and manufacturing facility; and

- experience any delays or encounter any issues with any of the above.

In addition, we expect to continue to incur additional costs associated with operating as a public company, including significant legal, audit, accounting, investor and public relations, regulatory, tax-related, director and officer insurance premiums, investor relations and other expenses. Developing pharmaceutical products, including conducting preclinical studies and clinical trials, is a time-consuming, expensive and uncertain process that takes years to complete, and we may never generate the necessary data or results required to obtain marketing approval for any product candidates or generate revenue from the sale of any product candidate for which we may obtain marketing approval. In addition, our product candidates, if approved, may not achieve commercial success. Our commercial revenues, if any, will be derived from sales of products that we do not expect to be commercially available for at least several years, if ever.

As a result, we will need substantial additional funding to support our continuing operations and pursue our growth strategy. Until such time as we can generate significant revenue from product sales, if ever, we expect to finance our operations through the public or private sale of our equity, government or private party grants, debt financings or other capital sources, including potential collaborations with other companies or other strategic transactions. To the extent that we raise additional capital through the sale of our equity or convertible debt securities, including through the use of the Stifel ATM Facility, the ownership interest of our shareholders will be or could be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our stockholders. Debt financing and equity financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. If we are unable to obtain additional funding, we could be forced to delay, reduce or eliminate some or all of our research and development programs, product portfolio expansion or any commercialization efforts, which could adversely affect our business prospects, or we may be unable to continue operations. If we raise funds through strategic collaborations or other similar arrangements with third parties, we may have to relinquish valuable rights to our platform technology, future revenue streams, research programs or product candidates or may have to grant licenses on terms that may not be favorable to us and/or may reduce the value of our common stock. Our ability to raise additional funds may be adversely impacted by worsening global economic conditions and disruptions to and volatility in the credit and financial markets in the United States and worldwide resulting from worsening geopolitical tensions and adverse macroeconomic conditions or otherwise. Because of the numerous risks and uncertainties associated with product development, we cannot predict the timing or amount of increased expenses, and there is no assurance that we will ever be profitable or generate positive cash flow from operating activities.

We did not have during the periods presented, and we do not currently have, any off-balance sheet arrangements that, have or are reasonably likely to have a material current or future effect on our financial condition, changes in financial condition, revenues or expenses, results of operations, liquidity, cash requirements or capital resources.

Cash Flows

The following table provides information regarding our cash flows for the periods presented (in thousands):

	Year Ended December 31,	
	2023	2022
Net cash used in operating activities	$ (100,292)	$ (85,144)
Net cash provided by (used in) investing activities	71,008	(94,091)
Net cash provided by financing activities	2,938	117,140
Net decrease in cash, cash equivalents and restricted cash equivalents	$ (26,346)	$ (62,095)

Operating Activities

Net cash used in operating activities was $100.3 million for the year ended December 31, 2023, reflecting a net loss of $117.9 million, offset by a net $0.7 million benefit from changes in operating assets and liabilities, and non-cash charges of $16.9 million. The non-cash charges primarily consisted of stock-based compensation expense

of $13.4 million, non-cash lease expense of $4.7 million and depreciation expense of $3.5 million, offset by non-cash interest accretion of $4.7 million.

Net cash used in operating activities was $85.1 million for the year ended December 31, 2022, reflecting a net loss of $92.1 million and net cash use of $9.8 million for operating assets and liabilities, which were offset by non-cash charges of $16.8 million. The non-cash charges primarily consisted of stock-based compensation expense of $10.7 million, non-cash lease expense of $3.6 million and depreciation expense of $2.5 million.

The $15.1 million increase in net cash used in operating activities for the year ended December 31, 2023 compared to the year ended December 31, 2022 was primarily due to an increase in research and development expenses, including clinical and manufacturing expenses as a result of the ongoing trem-cel clinical trial and the start of our VCAR33 clinical timing, and differences in the timing of payments for research and development expenses incurred during each respective period.

Investing Activities

Net cash provided by investing activities was $71.0 million for the year ended December 31, 2023, which consisted of purchases of $74.9 million of marketable securities and $1.1 million of property and equipment offset by proceeds of $147.0 million from the maturity of marketable securities. Net cash used in investing activities was $94.1 million for the year ended December 31, 2022, which consisted of purchases of $123.2 million of marketable securities and $8.5 million of property and equipment offset by proceeds of $37.6 million from the maturity of marketable securities.

Financing Activities

Net cash provided by financing activities was $2.9 million for the year ended December 31, 2023, which consisted of proceeds of $4.6 million from the sale of common stock under the Stifel ATM Facility and proceeds of $0.3 million from the exercise of stock options and purchases of common stock under our ESPP, offset by the payment of $0.7 million of issuance costs related to the underwritten public offering under our Shelf Registration Statement and concurrent private placement that closed in December 2022, and $1.2 million of taxes paid related to net share settlement of equity awards. Net cash provided by financing activities was $117.1 million for the year ended December 31, 2022, which consisted of proceeds of $111.5 million from the sale of common stock under the public offering and concurrent private placement, before deducting commissions and issuance costs payable by us, proceeds of $4.5 million received from the sale of common stock under the Jefferies ATM Facility and the Stifel ATM Facility, and net proceeds of $1.2 million from the exercise of stock options and purchases of common stock under our ESPP.

Contractual Obligations and Other Commitments

Contractual obligations relate to future minimum lease payments for existing non-cancellable leases primarily relating to corporate office and laboratory real estate, with terms expiring through February 2030. Future minimum annual rental payments required under these operating lease agreements as of December 31, 2023 are described in more detail in Note 9 to our audited consolidated financial statements, included elsewhere in this Annual Report.

Other commitments include license and collaboration agreements we have entered into with certain parties. Such arrangements require ongoing payments, including payments upon the achievement of certain development, regulatory and commercial milestones, receipt of sublicense income, as well as royalties on commercial sales. Payments under these arrangements are expensed as incurred.

We also have agreements with certain vendors for various services, including services related to clinical operations and support, which we are not contractually able to terminate for convenience and avoid any and all future obligations to the vendors. Under such agreements, we are contractually obligated to make certain payments to vendors to reimburse them for their unrecoverable outlays incurred prior to cancellation. The exact amounts of such obligations are dependent on the timing of termination and the exact terms of the relevant agreement and

cannot be reasonably estimated. We do not include these payments in this summary as they are not fixed and estimable.

Critical Accounting Estimates

Our management's discussion and analysis of financial condition and results of operations is based on our consolidated financial statements. Our consolidated financial statements are prepared in accordance with generally accepted accounting principles in the United States. The preparation of our consolidated financial statements and related disclosures requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, costs and expenses, and the disclosure of contingent assets and liabilities in our consolidated financial statements. We base our estimates on historical experience, known trends and events and various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. We evaluate our estimates and assumptions on an ongoing basis. Our actual results may differ from these estimates under different assumptions or conditions. During the year ending December 31, 2023, there were no material changes to these assumptions.

While our significant accounting policies are described in more detail in Note 2 to our audited consolidated financial statements included elsewhere in this Annual Report, we believe that the following accounting policies are those most critical to the judgments and estimates used in the preparation of our consolidated financial statements.

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

Recent Accounting Pronouncements

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

Emerging Growth Company and Smaller Reporting Company Status

Section 107 of the JOBS Act provides that an "emerging growth company" can take advantage of the extended transition period provided in Section 7(a)(2)(B) of the Securities Act of 1933, as amended, for complying with new or revised accounting standards. Thus, an emerging growth company can delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We elected the extended transition period for complying with new or revised accounting standards, which delays the adoption of these accounting standards until they would apply to private companies.

In addition, as an emerging growth company, we may take advantage of specified reduced disclosure and other requirements that are otherwise applicable generally to public companies. These provisions include:

- being permitted to present only two years of audited consolidated financial statements in addition to any required unaudited interim consolidated financial statements, with correspondingly reduced disclosure in

the section titled "Management's Discussion and Analysis of Financial Condition and Results of Operations";

- an exception from compliance with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended;
- reduced disclosure about our executive compensation arrangements in our periodic reports, proxy statements and registration statements;
- exemptions from the requirements of holding non-binding advisory votes on executive compensation or golden parachute arrangements; and
- an exemption from compliance with the requirements of the Public Company Accounting Oversight Board regarding the communication of critical audit matters in the auditor's report on consolidated financial statements.

We may take advantage of these provisions until the last day of the fiscal year ending after the fifth anniversary of our initial public offering or such earlier time that we no longer qualify as an emerging growth company. We will cease to qualify as an emerging growth company on the date that is the earliest of: (i) December 31, 2026; (ii) the last day of the fiscal year in which we have more than $1.235 billion in total annual gross revenues; (iii) the date on which we are deemed to be a "large accelerated filer" under the rules of the SEC, which means the market value of our common stock that is held by non-affiliates exceeds $700 million as of the prior June 30th and we have been a public company for at least 12 months and have filed one annual report on Form 10-K; or (iv) the date on which we have issued more than $1.0 billion of non-convertible debt over the prior three-year period. We may choose to take advantage of some but not all of these reduced reporting burdens. We have taken advantage of certain reduced reporting requirements in this this Annual Report. Accordingly, the information contained herein may be different than you might obtain from other public companies in which you hold equity interests.

We are also a "smaller reporting company." If we are a smaller reporting company at the time that we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, as a smaller reporting company, we may choose to present only the two most recent fiscal years of audited consolidated financial statements in our Annual Report and, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation.

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

We are a smaller reporting company, as defined in Rule 12b-2 under the Securities Exchange Act of 1934, as amended, for this reporting period and are not required to provide the information required under this item.

Item 8. Financial Statements and Supplementary Data.

The financial statements required to be filed pursuant to this Item 8 are appended to this Annual Report on Form 10-K. An index of those financial statements is found in Item 15, Exhibits and Financial Statement Schedules, 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

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2023. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934 (the "Exchange Act"), means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the Securities and Exchange Commission's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Our management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and our management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of December 31, 2023, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level.

Management's Annual Report on Internal Control over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Rule 13a-15(f) under the Exchange Act. Our management conducted an assessment of the effectiveness of our internal control over financial reporting based on the criteria set forth in "Internal Control-Integrated Framework (2013)" issued by the Committee of Sponsoring Organization of the Treadway Commission. Based on this assessment, management concluded that, as of December 31, 2023 our internal control over financial reporting was effective.

This Annual Report on Form 10-K does not include an attestation report of our independent registered public accounting firm on 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 were no changes in our internal control over financial reporting that occurred during our most recent fiscal quarter that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information.

During the quarter ended December 31, 2023, none of our directors or officers (as defined in Rule 16a-1(f) under the Exchange Act) adopted, modified or terminated a "Rule 10b5-1 trading arrangement" or a "non-Rule 10b5-1 trading arrangement" (as each term is defined in Item 408 of Regulation S-K).

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 10 will be set forth under the captions “Executive Officers”, “Proposal No. 1 – Election of Two Class III Directors,” “Corporate Governance,” and "Delinquent Section 16(a) Reports" in our Definitive Proxy Statement with respect to our 2024 Annual Meeting of Stockholders and is incorporated herein by reference.

Item 11. Executive Compensation.

The information required by this Item 11 will be set forth under the captions “Executive Compensation” and “Director Compensation” in our Definitive Proxy Statement with respect to our 2024 Annual Meeting of Stockholders and is incorporated herein by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

The information required by this Item 12 will be set forth under the captions “Security Ownership of Certain Beneficial Owners and Management” and “Equity Compensation Plans at December 31, 2023” in our Definitive Proxy Statement with respect to our 2024 Annual Meeting of Stockholders and is incorporated by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

The information required by this Item 13 will be set forth under the captions “Certain Relationships and Related Party Transactions” and “Corporate Governance” in our Definitive Proxy Statement with respect to our 2024 Annual Meeting of Stockholders and is incorporated herein by reference.

Item 14. Principal Accountant Fees and Services.

The information required by this Item 14 will be set forth under the caption “Independent Registered Public Accountants’ Fees” in our Definitive Proxy Statement with respect to our 2024 Annual Meeting of Stockholders and is incorporated herein by reference.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

(1) For a list of the financial statements included herein, see Index to the Consolidated Financial Statements on page F-1 of this Annual Report on Form 10-K, incorporated into this Item by reference.

(2) Schedules have been omitted since they are either not required or not applicable or the information is otherwise included herein.

(3) Exhibits

Exhibit Number	Description	Incorporated by Reference				Filed Herewith
		Form	File No.	Exhibit Number	Filing Date	
3.1	Amended and Restated Certificate of Incorporation of the Registrant	8-K	001-39979	3.1	February 9, 2021	
3.2	Amended and Restated Bylaws of the Registrant	8-K	001-39979	3.2	February 9, 2021	
4.1	Form of Common Stock Certificate of the Registrant	S-1/A	333-252175	4.1	February 1, 2021	
4.2	Amended and Restated Investors' Rights Agreement, by and among the Registrant and certain of its stockholders, dated June 30, 2020	S-1/A	333-252175	4.2	February 1, 2021	
4.3	Description of the Registrant's Securities Registered Pursuant to Section 12 of the Securities Exchange Act of 1934	10-K	001-39979	4.3	March 14, 2022	
10.1†	Patent License Agreement, by and between the Registrant and the U.S. Department of Health and Human Services, as represented by the National Cancer Institute, dated October 30, 2020	S-1	333-252175	10.3	January 15, 2021	
10.2†	Exclusive License Agreement, by and between the Registrant and The Trustees of Columbia University in the City of New York ("Columbia"), dated April 28, 2016	S-1	333-252175	10.1	January 15, 2021	
10.3†	First Amendment to Exclusive License Agreement, by and between the Registrant and Columbia, dated February 12, 2019	S-1	333-252175	10.2	January 15, 2021	
10.4†	Second Amendment to Exclusive License Agreement, by and between the Registrant and Columbia, dated November 8, 2021	10-Q	001-39979	10.1	November 10, 2021	

10.5	Lease Agreement, by and between the Registrant and PPF Off 100 Cambridge Park Drive, LLC ("Landlord"), dated December 17, 2019	S-1	333-252175	10.4	January 15, 2021
10.6	First Amendment to Lease, by and between the Registrant and the Landlord, dated June 15, 2021	8-K	001-39979	10.1	June 17, 2021
10.7	Second Amendment to Lease, by and between the Registrant and the Landlord, dated June 15, 2021	8-K	001-39979	10.2	June 17, 2021
10.8+	2015 Stock Incentive Plan and Forms of Option Grant Agreements, Exercise Notices and Restricted Stock Agreement	S-1	333-252175	10.5	January 15, 2021
10.9+	2021 Equity Incentive Plan and Forms of Stock Option Grant Notice, Stock Option Agreement, Restricted Stock Unit Grant Notice and Restricted Stock Unit Award Agreement	S-1/A	333-252175	10.6	February 1, 2021
10.10+	2021 Employee Stock Purchase Plan	S-1/A	333-252175	10.7	February 1, 2021
10.11+	2023 Inducement Plan and Forms of Stock Option Grant Notice, Stock Option Agreement, Notice of Exercise, RSU Award Grant Notice and Award Agreement (RSU Award) thereunder	S-8	333-274275	99.1	August 30, 2023
10.12+	Form of Indemnification Agreement with Executive Officers and Directors	S-1	333-252175	10.8	January 15, 2021
10.13+	Offer Letter, by and between the Registrant and Robert Ang, dated June 28, 2019	S-1	333-252175	10.9	January 15, 2021
10.14+	Offer Letter, by and between the Registrant and Nathan Jorgensen, dated March 20, 2020	S-1	333-252175	10.12	January 15, 2021
10.15+	Offer Letter, by and between the Registrant and Tirtha Chakraborty, dated August 28, 2019	S-1	333-252175	10.13	January 15, 2021
10.16+	Non-Employee Director Compensation Policy	10-Q	001-39979	10.1	May 11, 2023
10.17+	Executive Severance and Change in Control Benefits Plan	S-1/A	333-252175	10.15	February 1, 2021
10.18	Securities Purchase Agreement, dated as of December 7, 2022, by and between the Registrant and RA Capital Healthcare Fund, L.P.	8-K	001-39979	10.1	December 7, 2022

10.19	Sales Agreement, dated December 23, 2022, by and between the Registrant and Stifel, Nicolaus & Company, Incorporated	8-K	001-39979	1.1	December 23, 2022	
21.1	Subsidiaries of the Registrant	S-1	333-252175	21.1	January 15, 2021	
23.1	Consent of Ernst & Young LLP					X
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					X
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					X
32.1*	Certification of Principal Executive Officer and Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002					X
97.1	Incentive Compensation Recoupment Policy					X
101.INS	Inline XBRL Instance Document					X
101.SCH	Inline XBRL Taxonomy Extension Schema Document					X
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document					X
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document					X
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document					X
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document					X
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)					

+ Indicates management contract or compensatory plan.

† Portions of the exhibit have been omitted as the Registrant has determined that: (i) the omitted information is not material; and (ii) the omitted information is the type that the Registrant treats as private or confidential.

***** This certification is being furnished and will not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or otherwise subject to the liability of that section, and are not to be incorporated by reference into any filing of the Registrant, whether made before or after the date hereof, regardless of any general incorporation language in such filing.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

VOR BIOPHARMA INC.

Date: March 20, 2024

By: Robert Ang
Robert Ang, M.B.B.S., M.B.A.
President and Chief Executive Officer

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
Robert Ang B.S., M.B.A.	President, Chief Executive Officer and Director (Principal Executive Officer)	March 20, 2024
Nathan Jorgensen B.A.	Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer)	March 20, 2024
	Chairman of the Board	March 20, 2024
Daniella Beckman	Director	March 20, 2024
David C. Lubner	Director	March 20, 2024
ndberg, M.D.	Director	March 20, 2024
Joshua Resnick	Director	March 20, 2024

VOR BIOPHARMA INC.
INDEX TO FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Vor Biopharma Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Vor Biopharma Inc. (the Company) as of December 31, 2023 and 2022, the related consolidated statements of operations and comprehensive loss, stockholders' equity and cash flows for each of the two years in the period ended December 31, 2023, and 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 at December 31, 2023 and 2022, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2023, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

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

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

Our audits included performing procedures to assess the risks of material misstatement of the 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 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 financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP
We have served as the Company's auditor since 2020
Boston, Massachusetts
March 20, 2024

VOR BIOPHARMA INC.
CONSOLIDATED BALANCE SHEETS

(in thousands, except share amounts)	December 31, 2023	December 31, 2022
Assets		
Current assets:		
Cash and cash equivalents	$ 31,360	$ 57,706
Marketable securities	105,815	172,539
Prepaid expenses	3,153	4,368
Other current assets	475	2,337
Total current assets	140,803	236,950
Restricted cash equivalents	2,413	2,413
Property and equipment, net	10,050	12,634
Operating lease right-of-use assets	40,048	44,444
Other assets	4,812	2,925
Total assets	$ 198,126	$ 299,366
Liabilities and stockholders' equity		
Current liabilities:		
Accounts payable	$ 815	$ 1,772
Accrued liabilities	10,877	7,889
Operating lease liabilities	3,830	3,272
Other current liabilities	50	186
Total current liabilities	15,572	13,119
Long-term liabilities:		
Operating lease liabilities—non-current	31,830	35,640
Total liabilities	47,402	48,759
Stockholders' equity:		
Preferred stock, $0.0001 par value; 10,000,000 shares authorized as of December 31, 2023 and December 31, 2022; 0 shares issued and outstanding as of December 31, 2023 and December 31, 2022	—	—
Common stock, $0.0001 par value; 400,000,000 shares authorized as of December 31, 2023 and December 31, 2022; 67,901,610, and 66,079,597 shares issued and 67,891,311 and 65,996,138 outstanding as of December 31, 2023 and December 31, 2022, respectively	7	7
Additional paid-in capital	490,874	473,587
Accumulated other comprehensive loss	(77)	(770)
Accumulated deficit	(340,080)	(222,217)
Total stockholders' equity	150,724	250,607
Total liabilities and stockholders' equity	$ 198,126	$ 299,366

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

VOR BIOPHARMA INC.
CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS

(in thousands, except share and per share amounts)	Year Ended December 31, 2023	2022
Operating expenses:		
Research and development	$ 94,315	$ 64,550
General and administrative	31,721	28,868
Total operating expenses	$ 126,036	$ 93,418
Loss from operations	$ (126,036)	$ (93,418)
Other income:		
Interest income	8,173	1,324
Total other income	8,173	1,324
Net loss	$ (117,863)	$ (92,094)
Net loss per share attributable to common stockholders, basic and diluted	$ (1.75)	$ (2.33)
Weighted-average common shares outstanding, basic and diluted	67,191,973	39,551,420
Other comprehensive income (loss):		
Unrealized gain (loss) on available for sale investments	693	(770)
Total other comprehensive income (loss)	693	(770)
Comprehensive loss	$ (117,170)	$ (92,864)

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

VOR BIOPHARMA INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

(in thousands, except share amounts)	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit	Total Stockholders' Equity
Balance, December 31, 2021	37,174,741	$ 4	$ 346,382	$ —	$ (130,123)	$ 216,263
Issuance of common stock upon vesting of RSUs, vesting and exercise of stock options, and issuance of common stock from ESSP, net of shares withheld for taxes	1,025,193	—	1,350	—	—	1,350
Issuance of common stock from at-the-market sales agreement	866,030	—	4,356	—	—	4,356
Issuance of common stock from offering and concurrent private placement, net of issuance costs	26,930,174	3	110,804	—	—	110,807
Stock-based compensation expense	—	—	10,695	—	—	10,695
Other comprehensive loss, net of tax	—	—	—	(770)	—	(770)
Net loss	—	—	—	—	(92,094)	(92,094)
Balance, December 31, 2022	65,996,138	$ 7	$ 473,587	$ (770)	$ (222,217)	$ 250,607
Issuance of common stock upon vesting of RSUs, vesting and exercise of stock options, and issuance of common stock from ESSP, net of shares withheld for taxes	878,510	—	(787)	—	—	(787)
Issuance of common stock from at-the-market sales agreements	1,016,662	—	4,712	—	—	4,712
Stock-based compensation expense	—	—	13,362	—	—	13,362
Other comprehensive loss, net of tax	—	—	—	693	—	693
Net loss	—	—	—	—	(117,863)	(117,863)
Balance, December 31, 2023	67,891,310	$ 7	$ 490,874	$ (77)	$ (340,080)	$ 150,724

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

VOR BIOPHARMA INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS

(in thousands)	Year Ended December 31, 2023	2022
Cash flows from operating activities		
Net loss	$ (117,863)	$ (92,094)
Adjustments to reconcile net loss to net cash used in operations:		
Depreciation expense	3,492	2,525
Non-cash lease expense	4,727	3,578
Stock-based compensation	13,362	10,695
Interest amortization on marketable securities	(4,660)	(12)
Changes in operating assets and liabilities:		
Operating lease liabilities, net	(3,583)	(10,454)
Prepaid expenses and other current assets	3,270	225
Accounts payable and accrued liabilities	2,850	1,114
Other assets	(1,887)	(721)
Net cash used in operating activities	(100,292)	(85,144)
Cash flow from investing activities		
Purchases of marketable securities	(74,923)	(123,189)
Proceeds from maturities of marketable securities	147,000	37,560
Purchases of property and equipment	(1,069)	(8,462)
Net cash provided by (used in) investing activities	71,008	(94,091)
Cash flow from financing activities		
Proceeds from the issuance of common stock from public offering and concurrent private placement, net of underwriter fees and issuance costs	—	111,524
Payment of issuance costs related to underwritten public offering and concurrent private placement	(717)	—
Proceeds from the issuance of common stock from at-the-market sales agreements, net of issuance costs	4,578	4,451
Shares repurchased for tax withholdings upon vesting of restricted stock unit awards	(1,187)	—
Proceeds from stock option exercises and the issuance of shares under ESPP	264	1,165
Net cash provided by financing activities	2,938	117,140
Net decrease in cash, cash equivalents and restricted cash equivalents	(26,346)	(62,095)
Cash, cash equivalents and restricted cash equivalents, beginning of period	$ 60,119	$ 122,214
Cash, cash equivalents and restricted cash equivalents, end of period	$ 33,773	$ 60,119
Supplemental disclosure of non-cash activities		
Right-of-use assets obtained in exchange for lease obligations	$ —	$ 23,376
Purchases of property and equipment in accounts payable and accrued liabilities	$ 70	$ 38
Financing costs associated with the sale of common stock included in accounts payable and accrued expenses	$ 27	$ 812

A reconciliation of the cash, cash equivalents and restricted cash reported within the consolidated balance sheets that sum to the total of the same amounts shown in the statements of cash flows is as follows:

(in thousands)	December 31, 2023	2022
Cash and cash equivalents	$ 31,360	$ 57,706
Restricted cash equivalents	2,413	2,413
Total cash, cash equivalents and restricted cash equivalents as shown on the statements of cash flows	$ 33,773	$ 60,119

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

1. Nature of the Business

Vor Biopharma Inc. (the "Company") is a clinical-stage cell and genome engineering company that combines a novel patient engineering approach with targeted therapies to provide a single company solution for patients suffering from hematological malignancies. The Company's proprietary platform leverages its expertise in hematopoietic stem cell ("HSC") biology, genome engineering and targeted therapy development to genetically modify HSCs to remove surface targets expressed by cancer cells. The Company is headquartered in Cambridge, Massachusetts. The Company was incorporated on December 30, 2015.

Risks and Uncertainties

The Company is subject to a number of risks common to development stage companies in the biotechnology industry, including, but not limited to, risks of failure of preclinical studies and clinical trials, dependence on key personnel, protection of proprietary technology, reliance on third party organizations, risks of obtaining regulatory approval for any product candidate that it may develop, development by competitors of technological innovations, compliance with government regulations, and the need to obtain additional financing.

The Company anticipates that it will continue to incur significant operating losses for the next several years as it continues to develop its product candidates. The Company believes that its existing cash, cash equivalents and marketable securities at December 31, 2023 will be sufficient to allow the Company to fund its current operations through at least a period of one year after the date the financial statements are issued.

2. Summary of Significant Accounting Policies

Basis of Presentation

The accompanying consolidated financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America ("GAAP"). Certain comparative amounts have been reclassified to conform to the current period presentation. Any reference in these notes to applicable guidance is meant to refer to the authoritative GAAP as found in the Accounting Standards Codification ("ASC") or an Accounting Standards Update ("ASU") issued by the Financial Accounting Standards Board ("FASB").

Use of Estimates

The preparation of the consolidated financial statements in conformity with GAAP requires the Company's management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the consolidated financial statements and the reported amount of expenses during the reporting period. Actual results could differ from those estimates. Management considers many factors in selecting appropriate financial accounting policies in developing the estimates and assumptions that are used in the preparation of the consolidated financial statements. Management must apply significant judgment in this process. Management's estimation process often may yield a range of potentially reasonable estimates and management must select an amount that falls within that range of reasonable estimates. Estimates are used in the following areas, among others: accrued expenses and related research and development expenses.

Segments

Operating segments are defined as components of an enterprise for which separate and discrete information is available for evaluation by the chief operating decision-maker in deciding how to allocate resources and assess performance. The Company has one operating segment. The Company's chief operating decision maker, its Chief Executive Officer, manages the Company's operations on an aggregate basis for the purpose of allocating resources.

Cash and Cash Equivalents

The Company considers highly-liquid investments purchased with an original maturity date of ninety days or less from the date of purchase to be cash equivalents. Cash and cash equivalents include cash held in banks and amounts held in money market funds. Cash equivalents are stated at cost, which approximates market value.

Marketable Securities

Investments in marketable debt securities are classified as available-for-sale. Marketable securities with maturities beyond one year may be classified as short-term based on their highly liquid nature and because such securities represent an investment of cash that is available for current operations.

Available-for-sale marketable securities are reported at fair value at each balance sheet date. Unrealized gains or losses are reported as a component of accumulated other comprehensive income (loss), a component of stockholders' equity. Amortization and accretion of premiums and discounts are recorded in interest income. Realized gains and losses are included as a component of other income, net in the consolidated statements of operations.

The Company evaluates its marketable securities with unrealized losses for impairment. When assessing marketable securities for unrealized declines in value, the Company considers whether the decline in value is related to a credit loss or non-credit loss. For credit losses, the Company reduces the marketable security to fair value through an allowance for credit losses recorded to the balance sheet and corresponding charge to the statement of operations. The allowance for credit losses and corresponding impairment charge is adjusted each period for changes in fair value. For non-credit losses, the Company reduces the marketable security to fair value through a charge to the statement of comprehensive income (loss), reported as a component of accumulated other comprehensive income (loss) in stockholders' equity. No credit losses were recorded during the periods presented.

Restricted Cash Equivalents

The Company had $2.4 million of restricted cash equivalents in the form of a letter of credit related to a lease at December 31, 2023 and 2022.

Comprehensive income (loss)

Comprehensive income (loss) includes net loss, as well as other changes in stockholders' equity that result from transactions and economic events other than those with stockholders.

Concentrations of Credit Risk

Financial instruments that potentially expose the Company to concentrations of credit risk consist primarily of cash and cash equivalents, restricted cash equivalents and marketable securities. The Company maintains deposits in accredited financial institutions in excess of federally insured limits. The Company deposits its cash in financial institutions that it believes have high credit quality and has not experienced any losses on such accounts and does not believe it is exposed to any unusual credit risk beyond the normal credit risk associated with commercial banking relationships.

The Company's marketable securities may consist of money market funds and marketable debt securities, including corporate bonds and U.S. Treasury securities. The Company's investment policy limits instruments to investment grade securities with high credit quality issuers with the objective to preserve capital and to maintain liquidity until the funds can be used in business operations.

Fair Value Measurements

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

of the following three levels of the fair value hierarchy, of which the first two are considered observable and the last is considered unobservable:

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

To the extent that the valuation is based on models or inputs that are less observable or unobservable in the market, the determination of fair value requires more judgment. Accordingly, the degree of judgment exercised by the Company in determining fair value is greatest for instruments categorized in Level 3. A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement.

Cloud Computing Arrangements

The Company capitalizes implementation costs for cloud computing arrangement service contracts. The Company's cloud computing arrangements relate to its enterprise resource planning and manufacturing software. For such cloud computing service contracts, the Company capitalizes certain implementation costs as prepaid expenses in the consolidated balance sheets. The Company amortizes these capitalized cloud computing implementation costs into general and administrative expenses using the straight-line method over the fixed, non-cancellable term of the associated hosting arrangement, plus any reasonably certain renewal periods.

Property and Equipment, Net

Property and equipment, net is recorded at cost less accumulated depreciation. Depreciation expense is recorded using the straight-line method over the estimated useful life of the related asset, which are as follows:

	Estimated Useful Life
Computer equipment	3 years
Manufacturing equipment	5 years
Furniture and equipment	5 years
Laboratory equipment	5 years
Leasehold improvements	Shorter of remaining lease term or useful life

Purchased assets that are not yet in service are recorded to construction-in-process and no depreciation expense is recorded. Once they are placed in service, they are reclassified to the appropriate asset class. When assets are retired or otherwise disposed of, the assets and related accumulated depreciation are eliminated from the accounts and any resulting gain or loss is reflected in the Company's consolidated statements of operation and comprehensive loss. Expenditures for maintenance and repairs are expensed as incurred.

Impairment of Long-Lived Assets

Long-lived assets consist of property and equipment. The Company continually evaluates whether events or circumstances have occurred that indicate that the estimated remaining useful life of its long-lived assets may warrant revision or that the carrying value of these assets may not be recoverable. If circumstances require that a long-lived asset or asset group be tested for impairment, the Company first compares the estimated undiscounted future cash flows expected to result from the use or disposition of that asset or asset group to its carrying amount. If the carrying amount of the long-lived asset or asset group is not recoverable on an undiscounted cash flow basis, an impairment loss would be recognized to the extent the carrying value exceeds its fair value. Fair value is determined through various valuation techniques including discounted cash flow models, quoted market prices and third-party independent appraisals, as considered necessary. No impairments occurred in the years ending December 31, 2023 and 2022.

Leases

At the inception of an arrangement, the Company determines whether the arrangement is or contains a lease. Leases with a term greater than one year are recognized on the consolidated balance sheet as a right-of-use ("ROU") asset and current and non-current lease liabilities, as applicable. The Company has made an accounting policy election, known as the short-term lease recognition exemption, which allows the Company to not recognize ROU assets and lease liabilities that arise from short-term leases (12 months or less); The Company has applied this election to all classes of underlying assets. The Company typically only includes an initial lease term in its assessment of a lease arrangement. Options to renew or options to cancel a lease are not included in the Company's assessment unless there is reasonable certainty that the Company will renew or will not cancel, respectively. The Company monitors its material leases on a quarterly basis.

Operating lease liabilities and their corresponding ROU assets are recorded based on the present value of future lease payments over the expected remaining lease term. Lease cost for operating leases is recognized on a straight-line basis over the lease term as an operating expense. Certain adjustments to the ROU asset may be required for items such as lease prepayments or incentives received. The interest rate implicit in lease contracts is typically not readily determinable. As a result, the Company utilizes its incremental borrowing rate, which reflects the fixed rate at which the Company could borrow on a collateralized basis the amount of the lease payments in the same currency, for a similar term, in a similar economic environment.

The Company has elected to account for the lease and non-lease components together for office, laboratory, and manufacturing real estate leases.

Research and Development

Research and development expenses include costs directly attributable to the conduct of the Company's research and development programs.

Expenditures relating to research and development are expensed in the period incurred. Nonrefundable advance payments for goods and services that will be used in future research and development activities are expensed when the activity has been performed or when the goods have been received rather than when the payment is made. The cost of materials for a research and development activity that have an alternative future use is capitalized when the materials are acquired and recognized as expense as consumed. The costs of materials that were acquired for a particular research and development activity and have no alternative future use are expensed in the period acquired.

Costs incurred in obtaining licenses are recognized as research and development expense as incurred if the license has no alternative use.

Accrued Research and Development Expenses

The Company has entered into various research and development related contracts, including contracts with third-party contract research organizations and contract manufacturing organizations. These agreements are cancelable, and related payments are recognized as research and development expenses as incurred. The Company records accrued liabilities for estimated ongoing research costs. When evaluating the adequacy of the accrued liabilities, the Company analyzes the progress of the studies, 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. To date, the Company's historical accrual estimates have not been materially different from the actual costs.

Stock-Based Compensation Expense

The Company accounts for stock-based compensation under the provisions of ASC 718-10, *Compensation—Stock Compensation* ("ASC 718-10"), which requires all share-based payments to employees, non-employees and directors, including grants of stock options and restricted stock, to be recognized in the consolidated statements of operations and comprehensive loss based on their fair values on the date of grant over the requisite service period, which is generally the vesting period of the respective award. Forfeitures are accounted for as they occur. Generally, the Company issues awards with only service-based vesting conditions and records the expense for these awards using the ratable method. The Company classifies stock-based compensation expense in the same manner in which the award recipient's payroll or service provider's costs are classified. Share-based payments that contain performance conditions are recognized when such conditions are probable of being achieved.

The fair value of each restricted common stock award and each restricted stock unit award is estimated on the date of grant based on the fair value of the Company's common stock on that same date.

The fair value of each option grant is estimated on the date of grant using the Black-Scholes option pricing model which requires inputs based on certain subjective assumptions, including the following:

- *Fair Value of Common Stock*— See the discussion below.
- *Expected Term*—The expected term represents the period that the stock-based awards are expected to be outstanding. The Company uses the simplified method to determine the expected term, which is based on the average of the time-to-vesting and the contractual life of the options.
- *Expected Volatility*—Because the Company does not have sufficient trading history for its common stock as of December 31, 2023, the expected volatility was 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 the similar size, stage in life cycle or area of specialty. The Company will continue to apply this process until a sufficient amount of historical information regarding the volatility of its 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 the awards.
- *Dividend Yield*—The Company has never paid dividends on its common stock and has no plans to pay dividends on its common stock. Therefore, the Company used an expected dividend yield of zero.

The Company began to use the closing common stock price as reported on the Nasdaq Global Select Market exchange as the fair value of common stock on the date of a grant subsequent to the Company's initial public offering of its common stock ("IPO"). Prior to the Company's IPO the estimated fair value of common stock was determined by the Company's board of directors as of the date of each option grant, with input from management, considering third-party valuations of its common stock as well as the Company's board of directors' assessment of additional objective and subjective factors that it believed were relevant and which may have changed from the date of the most recent third-party valuation through the date of the grant. These objective and subjective factors include: (i) prices paid for the Company's redeemable convertible preferred stock, and the rights, preferences, and privileges of the Company's redeemable convertible preferred stock and common stock; (ii) the Company's stage of development; (iii) the fact that the grants of stock-based awards related to illiquid securities in a private company; and (iv) the likelihood of achieving a liquidity event for the common stock underlying the stock-based awards, such as an initial public offering or sale of the Company, given prevailing market conditions. These third-party valuations were performed in accordance with the guidance outlined in the American Institute of Certified Public Accountants' Accounting and Valuation Guide, Valuation of Privately Held Company Equity Securities Issued as Compensation. Each valuation methodology includes estimates and assumptions that require the Company's judgment. The methodology utilized to estimate the fair value of the Company's common stock was the option-pricing method ("OPM") to back-solve the estimated value of the Company's equity and corresponding value of the Company's common stock.

Income Taxes

The Company accounts for income taxes using the asset and liability approach. Deferred tax assets and liabilities represent future tax consequences of temporary differences between the financial statement carrying amounts and the tax basis of assets and liabilities and for loss carryforwards using enacted tax rates expected to be in effect in the years in which the differences reverse. A valuation allowance is established to reduce deferred tax assets to the amounts expected to be realized. The Company also recognizes a tax benefit from uncertain tax positions only if it is "more likely than not" that the position is sustainable based on its technical merits. The Company accounts for interest or penalties related to uncertain tax positions as part of its provision for income taxes. To date, the Company has not incurred interest and penalties related to uncertain tax positions. Should such costs be incurred, they would be classified as a component of provision for income taxes.

Net Loss Per Share

Basic net loss per share is computed by dividing net loss by the weighted-average number of common shares outstanding during the reporting period, without consideration for potentially dilutive securities. Diluted net loss per share is computed by dividing net loss by the weighted-average number of common shares and potentially dilutive

securities outstanding during the periods. For purposes of the diluted net loss per share calculation, restricted stock, restricted stock units and stock options considered to be potentially dilutive securities were excluded from the calculation of diluted net loss per share because their effect would be anti-dilutive and therefore, basic and diluted net loss per share were the same for all reporting periods presented.

Recent Accounting Pronouncements

From time to time, new accounting pronouncements are issued and adopted by the Company as of the specified effective date. Unless otherwise discussed, the impact of recently issued standards that are not yet effective will not have a material impact on the Company's consolidated financial statements upon adoption. Under the Jumpstart Our Business Startups Act of 2012, as amended (the "JOBS Act"), the Company meets the definition of an emerging growth company and has elected to take advantage of the extended transition period for complying with certain new or revised accounting standards pursuant to Section 107(b) of the JOBS Act.

Recently Issued Accounting Pronouncements Not Yet Adopted

In October 2023, the FASB issued ASU 2023-06 Disclosure Improvements: Codification Amendments in Response to the SEC's Disclosure Update and Simplification Initiative ("ASU 2023-06"), which modifies certain disclosure and presentation requirements of a variety of Topics in the Codification and is intended to both clarify or improve such requirements and align the requirements with the SEC's regulations. The effective date for each amendment is the effective date of the removal of the related disclosure from Regulation S-X or Regulation S-K, with early adoption prohibited. The Company will apply the provisions prospectively as such provisions become effective, and does not expect ASU 2023-06 to have a material impact on the consolidated financial statements.

In November 2023, the FASB issued ASU 2023-07, Segment Reporting (Topic 280): Improvements to Reportable Segment Disclosures ("ASU 2023-07"). ASU 2023-07 updates reportable segment disclosure requirements, primarily through enhanced disclosures about significant segment expenses and information used to assess segment performance. This update is effective beginning with the Company's 2024 fiscal year annual reporting period, with early adoption permitted. The Company is currently evaluating the impact that the adoption of this standard will have on its consolidated financial statements and disclosures.

In December 2023, the FASB issued ASU 2023-09, Income Taxes (Topic 740): Improvements to Income Tax Disclosures ("ASU 2023-09"). ASU 2023-09 requires more detailed income tax disclosures, requiring entities to disclose disaggregated information about their effective tax rate reconciliation as well as expanded information on income taxes paid by jurisdiction. The disclosure requirements will be applied on a prospective basis, with the option to apply them retrospectively. This update is effective beginning with the Company's 2025 fiscal year annual reporting period, with early adoption permitted. The Company is currently evaluating the impact that the adoption of this standard will have on its consolidated financial statements and disclosures.

3. Marketable Securities

The amortized cost and estimated fair value of marketable securities, by contractual maturity are as follows:

	December 31, 2023			
(in thousands)	Amortized Cost	Gross Unrealized Holding Gains	Gross Unrealized Holding Losses	Fair Value
Maturing in one year or less				
U.S. Treasury Bill	$ 8,806	$ 6	$ —	$ 8,812
U.S. Treasuries	97,086	12	(95)	97,003
Total	$ 105,892	$ 18	$ (95)	$ 105,815

(in thousands)	December 31, 2022 Amortized Cost	Gross Unrealized Holding Gains	Gross Unrealized Holding Losses	Fair Value
Maturing in one year or less				
Corporate Bonds	$ 5,001	$ —	$ (56)	$ 4,945
U.S. Treasuries	116,432	—	(617)	115,815
Maturing after one year through five years				
U.S. Treasuries	51,876	—	(97)	51,779
Total	$ 173,309	$ —	$ (770)	$ 172,539

The following table summarizes the fair value and gross unrealized losses aggregated by category and the length of time that individual securities have been in an unrealized loss position:

(in thousands)	December 31, 2023 Greater than twelve months Fair value	Greater than twelve months Unrealized loss	Total Fair value	Total Unrealized loss
U.S. Treasuries	$ 53,447	$ (95)	$ 53,447	$ (95)
Total	$ 53,447	$ (95)	$ 53,447	$ (95)

(in thousands)	December 31, 2022 Greater than twelve months Fair value	Greater than twelve months Unrealized loss	Total Fair value	Total Unrealized loss
Corporate Bonds	$ 4,945	$ (57)	$ 4,945	$ (57)
U.S. Treasuries	162,601	(713)	162,601	(713)
Total	$ 167,546	$ (770)	$ 167,546	$ (770)

The Company holds investment grade marketable securities considered to be in an unrealized loss position. Although these marketable securities are held at an unrealized loss position at December 31, 2023, the Company does not intend to sell the marketable securities prior to the value of the securities being recovered and the Company has concluded that it is more likely than not that the marketable securities cost basis values will be recovered prior to sale of the securities and that there are no conditions or events that might require the Company to sell the securities before recovery of the cost basis occurs. Further, the Company did not record any impairments to marketable securities or reserves for credit losses related to its marketable debt securities during the periods ended December 31, 2023 and December 31, 2022.

4. Fair Value Measurements

The following tables present information about the Company's financial assets and liabilities measured at fair value on a recurring basis:

(in thousands)	December 31, 2023 Level 1	Level 2	Level 3	Total
Cash equivalents				
Money market funds	$ 31,164	$ —	$ —	$ 31,164
Marketable securities				
U.S. Treasury Bill	8,812	—	—	8,812
U.S. Treasuries	—	97,003	—	97,003
Total marketable securities	8,812	97,003	—	105,815
Restricted cash equivalents				
Money market funds	2,413	—	—	2,413
Total	$ 42,389	$ 97,003	$ —	$ 139,392

(in thousands)	December 31, 2022 Level 1	Level 2	Level 3	Total
Cash equivalents				
Money market funds	$ 46,981	$ —	$ —	$ 46,981
Marketable securities				
Corporate bonds	—	4,945	—	4,945
U.S. Treasuries	—	167,594	—	167,594
Total marketable securities	—	172,539	—	172,539
Restricted cash equivalents				
Money market funds	2,413	—	—	2,413
Total	$ 49,394	$ 172,539	$ —	$ 221,933

The fair value of the Company's cash equivalents and restricted cash equivalents is based on quoted market prices in active markets with no valuation adjustment. The fair value of marketable securities was determined based on observable market inputs. During the years ended December 31, 2023 and 2022, there were no transfers between levels.

Prepaid expenses, accounts payable and accrued expenses are stated at their respective historical carrying values which approximate fair value due to their short-term nature.

5. Property and Equipment, Net

Property and equipment, net consisted of the following:

(in thousands)	December 31, 2023	December 31, 2022
Laboratory equipment	$ 10,028	$ 9,499
Manufacturing equipment	6,936	5,706
Computer equipment	432	432
Furniture, fixtures and other	599	568
Construction in progress	146	1,039
Total	18,141	17,244
Less: Accumulated depreciation	(8,091)	(4,610)
Property and equipment, net	$ 10,050	$ 12,634

Depreciation expense for the years ended December 31, 2023 and 2022 was approximately $3.5 million and $2.5 million, respectively.

6. Accrued Expenses and Other Current Liabilities

Accrued expenses and other current liabilities consisted of the following:

(in thousands)	December 31, 2023	December 31, 2022
Employee-related expenses	$ 5,962	$ 4,408
Professional fees	1,245	1,701
Clinical expenses	1,495	532
Research and development expenses	1,059	569
Manufacturing expenses	842	328
Other	274	351
Total accrued liabilities	$ 10,877	$ 7,889

7. Stockholders' Equity

Common Stock

As of December 31, 2023 and 2022, the Company's authorized capital stock included 400,000,000 shares of its $0.0001 par value common stock.

Each share of common stock entitles the holder to one vote on all matters submitted to a vote of the Company's stockholders provided, however, that, except as otherwise required by law, holders of common stock shall not be entitled to vote on any amendment to the Company's Certificate of Incorporation, as amended (the "Certificate of Incorporation"), that relates solely to the terms of one or more outstanding series of preferred stock if the holders of such affected series are entitled, either separately or together with the holders of one or more other such series, to vote thereon pursuant to the Certificate of Incorporation or pursuant to the Delaware General Corporation Law. Common stockholders are entitled to receive dividends, as may be declared by the Company's board of directors, if any, subject to the preferential dividend rights of the preferred stock. No dividends have been declared or paid as of and for either of the years ended December 31, 2023 and 2022.

At-the-Market Sales

During the years ended December 31, 2023 and, 2022, the Company sold 1,016,662 and 866,030 shares of common stock, respectively, in at-the-market offerings at a weighted average price per share of $4.75 and $5.25, respectively, for aggregate net proceeds of $4.7 million and $4.4 million, respectively after deducting commissions.

Offering and Concurrent Private Placement

In December 2022, the Company issued 15,302,267 shares of common stock in an underwritten public offering at a price per share of $4.30 for proceeds of $61.3 million, after deducting underwriting discounts, commissions, and offering expenses payable by the Company. In a separate concurrent private placement, the Company sold 11,627,907 shares of common stock at a price of $4.30 per share to RA Capital Healthcare Fund, L.P. for proceeds of $49.5 million, after deducting related placement fees payable by the company.

8. Stock-Based Compensation

2023 Inducement Plan

On August 25, 2023, the Company's board of directors adopted the Company's 2023 Inducement Plan (the "2023 Inducement Plan") pursuant to which the Company reserved 3,500,000 shares of common stock for issuance under the 2023 Inducement Plan. The 2023 Inducement Plan provides for the grant of non-statutory stock options, restricted stock awards, restricted stock unit awards, stock appreciation rights, performance awards and other forms of stock-based compensation to eligible individuals. In accordance with Nasdaq Marketplace Rule 5635(c)(4), awards under the 2023 Inducement Plan may only be made to individuals not previously employees or directors of the Company (or following such individuals' bona fide period of non-employment with the Company), as an

inducement material to the individuals' entry into employment with the Company. Awards granted under the 2023 Inducement Plan must be approved by either a majority of the Company's independent directors or the compensation committee of the Company's board of directors. As of December 31, 2023, the Company had 3,263,436 shares of its common stock available for future issuance under the 2023 Inducement Plan.

Stock Incentive Plans

In December 2015, the Company's board of directors adopted and approved the 2015 Stock Incentive Plan (as amended to date, the "2015 Plan"). The 2015 Plan provided for the granting of incentive stock options, non-statutory stock options, restricted stock awards and other stock-based awards to eligible employees, officers, directors, consultants and advisors as determined by the Company's board of directors.

In February 2021, the Company's board of directors adopted and stockholders approved the 2021 Equity Incentive Plan (the "2021 Plan"). The 2021 Plan became effective on February 5, 2021, following which no further grants were or will be made under the 2015 Plan. The 2021 Plan provides for the grant of stock options, non-statutory stock options, restricted stock awards, restricted stock unit awards, stock appreciation rights, performance stock awards and other forms of stock compensation to our employees, consultants and directors.

The number of shares of our common stock reserved for issuance under our 2021 Plan will automatically increase on January 1 of each year through January 1, 2031, by 4.0% of the total number of shares of common stock outstanding on December 31 of the preceding calendar year. Any grants that expire or are canceled, terminated, forfeited, fail to vest, or are withheld to satisfy a tax withholding obligation are allowed to be reissued under 2021 Plan. As of December 31, 2023, the Company had 1,270,867 shares of its common stock available for future issuance under the 2021 Plan.

Stock Options

The Company's stock options generally vest over 48 months with 25% vesting after one year followed by ratable monthly vesting over three years and have a contractual term of 10 years. The weighted-average assumptions used principally in determining the fair value of options granted were as follows:

	Year Ended December 31,	
	2023	2022
Fair value of common stock	$ 4.94	$ 4.78
Expected term (in years)	6.0	5.9
Expected volatility	81.7%	78.8%
Risk-free interest rate	3.8%	2.5%
Dividend yield	—	—

The following table summarizes the Company's stock option activity for the year ended December 31, 2023:

	Shares	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value (in thousands)
Outstanding at December 31, 2022	6,471,524	$ 6.69	8.28	$ 14,949
Granted	2,347,469	4.94		
Vested and exercised	(94,028)	1.85		
Forfeited	(358,336)	7.41		
Expired	(76,552)	12.09		
Outstanding at December 31, 2023	8,290,077	$ 6.17	7.71	$ 999
Exercisable at December 31, 2023	4,539,019	$ 6.19	7.02	$ 880

The aggregate intrinsic value of options is calculated as the difference between the exercise price of the stock options and the fair value of the Company's common stock for those stock options that had exercise prices lower than the fair value of the common stock as of the respective date.

The weighted-average grant-date fair value of stock options granted during the years ended December 31, 2023 and 2022 was $3.56 and $7.10 per share, respectively. As of December 31, 2023, total unrecognized

compensation expense related to stock options was $14.0 million which is expected to be recognized over a weighted-average period of 2.3 years. The intrinsic value of stock options exercised was $0.1 million for the year ended December 31, 2023.

As of December 31, 2023 and 2022, options for 10,299 and 83,459 shares with weighted average exercise prices of $4.90 and $2.23 were exercised and unvested, respectively. The underlying proceeds from the unvested exercises of less than $0.1 million and $0.2 million is recorded in other current liabilities as of December 31, 2023 and 2022, on the consolidated balance sheet.

Restricted Stock Units

As of December 31, 2023, there were 1,113,381 restricted stock units outstanding under the 2021 Plan and the 2023 Inducement Plan. The following table summarizes the Company's unvested restricted stock unit activity for the year ended December 31, 2023:

	Shares	Weighted-Average Grant Date Fair Value
Unvested at December 31, 2022	1,430,200	$ 5.49
Granted	801,611	4.88
Vested	(1,019,846)	5.59
Forfeited	(98,584)	5.71
Unvested at December 31, 2023	1,113,381	$ 4.94

As of December 31, 2023, total unrecognized compensation expense related to the unvested restricted stock units was $4.6 million, which is expected to be recognized over a weighted average period of 2.2 years.

2021 Employee Stock Purchase Plan

In February 2021, the Company's board of directors adopted and stockholders approved the 2021 Employee Stock Purchase Plan (the "ESPP"). The ESPP became effective on February 5, 2021. The number of shares of common stock reserved for issuance under the ESPP will automatically increase on January 1 of each year through January 1, 2031, by the lesser of (i) 1% of the total number of shares of our common stock outstanding on December 31 of the preceding calendar year, and (ii) 1,800,000 shares. If purchase rights granted under the ESPP terminate without having been exercised, the shares of common stock not purchased under such purchase rights will again become available for issuance under the ESPP. As of December 31, 2023, the Company had 1,289,604 shares of its common stock available for future issuance under the ESPP.

The ESPP permits eligible employees to purchase common stock through accumulated payroll deductions at a purchase price equal to 85% of the lesser of the market value of the common stock at the beginning of the 6-month offering period or on the purchase date. During the years ended December 31, 2023 and 2022, the Company issued 82,703 and 34,242 shares with a weighted average purchase price of $2.73 and $3.41 during the year ended December 31, 2023, which resulted in an immaterial amount of compensation expense.

Stock-Based Compensation

Stock-based compensation expense was allocated as follows:

	Year Ended December 31,	
(in thousands)	2023	2022
Research and development	$ 6,831	$ 6,036
General and administrative	6,531	4,659
Total stock-based compensation expense	$ 13,362	$ 10,695

9. Leases

Cambridgepark Lease

In December 2019, the Company entered into a lease agreement for its new corporate office and laboratory facility (the "Cambridgepark Lease") in Cambridge, Massachusetts. The Cambridgepark Lease has a term of 10

years, beginning on the rent commencement date which is two months after the lease commencement date. There are no options to extend the lease. The lease commencement date, for accounting purposes, was deemed to be reached as of June 30, 2020.

On June 15, 2021, the Company entered into the first lease amendment ("First Lease Amendment") and the second lease amendment ("Second Lease Amendment" and, together with the First Lease Amendment, the "Lease Amendments") with PPF Off 100 Cambridge Park Drive, LLC (the "Landlord"). The Lease Amendments amended the Cambridgepark Lease with the Landlord in Cambridge, Massachusetts to add additional leased space in the same building (the "Amended Cambridgepark Lease").

The First Lease Amendment expanded the amount of space leased by the Company by an additional 10,262 square feet in exchange for aggregate total fixed rent payments of approximately $8.4 million with the annual fixed rental payments escalating from $0.8 million to $1.1 million during the term. The First Lease Amendment commenced for accounting purposes on January 28, 2022.

The Second Lease Amendment expands the amount of space leased by the Company by an additional 30,175 square feet in exchange for aggregate total fixed rent payments of approximately $22.3 million with the annual fixed rental payments escalating from $1.1 million to $3.0 million during the term. The Second Lease Amendment's term commenced for accounting purposes on April 29, 2022.

Payments associated with the Amended Cambridgepark Lease include fixed and variable payments. Variable payments relate to the Company's share of the Landlord's operating costs associated with the underlying assets and are recognized when the event on which those payments are assessed. The Amended Cambridgepark Lease does not contain a residual value guarantee. The Lease Amendments term end dates are coterminous with the Cambridgepark Lease.

In conjunction with the Amended Cambridgepark Lease, the Company was required to establish a $2.4 million irrevocable standby letter of credit for the benefit of the Landlord, which has been secured by money market investments and is presented as restricted cash equivalents.

The elements of lease expense were as follows:

(in thousands)	Year Ended December 31, 2023	2022
Operating lease cost	$ 7,802	$ 6,435
Variable lease cost	2,618	1,798
Total lease cost	$ 10,420	$ 8,233

Amounts reported in the consolidated balance sheets and the weight-average lease term and discount rate information were as follows:

(in thousands except weighted-average amounts)	December 31, 2023	December 31, 2022
Assets		
Operating lease right-of-use assets	$ 40,048	$ 44,444
Liabilities		
Operating lease liabilities, current	$ 3,830	$ 3,272
Operating lease liabilities, non-current	31,830	35,640
Total lease liabilities	$ 35,660	$ 38,912
Weighted-Average Lease Term and Discount Rate		
Weighted-average remaining lease term (years)	6.7	7.7
Weighted-average discount rate	8.2%	8.2%

The following table represents other lease activity:

(in thousands)	Year Ended December 31, 2023	2022
Cash Flow Information		
Cash paid for amounts included in the measurement of lease liabilities		
Operating cash flows for operating leases	$ 6,658	$ 13,311
Right-of-use assets obtained in exchange for lease obligations	$ —	$ 23,376

Future lease payments for noncancelable leases as of December 31, 2023 were as follows:

(in thousands)	December 31, 2023
2024	$ 6,591
2025	6,651
2026	6,681
2027	6,882
2028	7,088
Thereafter	12,902
Total lease payments	$ 46,795
Less: imputed interest	(11,135)
Present value of lease liabilities	$ 35,660

10. Significant Agreements

The Company has agreements with third parties in the normal course of business under which it has obtained licenses for certain developed technologies. Such arrangements may require ongoing payments including annual fees and payments upon the achievement of various development, clinical, regulatory, and commercial milestones. In addition, if any products related to these agreements are approved for sale, the Company may be required to pay significant milestones upon approval and milestones and/or royalties on future sales. The payment of these amounts, however, is contingent upon the occurrence of various future events, which have a high degree of uncertainty of occurrence.

11. Commitments and Contingencies

Legal Proceedings

The Company is not currently a party to any material legal proceedings. At each reporting date, the Company evaluates whether or not a potential loss amount or potential range of loss is probable and reasonably estimated under the provisions of the authoritative guidance that addresses accounting for contingencies. The Company recognizes expenses for its costs related to its legal proceedings, as incurred.

12. Defined Contribution Benefit Plan

The Company maintains a defined contribution plan under Section 401(k) (the "401(k) Plan") of the Internal Revenue Code, as amended (the "Code"). The 401(k) Plan covers all employees who meet defined minimum age and service requirements and allows participants to defer a portion of their annual compensation on a pretax basis, as well as Roth post tax deferrals. The Company matches 100% of compensation amounts deferred up to the first 1% of an employee's compensation plus 50% of compensation amounts deferred between 1% and 6% of an employee's compensation. All matching contributions are immediately vested. Expense recognized by the Company for matching contributions made in accordance with the 401(k) Plan was $1.0 million and $0.8 million for the years ended December 31, 2023 and December 31, 2022, respectively.

13. Income Taxes

The Company accounts for income taxes under FASB ASC 740 ("ASC 740"). For the years ended December 31, 2023 and 2022, the Company did not record a current or deferred income tax expense or benefit. The following table reconciles the federal statutory income rate to the Company's effective income tax rate:

	Year Ended December 31,	
	2023	2022
Federal income tax rate	21.0 %	21.0 %
State income tax benefit	6.1 %	5.8 %
Permanent items	(0.9) %	(0.4) %
Research tax credits	5.7 %	5.5 %
Other	(0.4) %	(0.4) %
Valuation allowance	(31.5) %	(31.5) %
Effective income tax rate	—	—

Deferred tax assets and liabilities reflect the net tax effects of net operating loss and tax credit carryforwards and temporary differences between the carrying amount of assets and liabilities for financial reporting and the amounts used for tax purposes. Significant components of the Company's deferred tax assets and liabilities were as follows:

	December 31,	
(in thousands)	2023	2022
Deferred tax assets:		
Accrued expenses	$ 1,428	$ 1,224
Federal net operating loss carryforwards	39,934	32,262
State net operating loss carryforwards	11,423	8,919
Tax credits	17,062	10,712
Stock compensation	1,545	1,248
R&D Capitalization	33,503	14,881
Amortization	1,464	429
Lease liability	9,746	10,445
Total deferred tax assets	116,105	80,120
Valuation allowance	(104,403)	(68,348)
Net total deferred tax assets	$ 11,702	$ 11,772
Deferred tax liabilities:		
Lease right of use asset	(10,945)	(11,951)
Depreciation and amortization	(757)	179
Total deferred tax liabilities	$ (11,702)	$ (11,772)
Net deferred tax assets	$ —	$ —

The Company has weighed the positive and negative evidence to assess the recoverability of its deferred tax assets. Realization of future tax benefits is dependent on many factors, including the Company's ability to generate taxable income. After this assessment, the Company determined it was more likely than not that the Company will not realize the benefit of its deferred tax assets. As a result, the Company has provided a full valuation allowance against its net deferred tax assets. The valuation allowance for deferred tax assets as of December 31, 2023 and 2022 was $104.4 million and $68.3 million, respectively. For the years ended December 31, 2023 and 2022, the Company recorded an increase in the valuation allowance of $36.1 million and $28.9 million, respectively, primarily related to net operating losses incurred by the Company.

As of December 31, 2023, the Company had gross U.S. federal net operating loss carryforwards of $190.2 million including $188.3 million that had an indefinite carryforward period and $1.9 million that were subject to expiration at various dates through 2037. As of December 31, 2023, the Company had state net operating loss carryforwards of $180.8 million which will expire at various dates through 2043. As of December 31, 2023, the Company had U.S. federal research and development tax credit carryforwards of $12.2 million which will expire at various dates through 2042 and state research and credit carryforwards of $6.1 million which will expire at various

dates through 2038. The net operating loss and tax credit carryforwards are subject to review and possible adjustment by the Internal Revenue Service and state tax authorities.

Net operating loss and tax credit carryforwards may become subject to an annual limitation in the event of certain cumulative changes in the ownership interest of significant shareholders over a three-year period in excess of 50%, as defined under Sections 382 and 383 of the Code, respectively, as well as similar state provisions. This could limit the amount of tax attributes that can be utilized annually to offset future taxable income or tax liabilities. The amount of the annual limitation is determined based on the value of the Company immediately prior to the ownership change. Subsequent ownership changes may further affect the limitation in future years. The Company has not determined whether an ownership change has occurred and as such, the Company's net operating losses may be limited. Any limitation may result in expiration of a portion of the net operating loss carryforwards or research development credit carryforwards before utilization.

The Company has not, as yet, conducted a study of research and development credit carryforwards. Such a study, once undertaken by the Company, may result in an adjustment to the research and development credit carryforwards. However, a full valuation allowance has been provided against the Company's research and development credits and, if any adjustment is required, such adjustment would be offset by an adjustment to the valuation allowance. Thus, there would be no impact to the balance sheet or statement of operations if any adjustment is required.

As of December 31, 2023 and 2022, the Company did not have any unrecognized tax benefits. Any future interest and penalties related to income tax matters would be recognized in the provision for income tax. As of December 31, 2023 and 2022, the Company did not have a balance of accrued interest and penalties related to uncertain tax positions.

The Company files income tax returns in the United States and various states. As of December 31, 2023, there were no income tax examinations in progress.

The tax years 2020 through present remain open to examination by major taxing jurisdictions to which the Company is subject, which are primarily in the United States. In addition, tax years prior to 2019 resulted in losses and the Company also generated research and development tax credits during those years. Since carryforward attributes generated in these years may be utilized in future years, years prior to 2019 may still be adjusted upon examination by the Internal Revenue Service or state tax authorities if they have or will be used in a future period.

14. Net Loss Per Share

The following table sets forth the computation of the Company's basic and diluted net loss per share for the years ended December 31, 2023 and 2022:

	Year Ended December 31,	
(in thousands, except share and per share amounts)	**2023**	**2022**
Numerator:		
Net loss attributable to common stockholders	$ (117,863)	$ (92,094)
Denominator:		
Weighted-average number of common shares outstanding, basic and diluted	67,191,973	39,551,420
Net loss per share attributable to common stockholders, basic and diluted	$ (1.75)	$ (2.33)

The Company's potentially dilutive securities were stock options, unvested restricted stock, and restricted stock units. Based on the amounts outstanding at December 31, 2023 and 2022, the Company excluded the following potential common shares from the computation of diluted net loss per share because including them would have had an anti-dilutive effect:

	As of December 31,	
	2023	2022
Options to purchase common stock	8,290,077	6,388,065
Unvested restricted stock	10,299	83,459
Restricted stock units	1,113,381	1,430,200

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

We consent to the incorporation by reference in the following Registration Statements:

1. Registration Statement (Form S-8 No. 333-252908) pertaining to the 2015 Stock Incentive Plan, 2021 Equity Incentive Plan, 2021 Employee Stock Purchase Plan and Stock Option Awarded Outside of Any Plan of Vor Biopharma Inc.,
2. Registration Statement (Form S-8 No. 333-263540) pertaining to the 2021 Equity Incentive Plan and 2021 Employee Stock Purchase Plan of Vor Biopharma Inc.,
3. Registration Statement (Form S-8 No. 333-270789) pertaining to the 2021 Equity Incentive Plan and 2021 Employee Stock Purchase Plan of Vor Biopharma Inc. and Non-Plan Inducement Stock Option Grant,
4. Registration Statement (Form S-8 No. 333-274275) pertaining to the 2023 Inducement Plan of Vor Biopharma Inc.,
5. Registration Statement (Form S-3 No. 333-268798) of Vor Biopharma Inc., and
6. Registration Statement (Form S-3 No. 333-263541) of Vor Biopharma Inc.,

of our report dated March 20, 2024, with respect to the consolidated financial statements of Vor Biopharma Inc. included in this Annual Report (Form 10-K) for the year ended December 31, 2023.

/s/ Ernst & Young LLP

Boston, Massachusetts
March 20, 2024

Exhibit 31.1

CERTIFICATIONS

I, Robert Ang, certify that:

1. I have reviewed this Annual Report on Form 10-K of Vor Biopharma Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 20, 2024

By: Robert Ang
R

President and Chief Executive Officer
(*Principal Executive Officer*)

Exhibit 31.2

CERTIFICATIONS

I, Nathan Jorgensen, certify that:

1. I have reviewed this Annual Report on Form 10-K of Vor Biopharma Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 20, 2024

By: Nathan Jorgensen

Chief Financial Officer
(*Principal Financial Officer*)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report on Form 10-K of Vor Biopharma Inc. (the "Company") for the year ended December 31, 2023 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), each of the undersigned officers of the Company hereby certifies, pursuant to 18 U.S.C. § 1350, that to his knowledge:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and result of operations of the Company.

Date: March 20, 2024

By: Robert Ang

President and Chief Executive Officer
(*Principal Executive Officer*)

Date: March 20, 2024

By: Nathan Jorgensen

Chief Financial Officer
(*Principal Financial Officer*)