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, 2021

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 001-40591

HCW Biologics Inc.

(Exact name of registrant as specified in its Charter)

Delaware	**82-5024477**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
2929 N. Commerce Parkway Miramar, Florida	**33025**
(Address of principal executive offices)	**(Zip Code)**

Registrant's telephone number, including area code: (954) 842–2024

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, par value $0.0001 per share	HCWB	The Nasdaq Stock Market LLC

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,

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

The aggregate market value of the common stock held by non-affiliates of the registrant as of July 22, 2021, the closing date of the registrant's initial public offering, was approximately $91.4 million based on the closing price of the shares of $4.77 as reported on the Nasdaq Global Market on such date . The registrant has elected to use July 22, 2021, as the calculation date because on June 30, 2021 (the last business day of the registrant's most recently completed second fiscal quarter) the registrant was a privately held company. This calculation does not reflect a determination that certain persons are affiliates of the registrant for any other purpose.

The number of shares of the registrant's common stock outstanding as of March 22, 2022 was 35,779,489.

DOCUMENTS INCORPORATED BY REFERENCE

Part III incorporates by reference certain information from the registrant's definitive proxy statement (the "Proxy Statement") relating to its 2022 Annual Meeting of Stockholders. The Proxy Statement will be filed with the United States Securities and Exchange Commission within 120 days after the end of the fiscal year to which this report relates.

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Special Note Regarding Forward-Looking Statements

This Annual Report on Form 10-K contains forward-looking statements. All statements other than statements of historical facts contained in this report, including statements regarding our future results of operations and financial position, business strategy, product candidates, planned preclinical studies and clinical trials, research and development costs, regulatory approvals, timing and likelihood of success, as well as plans and objectives of management for future operations, are forward-looking statements. In some cases, forward-looking statements may be identified by words such as "believe," "may," "will," "estimate," "continue," "anticipate," "intend," "could," "would," "expect," "objective," "plan," "potential," "seek," "grow," "target," "if," and similar expressions intended to identify forward-looking statements.

We have based these forward-looking statements largely on our current expectations and projections about future events and trends that we believe may affect our financial condition, results of operations, business strategy short-term and long-term business operations and objectives and financial needs. These forward-looking statements are subject to known and unknown risks, uncertainties and assumptions, including risks described in the section titled “Risk Factors” set forth in Part I, Item 1A of this Annual Report on Form 10-K and in our other filings with the Securities and Exchange Commission (the "SEC"). It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. In light of these risks, uncertainties and assumptions, the future events and trends discussed in this Annual Report on Form 10-K may not occur, and actual results may differ materially and adversely from those anticipated or implied in the forward-looking statements. Forward-looking statements contained in this Annual Report on Form 10-K include, but are not limited to, statements about:

- our financial performance;
- the sufficiency of our existing cash and cash equivalents to fund our future operating expenses and capital expenditure requirements;
- our ability to obtain funding for our operations, including funding necessary to develop and commercialize our drug candidates;
- the ability to receive FDA clearance for clinical trials;
- the ability to secure clinical sites, enroll patients, and initiate clinical trials;
- the ability of our clinical trials to demonstrate safety and efficacy of our drug candidates, and other positive results;
- the success, cost and timing of our development activities, preclinical studies and clinical trials;
- the timing and focus of our future clinical trials, and the reporting of data from those trials;
- our plans relating to commercializing our drug candidates, if approved;
- our plans and ability to establish sales, marketing and distribution infrastructure to commercialize any drug candidates for which we obtain approval;
- our ability to attract and retain key scientific and clinical personnel;
- our ability to contract with third-party suppliers and manufacturers and their ability to perform adequately;
- our reliance on third parties to conduct clinical trials of our drug candidates, and for the manufacture of our drug candidates for preclinical studies and clinical trials;
- our ability to establish our own manufacturing facilities domestically;
- our ability to expand our drug candidates into additional indications and patient populations;
- the success of competing therapies that are or may become available;
- the beneficial characteristics, safety and efficacy of our drug candidates;
- regulatory developments in the United States and other jurisdictions;
- our ability to obtain and maintain regulatory approval of our drug candidates, and any related restrictions, limitations and/or warnings in the label of any approved drug candidate;

- our plans relating to the further development and manufacturing of our drug candidates, including additional indications for which we may pursue;
- our plans and ability to obtain or protect intellectual property rights;
- the scope of protection we are able to establish and maintain for intellectual property rights covering our drug candidates and technology; and
- potential claims relating to our intellectual property.

We caution you that the foregoing list may not contain all of the forward-looking statements made in this Annual Report on Form 10-K.

You should not rely upon forward-looking statements as predictions of future events. The events and circumstances reflected in the forward-looking statements may not be achieved or occur. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee future results, levels of activity, performance or achievements. Except as required by law, we do not intend to update any of these forward-looking statements after the date of this Annual Report on Form 10-K or to conform these statements to actual results or revised expectations.

Because some of these risks and uncertainties cannot be predicted or quantified and may be beyond our control, you should read this Annual Report on Form 10-K with the understanding that our actual future results, levels of activity, performance and events and circumstances may be materially different from what we expect.

This Annual Report on Form 10-K contains estimates, projections and other information concerning our industry, our business and the markets for our product candidates. We obtained the industry, market and similar data set forth in this report from our own internal estimates and research and from academic and industry research, publications, surveys and studies conducted by third parties, including governmental agencies. Information that is based on estimates, forecasts, projections, market research or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances that are assumed in this information. While we believe that the data we use from third parties are reliable, we have not separately verified these data. Further, while we believe our internal research is reliable, such research has not been verified by any third party. You are cautioned not to give undue weight to any such information, projections and estimates.

PART I

Item 1. Business.

Overview

HCW Biologics Inc. ("HCW Biologics", "HCW", the "Company, or "we") is a biopharmaceutical company focused on discovering and developing novel immunotherapies to lengthen health span by disrupting the link between chronic, low-grade inflammation and age-related diseases. We believe age-related, chronic, low-grade inflammation, or "inflammaging," is a significant contributing factor to several diseases and conditions, such as cancer, cardiovascular disease, diabetes, neurodegenerative diseases, and autoimmune diseases. The induction and retention of low-grade inflammation in an aging human body is mainly the result of the accumulation of non-proliferative senescent cells and persistent activation of protein complexes, known as inflammasomes, in innate immune cells. These two elements share common mechanisms in promoting secretion of proinflammatory proteins and in many cases interact to drive inflammaging. Our novel approach is to treat both of these elements. We believe our approach has the potential to fundamentally change the treatment of age-related diseases.

We have combined our deep understanding of disease-related immunology with our expertise in advanced protein engineering to develop our TOBI™ (Tissue factOr-Based fusIon) discovery platform for the design of category-defining immunotherapeutic drugs. This modular and tunable technology has allowed us to generate a novel pipeline of internally-developed product candidates capable of activating and targeting desired immune responses and blocking unwanted immunosuppressive activities. Using our TOBI™ platform, we have successfully developed over 30 molecules that can be administered by subcutaneous injection as well as used in adoptive cell therapy approaches. Our focus is to develop immunotherapeutic therapies administered by subcutaneous injection, and we intend to out-license cell therapy based approaches. We have selected two molecules as our lead product candidates: HCW9218 and HCW9302. We have chosen these product candidates because we believe they have the potential to become transformative immunotherapeutics for the treatment of a broad range of age-related diseases, and both can be administered to patients by subcutaneous injection.

In response to physiological or environmental stress, normal tissue cells enter a senescent state of irreversible growth arrest accompanied by the release of Senescence-Associated Secretory Phenotype ("SASP") factors. SASP factors, including proinflammatory cytokines, chemokines, and proteinases, drive the inflammation cycle, including activation of inflammasomes. As our body ages, senescent cells accumulate and increase the release of SASP factors leading to chronic, low-grade inflammation, and organ/tissue damage. Studies have shown that strategies to reduce or eliminate senescent cells can delay, prevent, and improve age-related dysfunctions, including cancer.

The bifunctionality of HCW9218 allows it to function as both a senolytic and senomorphic immunotherapeutic. HCW9218 is designed to treat the impact of accumulated senescent cells and the SASP factors which they secrete by eliminating senescent cells (i.e., senolytic effect) and reducing SASP factors (i.e., senomorphic effect). This molecule is a heterodimeric, bifunctional fusion protein complex comprising extracellular domains of the human transforming growth factor-β ("TGF-β") receptor II, as a TGF-β trap for TGF-β neutralization, and a human interleukin ("IL")-15/IL-15 receptor α complex for immune cell stimulation. Together, the activities of these domains drive senescent cell clearance and SASP factor neutralization. The Company published a paper authored by our scientific research team in the peer-reviewed journal, *Molecular Therapy,* entitled, "Bifunctional TGF-β trap/IL-15 Protein Complex Elicits Potent NK Cell and $CD8^+$ T Cell Immunity Against Solid Tumors." The paper highlights preclinical data from *in vivo* studies demonstrating the potential of HCW9218 as a novel immunostimulant with the ability to simultaneously lessen immunosuppression in patients with cancer.

As the first line of defense to infections or tissue injuries, the innate immune system activates inflammasomes to initiate protective immune responses. Similar to senescent cells, activated inflammasomes promote the release of proinflammatory factors. Unresolved activation of inflammasomes due to chronic infection or persistent tissue injury leads to chronic low-grade inflammation which perpetuates this cycle.

HCW9302 is designed to activate and expand regulatory T ("T_{reg}") cells to suppress the activity of inflammasome-bearing cells and the inflammatory factors which they secrete. This molecule is a single-chain, IL-2-based fusion protein. Inflammasomes are expressed in innate immune cells. When these cells are stimulated by various signals, the inflammasomes become active and the cells release inflammatory factors. In certain conditions, these signaling pathways persist leading to chronic inflammatory responses and associated tissue destruction. Preclinical studies in mouse models have demonstrated the ability of HCW9302 to activate T_{reg} cells and reduce inflammation-related diseases, supporting the potential of HCW9302 to treat a wide variety of autoimmune and age-related diseases.

To date, there has been limited clinical success in targeting senescent cell accumulation or aberrant inflammasome activity using small molecule-based approaches. Studies have found the immune cell activity in young individuals is capable of limiting these processes, which we believe indicates that immunotherapeutic approaches that combine relevant stimulatory and inhibitory components may provide a means of treating age-related diseases by addressing chronic inflammation.

HCW9218: Novel Senolytic and Senomorphic Immunotherapeutic

We have selected cancer as the initial indication for our clinical development. In cancer patients, chemotherapy treatments cause therapy-induced senescence, or TIS, which drives tumor cells to senescence, resulting in increased drug-resistance, immune evasion, disease relapse, and tumor metastasis. We believe the bifunctionality of HCW9218 will allow it to be effective against solid tumor cancers because it simultaneously provides immunostimulation of natural killer ("NK") cells and effector T cells to enhance the cytotoxicity of immune cells against tumor targets, while reducing immunosuppression associated with solid tumors by capturing and neutralizing TGF-β.

Chemotherapy is the current standard of care for treating most forms of cancer. However, these treatments inevitably result in toxicity and unwanted side effects. Multiple studies have revealed that increased normal tissue cellular senescence can promote tumor progression, creating a link between aging and cancer. The persistence of viable and metabolically active senescent tumor cells after chemotherapy has been attributed to worse overall survival in patients. Tumor cells can undergo senescence and secrete proinflammatory factors, or SASP factors, in response to chemotherapy. SASP factors promote TIS cancer cells to re-enter the growth cycle with stem-like characteristics which can result in disease relapse and metastasis. One of the key SASP factors is TGF-ß, well known for its immunosuppressive role in cancer progression. In healthy tissue, TGF-ß is transiently activated in response to tissue injury, resulting in collagen production and, ultimately, healing of the tissue. However, when TFG-ß becomes continuously active, studies have shown that it induces pathological effects associated with inflammation.

The U.S. Food and Drug Administration ("FDA") has permitted two clinical trials to proceed to evaluate HCW9218 in difficult-to-treat cancer indications. A Company-sponsored clinical trial will evaluate HCW9218 in advanced pancreatic cancer, and an Investigator-sponsored trial with the Masonic Cancer Center at University of Minnesota as the sponsor will evaluate HCW9218 in other solid tumors.

Company-sponsored clinical trial. In October 2021, the FDA permitted a Company-sponsored first-in-human Phase 1b clinical trial to proceed with a multi-site trial to evaluate our lead drug candidate, HCW9218, in patients with advanced pancreatic cancer. The Company has identified several potential clinical sites that are National Cancer Institute ("NCI") designated Comprehensive Cancer Centers. These Comprehensive Cancer Centers are completing their internal review processes for study start-up. We expect to initiate this trial in the first half of 2022. The Phase 1b portion is planned to be a dose escalation study of HCW9218 as a monotherapy in refractory patients with advanced pancreatic cancer. If the initial phase of the trial is completed successfully, the Company plans to have the primary aim of the later phases of the study to evaluate HCW9218 as an adjunct therapy to chemotherapy. We expect that the Phase 2 portion of this pancreatic trial will include a cohort of patients receiving HCW9218 as monotherapy and a cohort of patients receiving HCW9218 as an adjunct to chemotherapy.

Investigator-sponsored clinical trial. In January 2022, the FDA permitted the Masonic Cancer Center at University of Minnesota to proceed with a Phase 1 clinical trial, which is a single-center, Investigator-sponsored clinical trial to evaluate HCW9218 in patients with advanced solid tumors with progressive disease after prior chemotherapies. We expect to initiate this trial in the first half of 2022. The Masonic Cancer Center is the Twin Cities' only NCI-designated Comprehensive Cancer Center, and they are designated 'Outstanding' by the National Cancer Institute. This trial is planned to be a dose-escalation study and is designed as a "basket trial" and may include patients with breast, ovarian, prostate, and colorectal cancers. The Principal Investigator of the clinical trial is Melissa A. Geller, M.D., M.S., Professor and Division Director of Gynecologic Oncology in the Department of Obstetrics, Gynecology and Women's Health at the University of Minnesota. The Co-Principal Investigator is Jeffrey A. Miller, M.D., Deputy Director of the Masonic Cancer Center. If the initial phase of the trial is completed successfully, the Principal Investigators may design later phases of clinical trials in solid tumors with the end goal of estimating the response in select solid tumors in combination with disease-appropriate anti-cancer treatment.

The timing of the initiation of the Company-sponsored clinical trial depends upon completion of an internal review and approval process required for each site in order to participate in a clinical study. If any of the clinical sites we have selected does not receive approval to participate, then we will need to identify other potential clinical sites which may cause a delay. The duration of both the Company-sponsored trial and the Investigator-sponsored trial is expected to be approximately 12 months once patient enrollment begins; however, the timing depends on site preparation, how quickly patients can be enrolled in the studies, and the number of dose escalations that will be required to meet the primary objective of the studies. If all of the currently available lot of HCW9218 is used in the initial phase of the trial, continuing to the next phase of clinical trials is contingent upon obtaining FDA

approval of additional lots of cGMP material. Since we plan to have product release of additional cGMP material that meets FDA requirements by the end of 2022, we do not anticipate any delay in advancing our clinical trial to the next phase due to supply issues. However, we cannot assure you that supply will be available if and when it is needed owing to, among other things, the ongoing macro supply chain issues arising from the impact of the COVID-19 pandemic, which are beyond our control. See "Risk Factors -- Supply sources could be interrupted from time to time and, if interrupted, there is no guarantee that supplies could be resumed within a reasonable time frame and at an acceptable cost or at all."

We have selected difficult-to-treat, chemo-resistant cancer indications for our initial clinical trials. We believe a well- designed clinical trial in such challenging indications will demonstrate that HCW9218 can improve the efficacy of chemotherapy and minimize its side effects by eliminating TIS, that is chemotherapy-induced senescent cells in tumors and normal tissues. We are leveraging the extensive clinical expertise of our team to structure clinical trials with clear, objective, and measurable endpoints. We intend to manage initial clinical trials internally and will not use a clinical research organization to assist us.

HCW9302: Novel Immunotherapeutic for T_{reg} Expansion

Our internally developed, lead product candidate, HCW9302, is an IL-2-based fusion molecule that expands T_{reg} cells *in vivo* and *ex vivo* as an injectable or cell-based strategy to reduce inflammation through deactivation of inflammasomes. Preclinical studies have demonstrated the ability of HCW9302 to reduce inflammation, allowing for the potential to treat a wide variety of autoimmune and age-related diseases.

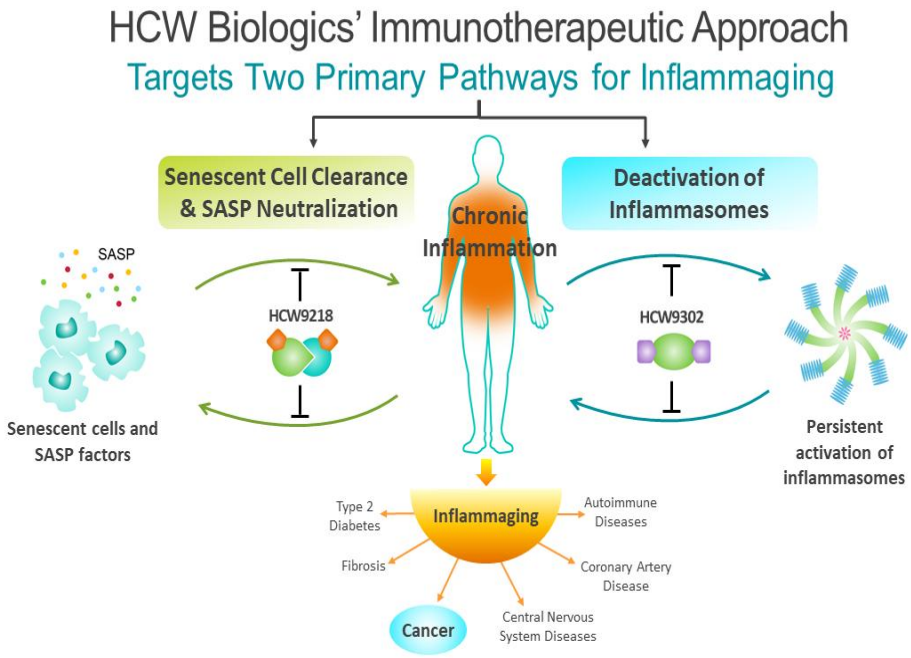
We expect to complete activities required for submission of an Investigational New Drug Application ("IND") to evaluate HCW9302 in an autoimmune disorder by the end of 2022. Upon completion of IND-enabling activities, we intend to submit an IND for a Phase 1b clinical trial to evaluate HCW9302 in alopecia areata. We have not submitted the IND for the planned trial, and we cannot provide any assurance that the FDA will allow us to initiate our planned clinical trials on a timely basis, or at all. In the event that the FDA does not accept our IND, we may also be required to seek feedback, and the feedback may be unfavorable. In the event we do not receive feedback on a timely basis, or we are required to change the design of our clinical protocol or address other feedback, clinical development of our products would be delayed and our costs may increase. Moreover, if the FDA does not allow our initial clinical trial to proceed, we may be required to conduct additional preclinical testing or other IND-enabling activities, which would result in further delay and additional costs. If we successfully complete a Phase 1b study, we plan to build on the safety data established with alopecia areata and expand indications in Phase 2 clinical trials to evaluate HCW9302 in other autoimmune indications or pro-inflammatory diseases, such as atherosclerosis.

Out-Licensing: Strategy for Monetizing Non-Core Assets

We have internally-developed over 30 molecules using our TOBI™ platform. In preclinlical studies, several of these molecules show pharmacological activity when administered as an injectable as well as a cell-based therapy. Our core focus will be the development of our lead product candidates, HCW9218 and HCW9302, as transformative immunotherapeutics, administered by subcutaneous injection. We intend to out-license certain rights for other internally-developed molecules with commercial potential that are outside of our focus area. We signed our first out-license agreement at the end of 2020, when we entered into an exclusive worldwide license with Wugen, Inc. ("Wugen"), a company that specializes in cell-based therapies for cancer. Wugen licensed limited rights to develop, manufacture, and commercialize cell therapy treatments for cancer based on two of our internally-developed multi-cytokine fusion protein molecules. Our clinical-stage molecule, HCW9201, is currently being evaluated for generation of memory-like NK ("ML-NK") cell products in two Phase 2 studies with patients with relapsed/refractory Acute Myeloid Leukemia ("r/r AML"). The studies were initiated by the School of Medicine at Washington University in St. Louis and are supported financially by Wugen. HCW Biologics is currently assessing opportunities to out-license rights to HCW9302, our molecule for T_{reg} activation and expansion, under terms that may include an upfront licensing fee, milestone payments based on performance, and a royalty based on sales of commercial products.

Our Approach

We believe we have an innovative strategy to treat age-related diseases. Our unique approach is to utilize our internally-developed TOBI™ platform to create novel multi-functional immunotherapeutics to rejuvenate our immune system. With our platform technology, we have generated product candidates that are designed to direct the immune system against solid tumors, therapy-induced senescence and the adverse side effects triggered by existing standard-of-care treatments for cancer, and hematological cancers. We have also developed product candidates that are designed to direct the immune system against inflammation allowing for the potential to treat a wide variety of autoimmune and proinflammatory diseases. Our approach is to develop immunotherapies that eliminate the main drivers of chronic inflammation by addressing the underlying development and sustainment of these factors, as depicted in the image below:



The Science of Chronic Inflammation

While inflammation is part of the normal repair response for healing, when it becomes prolonged and persists, it is damaging and destructive. Several common molecular pathways have been identified that are associated with both aging and low-grade inflammation. Our view is that there are two primary underlying processes that drive chronic inflammation: Accumulation of senescent cells and SASP factors, and activation of inflammasomes.

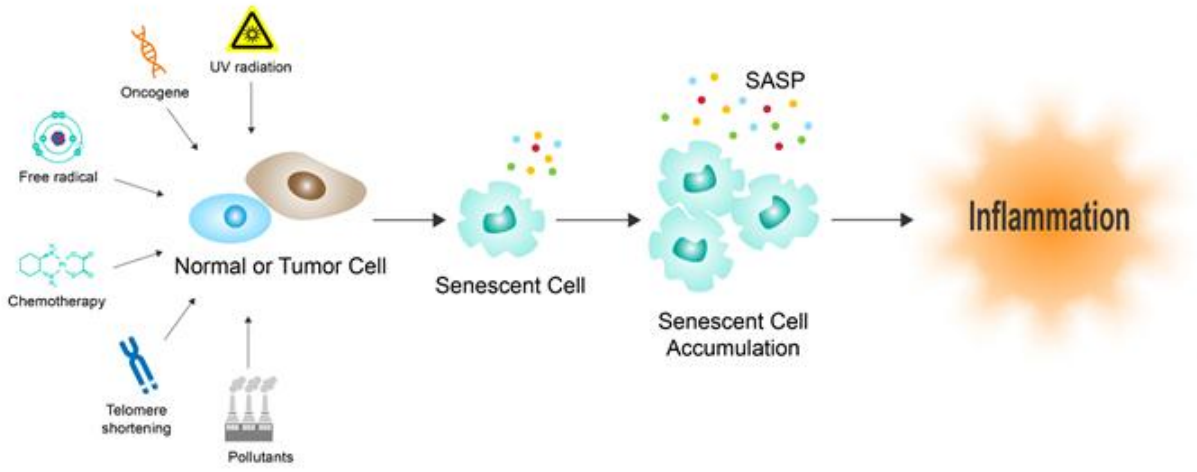
Senescence is a form of irreversible cell growth arrest accompanied by phenotypic changes, resistance to apoptosis, and activation of damage-sensing signaling pathways. Senescence is considered a stress response that can be induced by a wide range of intrinsic and extrinsic insults, including oxidative and genotoxic stress, DNA damage, telomere attrition, oncogenic activation, mitochondrial dysfunction, or chemotherapeutic agents.

Senescent cells remain metabolically active and can influence tissue hemostasis, disease, and aging through their SASP factors. Senescence is considered to be a physiologic process and is important in promoting wound healing, tissue homeostasis, regeneration, and regulation of fibrosis. Senescence also plays a role in tumor suppression. The accumulation of senescent cells, due to the aging of our immune cells, also drives aging and age-related diseases and conditions. The SASP factors can trigger chronic inflammatory responses and consequently augment chronic inflammatory conditions to promote tumor growth. The connection between senescence and aging was initially based on the observation that senescent cells accumulate in aged tissue. The use of transgenic models has enabled the detection of senescent cells systematically in many age-related disorders. Studies have demonstrated that senescent cells play an adverse role in age-related disorders.

An increasing body of evidence has shown that chemotherapy and radiation, standard-of-care anti-cancer regimens, cause the accumulation of senescent cells both in tumor and normal tissue. Paradoxically, cellular senescence protects non-dividing cancer cells by limiting the effect of chemotherapeutic drugs and radiation and contributes to chemoresistance, radiation resistance, disease relapse, and systemic side effects. Cancer chemotherapy efficacy is based on the assumption that treatment-induced apoptosis or necrosis of tumor cells results in prolonged patient survival. However, in addition to cytotoxic activity, chemotherapy also can cause tumor cells to enter a TIS state with SASP characteristics. The persistence of viable and metabolically active senescent tumor cells after chemotherapy has been attributed to worsen overall survival in patients. Chemotherapy targets rapidly proliferating cancer cells, exposes a stressor to normal cells which drive them into senescence, paracrine effects of inflammatory factors, or SASP factors, secreted by these senescent cells, and epigenetic changes induce these cells to more aggressive cancer stemness.

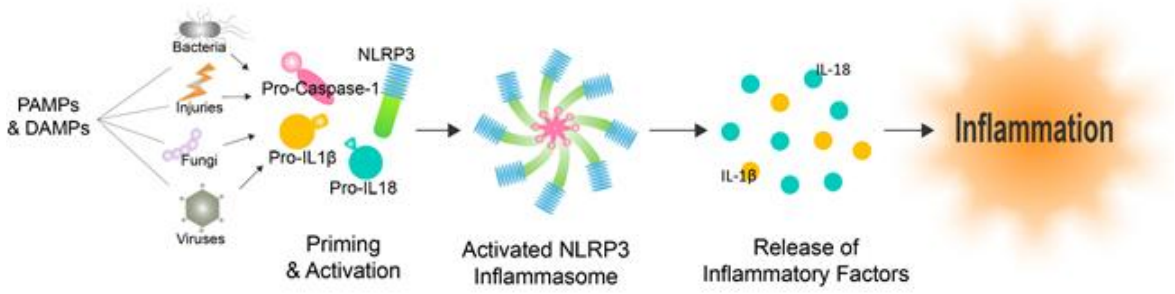
Systemic chemotherapy has also been found to elevate normal tissue senescence. Multiple studies have revealed that increased normal tissue senescent cells can promote tumor progression, creating a link between aging and cancer. Breast cancer survivors who received chemotherapy as a part of treatment have been found to have accelerated aging and increased incidence of cancer recurrence. Survivors from childhood cancers post-chemotherapy treatment also have been found to have high rates of developing secondary cancer, spinal disorders, and pulmonary diseases in adulthood. Furthermore, it is well established that clinical use of chemotherapies is associated with long-term damage to normal tissues and organs resulting from accumulation of TIS cells and proinflammatory SASP factors. Therefore, we believe that therapeutic approaches that alleviate chemotherapy-induced senescent cells and SASP factors in normal tissue may lead to a better quality of life for cancer patients.

SASP Factors Secreted by Senescent Cells Trigger Chronic Inflammatory Responses



Inflammasomes are large, multimeric protein complexes that are another contributing factor to chronic inflammation. Their assembly in innate immune cells and other cells is triggered by a variety of stimuli and culminates in the activation of Caspase-1 which then cleaves pro-interleukin ("IL")-1ß to IL-1ß. To date, diverse inflammasomes have been discovered. Among the various inflammasomes identified, the nucleotide-binding oligomerization domain, leucine-rich repeat-containing receptor ("NLR") family pyrin domain-containing three NLR ("NLRP3") inflammasome is best characterized. The NLRs are recognized as the key sensors of pathogens and danger signals known as PAMPs and DAMPs. The NLRP3 inflammasome has a two-step activation mechanism: "priming", which entails induction of pro-IL-1ß and NLRP3, and "activation", wherein a functional inflammasome complex is assembled following uptake of PAMPs or DAMPs. The pathology of various diseases, including Alzheimer's disease, Parkinson's disease, and atherosclerosis has been linked to hyperactivation of the NLRP3 inflammasome.

Inflammatory Factors Secreted by Activated Inflammasomes Trigger Chronic Inflammatory Responses



Our Approach for the Treatment of Inflammaging

We have identified two lead product candidates that are immunotherapeutics designed to rejuvenate the immune system in order to neutralize or reverse the two primary pathways of inflammaging. Without addressing both processes, a chronic, low-grade inflammatory environment will persist, resulting in a diverse range of pathological manifestations including cancer, atherosclerosis, diabetes, and neurodegeneration.

Senolytic for Senescence Cell Clearance and Senomorphic for SASP Neutralization

Senescent cells are caused when a normal cell is exposed to various stress factors, many of which are simply a part of living and aging. Other stressors are brought about by medical treatments, such as radiation and chemotherapy, resulting in TIS. The damaging part of senescent cells is that they secrete so-called SASP factors. SASP factors come in many different types, depending on the stressor and the cell type exposed to that stressor, but one thing they have in common is that they drive chronic, low-grade inflammation. For example, TGF-ß is considered one of the key SASP factors that induces or accelerates, and maintains a senescent phenotype in various cell types including fibroblasts, bronchial epithelial cells, and cancers in an autocrine/paracrine manner. Thus, to neutralize these pathways, a drug must be a senolytic agent that reduces senescent cells, as well as a senomorphic agent that eliminates SASP factors. Current clinical efforts to counteract TIS and age-related senescent cell activity have focused on senolytic chemical drugs that selectively induce senescent cell death and senomorphic chemical drugs that reduce the secretion of SASP factors. Despite the promise of senolytics and senomorphics, their efficacy in early phase clinical studies reported to date has been limited. Further, the specificity, toxicity, and optimal treatment schedule of these pharmaceutical agents in the cancer setting have yet to be determined.

We have developed an alternative approach to eliminate senescent cells using well-characterized protein immunotherapeutics including those that stimulate effector immune cells and reduce TGF-β activity. This approach is supported by our findings that TIS tumor cells upregulate NKG2D and other ligands on their surface for efficient recognition and killing by effector NK cells and $CD8^+$ T cells. Additionally, suppression of TGF-β activity enhances the anti-tumor/anti-senescent responses of these immune cells. HCW9218 is a unique combination of a TGF-β receptor, that neutralizes TGF-β secreted by tumors, combined with IL-15, a potent cytokine that stimulates the NK and $CD8^+$ T cell cytotoxicity. In our scientific publications, we reported that HCW9218 can activate immune cells to infiltrate into tumors to directly eliminate TIS cancer cells. This activity leads to robust anti-tumor activity of HCW9218 following docetaxel chemotherapy ("DTX") as measured by reduced melanoma tumor growth in mouse models. Therefore, TGF-β neutralization combined with activation of effector immune cells should be considered as a part of the strategy for

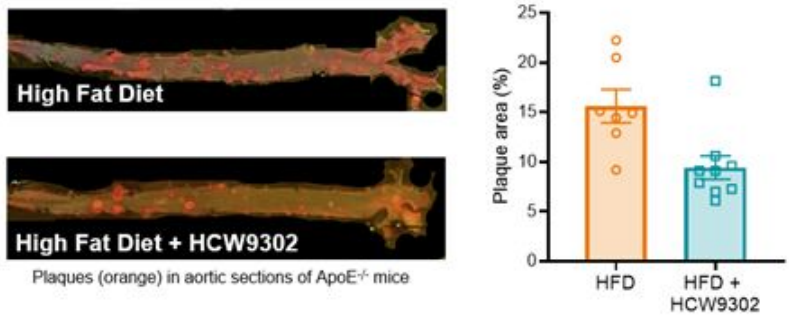
senescent cell removal and reduction of SASP factors. For a more detailed discussion, see the Company's pivotal scientific paper entitled, "Immunotherapeutic HCW9218 Augments Anti-Tumor Activity of Chemotherapy via NK Cell-Mediated Reduction of Therapy-Induced Senescent Cells," published in *Molecular Therapy*.

Deactivation of Inflammasomes by Activating T_{reg} Cells

To date, therapeutic approaches to reduce aberrant inflammasome activity have focused on inhibitors of various inflammasome components (i.e., NLRP3 and other NLRs, ASC, Caspase-1) and downstream mediators of inflammation (i.e., IL-1ß, IL-18, gasdermin D, etc.). This approach is validated based on the regulatory approval of three biologics that inhibit IL-1ß activity (anakinra, a recombinant form of the naturally occurring IL-1Ra; rilonacept, a soluble chimeric Fc fusion protein of IL-1R1 and IL-1R3; and canakinumab, a humanized monoclonal antibody specific for neutralizing IL-1ß). Together, these molecules are approved for treatment of cryopyrin-associated periodic syndrome, a multisystemic IL-1ß–mediated disease due to a gain of function in NLRP3; rheumatoid arthritis; systemic juvenile idiopathic arthritis and other auto-inflammatory diseases. We believe there is considerable interest in therapeutics that specifically block inflammasome activity upstream. However, these product candidates are still in early phase clinical testing and their bioavailability, off- and on-target toxicity, and utility profiles are still being evaluated.

Our approach is to deactivate inflammasome pathways in monocytes and macrophages through the immunosuppressive activities of T_{reg} cells induced by our immunomodulator molecules. This approach does not rely on inhibiting specific inflammasome components but rather utilizes natural processes of the immune system to attenuate and rebalance chronic self-perpetuating proinflammatory responses. In relevant animal models, we have observed encouraging results using HCW9302 to activate and expand T_{reg} cells for treatment of atherosclerosis and diabetes.

HCW9302 Reduces Atherosclerosis Plaques Induced by High Fat Diet in ApoE$^{-/-}$ Mice



Our Strategy

Our goal is to develop transformative immunotherapies to lengthen health span by disrupting the link between cellular senescence, chronic inflammation, and age-related diseases. Our strategy for efficiently validating our approach includes the following key components:

Focus resources on internally-developed intellectual property, including molecules, TOBI^{TM} platform, and manufacturing processes, without relying on third-party licensing for key intellectual property.

- Our TOBI^{TM} platform is a new approach to construct multi-functional fusion proteins and fusion protein complexes, using a novel TF-based scaffold platform. Multiple protein targets (e.g. cytokine, scFvs, ligands, etc.) can be packaged as a single molecule to engage immuno-stimulatory functions and address many signaling pathways simultaneously. Fusion protein complexes have *ex vivo* and *in vivo* applications for stimulating NK and T cells.

- Over 30 molecules have been created and characterized internally for *ex vivo* (i.e., to support cell therapies) and *in vivo* (i.e., as injectables) activation and expansion of NK, $CD8^+$ T, Tscm, and T_{reg} cells.

- Fusion protein complexes are readily purified using internally-developed affinity chromatography. Purified fusion protein complexes are highly stable immunotherapeutics. Large-scale cGMP manufacturing runs have been demonstrated.

Focus our resources on the development of two primary internally-developed molecules for which we can establish strong IP protection, best activity in animal models, and a well-tolerated safety profile when administered by subcutaneous injection.

- The activity of HCW9218 has been established in multiple *in vivo* animal studies, including reduction of cellular senescence and SASP factors in naturally-aged mice and elimination of cancer senescent cells caused by therapy-induced senescence to enhance efficacies of chemotherapies and remove the off-target effects caused by chemotherapy.

- We have completed *in vivo* animal studies demonstrating the activity of HCW9218 in reversing Type 2 Diabetes and as an anti-fibrotic agent.

- We have demonstrated the activity of HCW9302 to treat autoimmune and age-related diseases in relevant animal models.

Focus on cancer indications in initial clinical development of our lead product candidate, HCW9218, in indications with high unmet medical need or where side effects of standard-of-care therapy diminishes health span.

- Cancer is our gateway indication. We received FDA clearance to proceed with a Company-sponsored Phase 1b clinical trial to evaluate HCW9218 in refractory pancreatic cancer. The Masonic Cancer Center at University of Minnesota received FDA clearance to proceed with an Investigator-sponsored Phase 1 clinical trial to evaluate HCW9218 in patients with solid tumors, such as breast, ovarian, colorectal and prostate cancers. We expect to initiate both of these trials in the first half of 2022, but we cannot provide any assurance that the clinical sites will be ready to initiate the planned clinical trials on a timely basis, or at all.

- Clinical trials will allow us to evaluate the development of our novel immunotherapeutics as we attempt to augment the efficacy of chemotherapy against cancer while minimizing its side effects. Our clinical trial design will be designed to have clear, objective endpoints against which we can measure the success of our cancer treatment.

- Because of our highly efficient design for neutralizing TGF-ß, we have targeted cancer indications with TGF-ß mediated immunosuppression and a fibrotic tumor microenvironment (i.e., pancreatic, breast cancer).

- We plan to advance well-characterized immunotherapeutics with multiple mechanisms of action: effector immune cell activation, suppression of TGF-ß, reduction of senescent cells (i.e., senolytics), and reduction of SASP (i.e., senomorphics).

Focus on autoimmune indications with high unmet medical need in initial clinical development of our lead product candidate, HCW9302.

- IND-enabling activities and toxicology studies required for submission of an IND to evaluate HCW9302 in an autoimmune indication are expected to be completed in the second half of 2022, followed soon thereafter with an IND submission to evaluate HCW9302 in an autoimmune indication. We have not yet submitted the IND, nor can we guarantee when the IND will be submitted.

Leverage established clinical trial network.

- Our management team has extensive experience managing clinical trials, enabling us to reduce dependency on a contract research organization for our trials. Our founder and clinical development team have a track record of success in developing immuno-oncology therapeutics from bench to bedside.

- We have selected leading NCI-designated Comprehensive Cancer Centers as potential clinical sites for our multi-center, Company-sponsored trial. We are working with these institutions and Principal Investigators from these institutions to complete the required internal review processes for study start-up. Because the discussions with these clinical sites and Principal Investigators are not finalized, we are not certain we will be successful in reaching an agreement with any or all of these institutions. The course of these discussions and whether we might need to identify alternative clinical sites could impact the start date for our clinical trials. Any delays in our clinical trials could increase our costs and slow down the development and approval process, which could harm our commercial prospects.

Expand clinical evaluation of senolytic/senomorphic product candidates to other age-related indications following establishment of a safe treatment regimen in cancer patients for HCW9218. We may need pre-IND meetings for other cancer and non-cancer indications to determine if additional nonclinical toxicology studies are required.

- We are conducting preclinical research studies to evaluate HCW9218 in liver cancer and NAFLD that we believe may support a future clinical study.
- We are conducting preclinical research studies to evaluate HCW9218 in metabolic disease indications, specifically Type 2 Diabetes, leveraging our ability to reduce senescent cells and reduce SASP factors.

Out-license limited rights for certain HCW molecules outside of primary focus.

- We intend to continue to seek partners for out-licenses for our internally-developed molecules with strong clinical potential that are part of our clinical development focus (i.e., adoptive cell therapies). We consider this an attractive source of nondilutive financing.

Explore co-development or regional deals with big pharma for lead molecules.

- We are actively seeking co-development deals for the further advancement of our lead molecules, including clinical development, and commercialization.
- We are actively assessing whether it is advantageous for the Company to out-license rights to certain regional markets. Our primary goal is to enter a co-development deal on the best terms possible, so we will not enter such a transaction if we conclude it is optimal for the Company to enter a big pharma co-development deal for worldwide rights.

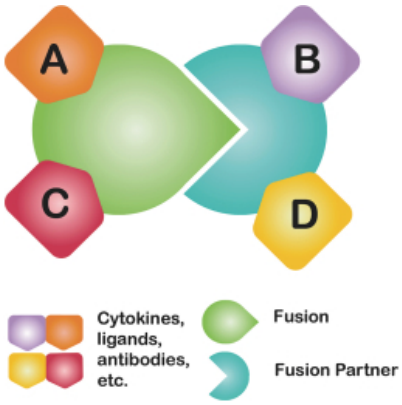
Our Programs

Our Internally-Developed TOBI™ Platform

TOBI™ (Tissue factOr-Based fusIon) platform is a new approach to construct multi-functional fusion proteins and fusion protein complexes using a novel TF protein scaffold. The extracellular domain of human TF was selected as it has a rigid elongated structure comprised mainly of ß-sheets with its N- and C-termini located at distal ends of the polypeptide, permitting genetic fusions of other protein domains without anticipated steric interference. This TF domain does not interact with the cell membrane phospholipid bilayer and, as a result, does not exhibit procoagulant activity. This TF domain is expressed at high levels by most cell types and is not expected to be immunogenic in humans. Consistent with these properties, we found that genetic fusion to the TF domain promoted increased production of difficult-to-express proteins, such as IL-15. Additionally, the TF fusion proteins could be readily purified by affinity chromatography using an anti-TF antibody and low pH elution conditions, like those used in Protein A-based affinity purification of therapeutic antibodies.

To generate multichain protein complexes, we also incorporated genetic fusions to the human IL-15 and IL-15Rα domains as shown in the figure below. When co-expressed in CHO cells, the fusion proteins form a soluble stable heterodimeric complex through high-affinity interactions between IL-15 and IL-15Rα domains. This approach offers an alternative to immunoglobulin (Fc) and other

engineered protein scaffolds, which typically require introduction of multiple mutations or other non-human sequences or complicated *in vitro* assembly/purification methods to generate bi- or multi-specific complexes.



Using the TOBI™ platform, we have constructed more than 30 fusion complexes comprising various cytokines, ligands, receptors, and single-chain antibodies, including disease-targeting antibodies and immune checkpoint inhibitors. The modular fusion components are carefully selected to stimulate, inhibit, and/or target specific immune responses using a knowledge-based disease-relevant strategy and in many cases, are designed to provide synergistic and balanced activities for optimal therapeutic benefit. The resulting fusion proteins are rigorously tested in state-of-the-art cell culture systems and disease-specific animal models to verify their utility for the intended clinical use and targeted indications.

TOBI™ also provides a scalable approach for generating large-scale cGMP-grade heteromeric fusion protein complexes to support clinical applications.

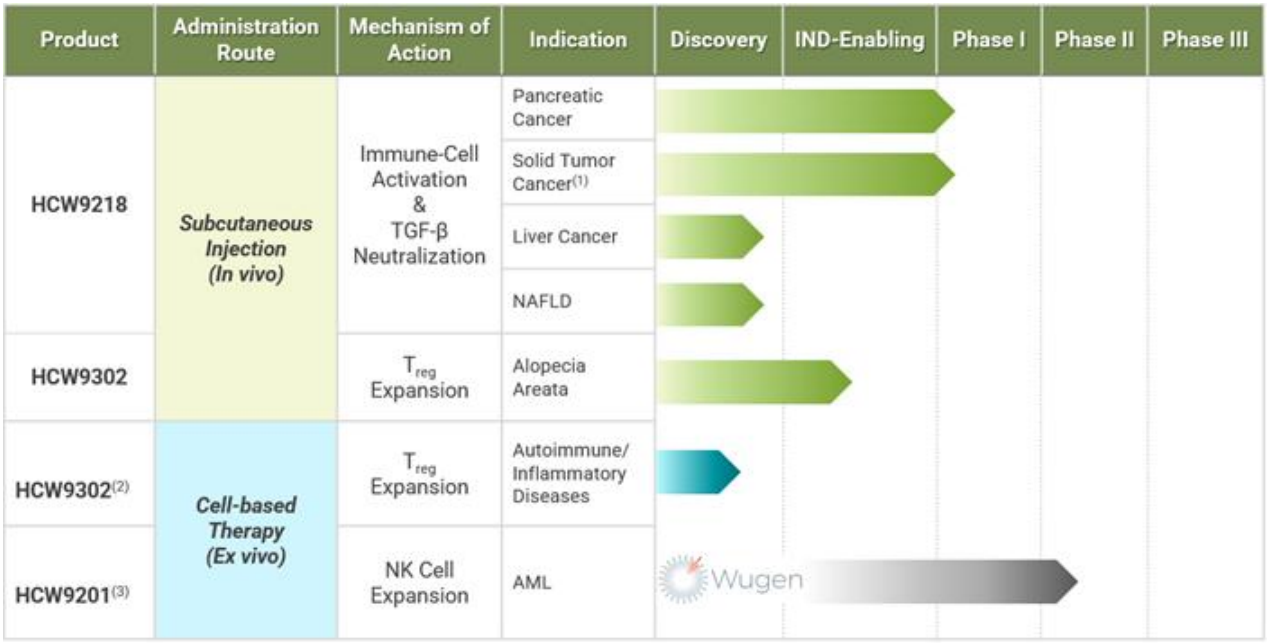
Our internally-developed TOBI™ discovery platform was featured in an article authored by the Company and published in the peer-reviewed journal *Cancer Immunology Research*.

Pipeline and Overview of TOBI™ Product Candidates

Our focus for clinical development is our two lead product candidates, HCW9218 and HCW9302. The initial clinical trials to evaluate HCW9218 are in several cancer indications. The FDA has permitted our Company-sponsored, first-in-human Phase 1b clinical trial to proceed to evaluate HCW9218 in patients with advanced pancreatic cancer. In addition, the Masonic Cancer Center at University of Minnesota received FDA clearance to proceed with a Phase 1 Investigator-sponsored clinical trial to evaluate HCW9218 in patients with other types of advanced solid tumors with progressive disease after prior chemotherapy. We expect to initiate both of these trials in the first half of 2022. For HCW9302, we expect to complete IND-enabling activities in the second half of 2022. Upon the completion of IND-enabling activities, we intend to submit an IND to evaluate HCW9302 in the autoimmune indication, alopecia areata. For our lead molecules, once the safe dose level and regimen are defined in initial clinical trials, we intend to expand into clinical trials to evaluate our lead molecules in other age-related pathologies. For HCW9218, these include fibrotic diseases (e.g., non-alcoholic fatty liver disease, or NAFLD), liver cancer, and dysfunctional metabolic disorders (e.g., Type 2 diabetes); and for HCW9302, these include autoimmune diseases and other proinflammatory diseases, such as coronary artery disease.

We have out-licensed limited rights for our molecules, HCW9201 and HCW9206, to develop cell-based therapy treatments. Our clinical-stage molecule, HCW9201, is currently being evaluated in a pair of Phase 2 clinical trials for a cell-based therapy treatment for r/r AML by our licensee. The School of Medicine at Washington University in St. Louis is the sponsor for both trials.

The pipeline for our lead immunotherapeutic programs is summarized below:



(1) This is an Investigator-Sponsored clinical trial with the Masonic Cancer Center at University of Minnesota. The solid tumor clinical trial is a "basket trial" that will include patients with breast, ovarian, prostate, and colorectal cancers.

(2) Available for license from HCW Biologics for *ex vivo* T_{reg} cells expansion.

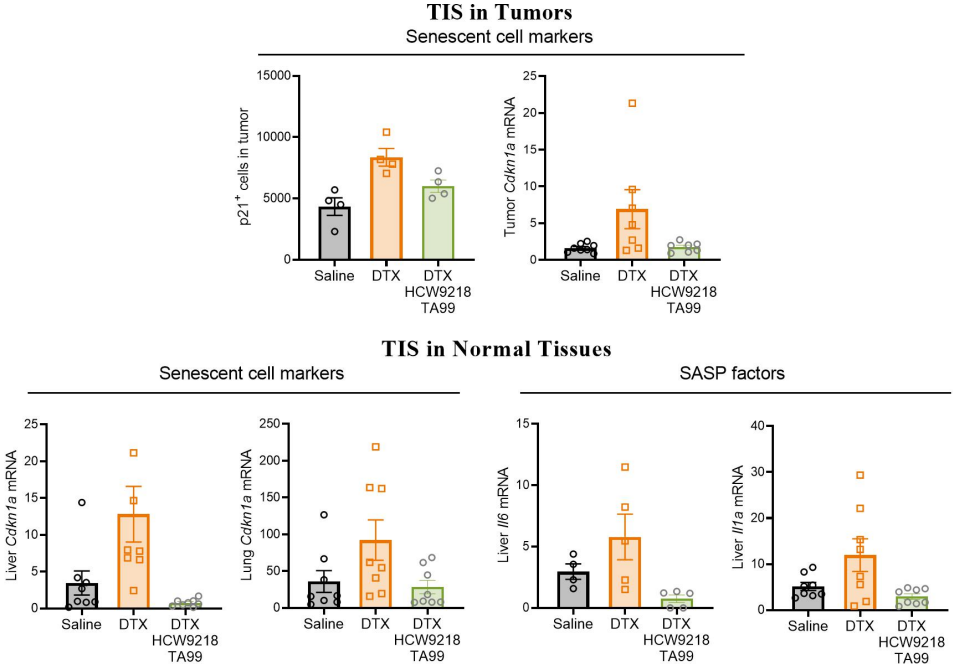
(3) Wugen licensed HCW9201, a clinical-stage molecule, from HCW Biologics for limited rights to develop cell-based therapy treatments. HCW Biologics has retained all other rights to HCW9201.

HCW9218

Advances in immuno-stimulatory and anti-immunosuppressive therapeutics have revolutionized cancer treatment. However, novel immunotherapeutics with these dual functions are not frequently constructed. We have used our TOBI™ platform to construct a heterodimeric bifunctional fusion molecule, HCW9218, capable of immuno-stimulatory as well as anti-immunosuppressive activity. HCW9218 is comprised of extracellular domains of the human TGF-ß receptor II and a human IL-15/IL-15 receptor α complex. HCW9218 potently activates NK cells and CD8+ T cells *in vitro* and *in vivo* to promote their proliferative and metabolic activities and enhances their cytotoxicity against tumor targets. This fusion complex also exhibited TGF-ß neutralizing activity *in vitro* and sequestered plasma TGF-ß in mice.

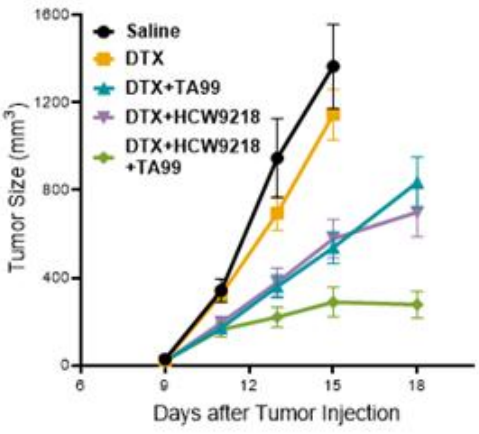
In animal models, HCW9218 displayed strong anti-tumor activity mediated by NK cells and $CD8^+$ T cells, and increased infiltration of NK cells and $CD8^+$ T cells into tumors. HCW9218 was well tolerated in preclinical studies, with a half-life sufficient to provide long lasting biological activity. HCW9218 may serve as a novel therapeutic to simultaneously provide immunostimulation and lessen immunosuppression associated with tumors and other age-related diseases. The figures below show that HCW9218 has the potential to augment the efficacy of chemotherapy (doxetaxel, DTX) in the presence and absence of therapeutic antibodies (TA99) in mice bearing melanoma tumors (upper left panel). These results correlated with the ability of HCW9218 to eliminate TIS cancer cells induced by DTX (upper center and right panels). Additionally, HCW9218 reduced TIS and SASP factors in normal tissues related to therapy induced adverse effects (lower panels), indicating that HCW9218 acts as a senolytic and senomorphic agent.

Preclinical Studies in Animal Models
HCW9218 Enhances Anti-Tumor Activity of Chemotherapy and Therapeutic Antibodies and Reduces TIS Senescent Cells and SASP Factors in Tumors and Normal Tissues



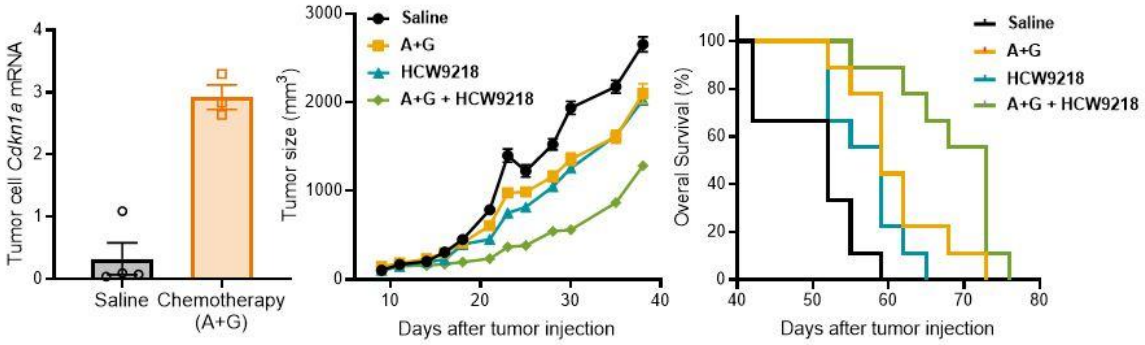
In our published scientific reports, we also observed in preclinical studies that HCW9218 could enhance the anti-tumor efficacy of immune checkpoint blockade (anti-PD-L1 antibody, α-PD-L1) via T-cell infiltration into the tumor avoiding immunosuppressive factors in the tumor microenvironment, or TME.

HCW9218 Enhances Anti-Tumor Activity of Immune Checkpoint Blockade



Moreover, HCW9218 enhanced the anti-tumor efficacy of chemotherapy against human pancreatic tumors in a xenograft model. Induction of senescence tumor cells in human SW1990 pancreatic cancer cells was observed following treatment with nab-paclitaxel and gemcitabine (A+G), standard-of-care chemotherapies (left panel). Further, HCW9218 treatment significantly enhanced A+G chemotherapy activity by controlling tumor growth and prolonging survival of SW1990 tumor-bearing mice (Center and right panels). The results of these studies support clinical development of HCW9218 in combination with chemotherapies and other immune therapies in patients with solid tumors, including pancreatic cancer.

HCW9218 Enhances Anti-Tumor Activity of Chemotherapy
in Mice Bearing Human SW1990 Pancreatic Tumor Xenografts



Cancer

Two clinical trials of HCW9218 have been permitted to proceed by the FDA. The first is a Company-sponsored, multi-center Phase 1b clinical trial for a dose escalation study of HCW9218 as monotherapy in refractory patients with advanced pancreatic cancer. We plan to enroll up to 24 patients in five NCI-designated centers, with the primary objectives of the study being to determine safety, maximum tolerated dose, and the recommended Phase 2 dose ("RP2D"). After determining the RP2D, we expect the Phase 2 portion of this clinical trial to include a cohort of patients receiving HCW9218 as monotherapy and a cohort of patients receiving HCW9218 as an adjunct to chemotherapy. The Phase 2 dose expansion portion aims to enroll up to 42 patients at the RP2D with primary objectives to determine the 6-month progression free survival rate and safety. The secondary objectives of this study are objective response rate, overall survival, time to progression, and duration of response. We have identified several NCI-designated Comprehensive Cancer Centers as potential clinical sites, all of which are progressing through their internal process for review. We will not be able to finalize our selection of a particular clinical site until the internal review is complete and approval is granted to participate in the clinical study. If any of the sites we have selected declines to participate in the study, we will need to identify alternative sites, which may delay the initiation of the trial. Once we do proceed, the time required to complete the study will depend on the number of cohorts required to determine RP2D and the time that is required to enroll patients to participate in the study.

The second clinical trial of HCW9218 in a cancer indication is an Investigator-sponsored trial for the Phase 1 portion of a clinical trial for dose escalation study of HCW9218 as a monotherapy in solid tumors, such as breast, ovarian, prostate and colorectal cancers. The sponsor is the Masonic Cancer Center at the University of Minnesota, a leading NCI-designated cancer center. The trial is designed as a dose escalation study of HCW9218 to identify the maximum tolerated dose for future evaluation. Depending on the toxicities observed in the treated patients, between 12 and 24 patients may be enrolled. There has not yet been a decision on the design of later phases of this clinical trial, if Phase 1 is successfully completed.

We believe, based on the results of our animal studies that HCW9218 has the potential to be an effective immunotherapy against pancreatic cancer, a very aggressive malignancy which is refractory to other immunotherapies including immune checkpoint blockade. TGF-ß has been shown to play a major role in promoting immunosuppression responses and fibrosis in the TME as well as inducing epithelial–mesenchymal transition ("EMT") of pancreatic tumor cells, which facilitates their migratory and invasive capabilities. As a result, elevated serum TGF-ß levels have been shown to correlate with a poor prognosis in patients with pancreatic cancer. Early phase clinical studies have provided evidence that strategies to decrease TGF-ß levels or signaling can provide clinical benefit, including objective responses and prolonged survival, in certain patients with advanced/metastatic pancreatic cancer. Studies in pancreatic tumor mouse models, including research performed in our laboratories, support evaluation of combination therapies including chemotherapy to enhance antigen presentation by tumors, TGF-ß antagonist to reduce TME immunosuppression and immuno-stimulatory agents to augment anti-tumor T cell and NK cell responses.

We have targeted advanced, chemo-resistant solid tumors in our clinical programs in cancer, all of which are difficult-to-treat and have large, unmet medical needs:

- Pancreatic Cancer is the 11th most commonly diagnosed cancer in the U.S., but it is the 3rd leading cause of cancer-related deaths. It has a 10.8% five-year survival rate. Long-term prognosis for pancreatic cancer depends on the size and type of the tumor, lymph node involvement and degree of metastasis at the time of diagnosis. Unfortunately, pancreatic cancer usually shows little or no symptoms until it has advanced and spread. Therefore, most cases are diagnosed at later, more difficult-to-treat stages. In the U.S. in 2021, there were 60,430 new cases and 48,220 deaths from pancreatic cancer. The average age at the time of diagnosis is 70 years of age.

- Solid tumors represent approximatively 90% of adult human cancers. In 2022, in the U.S. alone, it is believed there will be an estimated 1.9 million new cancer cases diagnosed and more than 600,000 cancer deaths, which are increasing with an aging population. The Investigator-sponsored trial being conducted by the Masonic Cancer Center at University of Minnesota to evaluate HCW9218 is focused on the treatment of advanced solid tumor cancer after failure of initial treatments. Various studies have revealed that 95% of cancer drugs for solid tumors fail. This research highlights the high unmet medical need for novel therapies to treat advanced solid tumors.

Age-Related Diseases Driven by Senescence

We are conducting extensive preclinical research on HCW9218 for senescent cell removal (senolytic) and SASP factor reduction (senomorphic) in various relevant animal models, including those for solid tumors, metabolic dysfunction, and chronological aging. Our initial data suggest that HCW9218 functions as a potent senolytic and senomorphic agent. We plan to determine the dose level and regimen from our cancer trials and then we intend to apply the dose level and treatment regimens to evaluate HCW9218 for age-related diseases, such as NAFLD and diabetes. Type 2 Diabetes affects approximately 30.8 million Americans, and another 88 million American adults have pre-diabetes. Our ultimate goal is to use HCW9218 in combination with HCW9302 to address neurodegenerative diseases, such as Alzheimer's Disease, Parkinson's Disease, and age-related Macular Degeneration.

HCW9302

T_{reg} cells are essential mediators of peripheral tolerance and the global immunoregulatory potential in hosts to self and non-self-antigens. T_{reg} cells achieve this immunoregulatory control through multiple suppressive mechanisms. Alternations in T_{reg} cell development, homeostasis or function can predispose these cells to affect a variety of disease conditions including allergy, autoimmunity, graft rejection, cancer, and response to immunotherapies. Current research is focused on developing novel therapies to enhance T_{reg} cell functions *in vivo* through use of cytokines and small molecule drugs to support endogenous T_{reg} cell proliferation or activation, *ex vivo* manipulated T_{reg} cells in autologous adoptive cell therapy to promote immunoregulation in settings of autoimmunity, or antigen-specific T_{reg} cells, including chimeric antigen receptor T_{reg} ("CAR-T_{reg}") cells, to strengthen tolerance in allergies. We have employed our TOBI™ platform to create HCW9302, an IL-2-based fusion molecule, to expand T_{reg} cells *in vivo* and *ex vivo* as an injectable or cell-based strategy to reduce inflammation and to treat a wide variety of autoimmune and age-related diseases. In relevant animal models, we have also observed encouraging results using HCW9302 to activate and expand T_{reg} cells for treatment of atherosclerosis and diabetes.

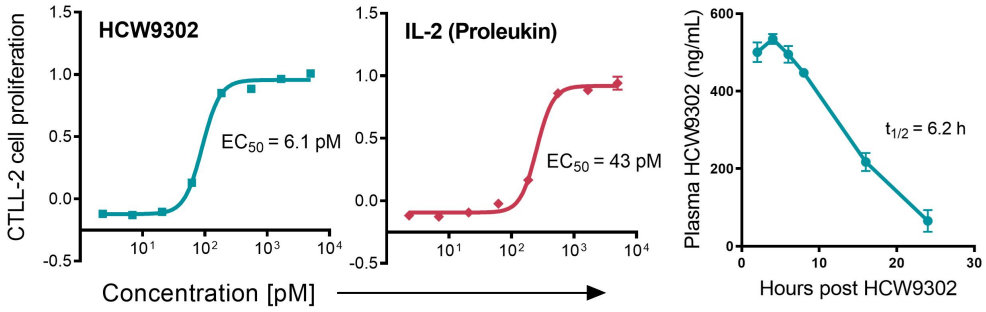
We are currently conducting IND-enabling activities required to prepare for submission of an IND for a Phase 1b clinical trial to evaluate HCW9302, administered by subcutaneous injection. The timing for this submission will depend on the completion of nonclinical toxicology studies and availability of research material, as well as finalizing the clinical protocol. The nonclinical toxicology studies are expected to be completed by the end of 2022, which we intend to follow with the submission of an IND for a Phase 1B clinical trial to evaluate HCW9302 in an autoimmune indication in the first half of 2023.

However, we have not submitted the IND for the planned trial, and we cannot provide any assurance that the FDA will authorize us to initiate our planned clinical trials on a timely basis, or at all. In the event we do not receive feedback on a timely basis, or we are required to change the design of our clinical protocol or address other feedback, clinical development of our products would be delayed and our costs may increase. Moreover, if the FDA does not allow our initial clinical trial to proceed, we may be required to conduct additional preclinical testing or other IND-enabling activities, which would result in further delay and additional costs.

HCW9302 exhibits increased biological activity with an extended half-life, compared to IL-2. The three graphs below illustrate the results of characterization studies:

- Left panel: IL-2 activity of HCW9302 was compared with Proleukin, the currently approved IL-2 drug, using a standard CTLL-2 cell proliferation assay.
- Center panel: HCW9302 was found to have >5-fold higher IL-2 activity than Proleukin.
- Right panel: We observed the half-life of HCW9302 was 6.2 hours in mice following subcutaneous administration (3 mg/kg) versus 20 minutes for Proleukin.

HCW9302 Exhibits Increased Biological Activity with an Extended Half-Life Compared to IL-2
HCW9302 Half-Life is 6.2 Hours versus IL-2 Half-Life of 20 minutes



Autoimmune and proinflammatory diseases

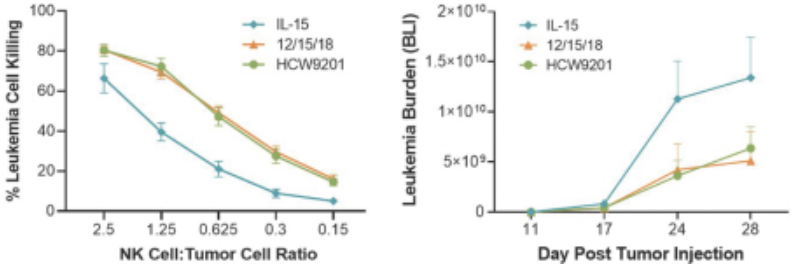
We have conducted extensive preclinical research on HCW9302 for deactivation of inflammasomes to temper the pro-inflammatory environment it creates in relevant animal models, including those for atherosclerosis. Our data suggest that HCW9302 functions as a potent agent to stimulate T_{reg} cells that suppress the activity of inflammasome-bearing cells and inflammatory factors. We intend to determine the dose level and regimen from our initial clinical trial in an autoimmune indication, which we have primarily determined will be alopecia areata, and then we intend to apply the dose level and treatment regimens established in initial clinical studies to evaluate HCW9302 for other autoimmune and proinflammatory diseases, such as atherosclerosis.

HCW9201

We believe NK cells are a promising cellular therapy for cancer, with challenges in the field including effector cell persistence, functional activity, and tumor recognition. Recent research has shown that priming blood NK cells with a cytokine cocktail of IL-12, IL-15, and IL-18 (“12/15/18”) results in ML-NK cell differentiation and enhanced responses against cancer. However, the lack of available, scalable cGMP-grade reagents has limited the advancement of this approach beyond early phase clinical trials. To address this challenge, we employed our TOBI™ platform to combine IL-12, IL-15, and IL-18 receptor engagement in a single protein complex (“HCW9201”). Further, we have developed cGMP-compliant production cell lines and scalable production processes to allow the generation of large amounts of HCW9201 that meets product quality characteristics for clinical use.

HCW9201 has been extensively evaluated for its capacity to stimulate activation and proliferation signals in human NK cells. RNA-seq and multidimensional mass cytometry studies have revealed strong parallels between the activities of HCW9201 and IL-12/15/18 in generated ML-NK cells. Moreover, HCW9201 stimulation improved NK cell metabolic fitness, and resulted in the DNA methylation remodeling characteristic of memory-like differentiation. NK cells primed with HCW9201 and the 12/15/18 cocktail had similar increases in ML-NK cell cytotoxicity and IFN-g production against leukemia targets. HCW9201- and 12/15/18-primed NK cells also equivalently controlled leukemia *in vivo* in NSG mice. Thus, HCW9201 represents a protein engineering approach that solves many problems associated with multi-signal receptor engagement on immune cells, and HCW9201-primed NK cells will be advanced as an ideal approach for clinical cGMP-grade ML-NK cell production for cancer therapy.

The figures below show that NK cells primed with HCW9201 and 12/15/18 cocktail killed leukemia cells (left) and controlled leukemia tumors in mice (right) better than NK cells primed with IL-15 alone.



HCW9206

We have used our TOBI™ platform to combine cytokine IL-7, IL-15, and IL-21 receptor engagement into a single protein complex: HCW9206. Although ML-NK cells have been demonstrated to be beneficial in clinical trials, the initially evaluated NK cell products were derived from fresh prepared apheresis lymphocytes from individual matched donors. Thus, this approach has limitations in the availability of donors and the reproducibility, scalability, and costs of generating clinical-grade ML-NK cells for adoptive cell therapy. To translate this exciting therapy to many patients, we have developed methods to expand the numbers of NK cells to support a multiple dosing regimen and for multiple patients. We have extensively tested HCW9206 and demonstrated that this complex can expand ML-NK cells without the use of feeder cells, which is the current process for producing NK cells using a cancer cell line that must be removed from the final drug product.

Out-License Programs

We have internally developed over 30 immunotherapeutic molecules and plan to develop additional molecules through our TOBI™ platform. Our strategy is to focus on the clinical development of our lead product candidates, HCW9218 and HCW9302, as immunotherapeutics for the treatment of age-related diseases, administered by subcutaneous injection. Our strategy is to out-license molecules and product rights not in our focus area, in particular *ex vivo* applications. We expect out-licensing to provide non-dilutive financing to bolster resources available to fund our core programs and possibly commercialize molecules with the potential to be developed successfully by our licensees for disease indications with large, unmet medical needs.

We established our first out-license arrangement in December 2020, when we entered into an exclusive worldwide license agreement with Wugen (the "Wugen License") for limited rights to develop cell therapy-based treatments using two HCW internally-developed fusion protein molecules and improvements thereto, including a clinical-stage and preclinical stage fusion molecule. We believe these molecules are capable of generating highly activated ML-NK cells in a short time frame and large-scale NK cell expansion without relying on feeder cells. Two Phase 2 clinical trials were initiated in January 2021 by the School of Medicine at Washington University in St. Louis with support from Wugen, in which certain of these licensed molecules were used. One trial is using *ex vivo* ML-NK cells, induced by the licensed molecule, against r/r AML with donor leukocyte infusion ("DLI") after haploidentical stem cell transplantation. The second Phase 2 clinical trial is also using *ex vivo* induced ML-NK cells against r/r AML. As licensor, we have limited information rights to clinical data which we are required to treat as nonpublic confidential information. As licensee, Wugen determines when and if clinical data read outs are disclosed to the public.

We retained manufacturing rights and other rights, including regulatory T cell-based cellular therapy and injectable rights, for licensed molecules under the terms of the Wugen License. We intend to enter into supply agreements with Wugen to provide cGMP and non-cGMP grade licensed molecules based on industry-standard terms, one agreement for development supply and one agreement for commercial supply. According to the terms of the Wugen license, Wugen will fund all future clinical development and commercialization activities for any indications utilizing the licensed molecules for cell therapy as covered by the license. We have the opportunity to receive additional payments for development and commercialization milestones as well as single-digit royalties.

Other TOBI™ Discovery Programs

Our discovery efforts for new product candidates are focused on characterizing and expanding our library of fusion molecules with cytokines, chemokines, ligands, receptors, and internally-developed single-chain antibodies, including fusion domains with increased or decreased biological activity, for cancer and other age-related diseases with an emphasis on neurodegenerative, fibrotic, and autoimmune diseases. Other TOBI™ discovery programs are summarized in the table below.

Name	Fusion Domains	Activity	Indications
HCW9206	IL-7, IL-15, IL-21	NK cell and $CD8^+$ T cell stimulation	Injectable for cancer
HCW9207	IL-18, IL-15, IL-12, anti-CD16 scFv	NK cell stimulation	Cancer
HCW9212	IL-7, IL-15, IL-21, CD137L	NK cell and $CD8^+$ T cell stimulation	Cancer
HCW9213	Anti-CD3, anti-CD28 scFvs	T cell/T_{reg} stimulation	Cancer, inflammatory diseases
HCW9228	TGRßRII dimer	TGF-ß antagonist	Cancer, fibrotic diseases
Antibodies			
HCW9106	Anti-CD26 scFv	Senescent cell inhibition and targeting	Inflammatory and age-related disease
HCW9107	Undisclosed target	Senescent cell inhibition and targeting	Inflammatory and age-related disease
HCW9108	Undisclosed target	T_{reg} binding, activation, inhibition, and targeting	Inflammatory and age-related disease

Manufacturing

Our product candidates include molecules that are multi-specific fusion protein complexes, such as HCW9201, HCW9206, and HCW9218; bispecific fusion protein complexes, such as HCW9302; and an internally-developed affinity ligand used in our manufacturing processes, HCW9101. We have established internally-developed manufacturing processes for producing these fusion molecules from Chinese hamster ovary ("CHO") cells at large scale in a cGMP-compliant setting.

On March 14, 2019, we entered into a manufacturing agreement with EirGenix, Inc. ("EirGenix"), a third-party global contract development and cGMP manufacturer of biologics, for the manufacture of the Company's internally-developed molecules. By the end of 2019, we successfully launched cGMP production with manufacturing runs adequate to support clinical trials. During the year ended December 31, 2020, various testing and quality control procedures were conducted on the materials manufactured in 2019-2020 to ensure materials met all expected quality requirements. During the year ended December 31, 2021, we successfully completed production of four molecules, HCW9101, HCW9201, HCW9218, and HCW9302. This includes clinical grade materials we need to initiate clinical trials and toxicology studies we have planned for 2022. Manufacturing, quality control procedures, and vialing will continue for several molecules in 2022, including additional clinical and research grade materials for our licensee.

We currently rely on EirGenix and other third-party manufacturers for the cGMP production of larger quantities of our drug product candidates for our clinical trials. Our management team and other internal personnel have extensive cGMP manufacturing experience in order to ensure seamless technology transfer and to manage the manufacturing and development processes conducted by third-party manufacturers. Our agreements with third-party manufacturers include confidentiality and intellectual property provisions as well as routine quality audits. In some instances, we have reserved resources from third-party manufacturers for the development and manufacture of our product candidates for near-term clinical programs. However, we currently obtain our products from these manufactures on a per project basis and do not have long-term supply arrangements in place. Should any of these manufacturers become unavailable to us for any reason, we believe that there are a number of potential replacements available to us on commercially reasonable terms to meet our future production requirements, although we may incur some delay and cost in qualifying and re-establishing the manufacturing processes at the replacements. We mitigate this risk by maintaining an inventory of clinical material for clinical trials we expect to initiate in the next 12-24 months.

We do not own or operate facilities for clinical drug manufacturing, storage, distribution, or quality testing. Currently, all of our clinical manufacturing is outsourced to third-party manufacturers. We plan to use some of the net proceeds of the IPO to establish our own manufacturing facilities in the US. We have expertise in building and running cGMP manufacturing facilities for immunotherapeutics. In addition, our manufacturing process is wholly-owned and developed by us, so we will not rely on a third-party for manufacturing expertise or processes.

Intellectual Property

Overview

We strive to protect and enhance internally-developed technology, inventions, and improvements that are commercially important to the development of our business, including seeking, maintaining, and defending patent rights, for our internally-developed molecules and manufacturing processes. We also rely on trade secrets relating to our technology platform and on know-how, continuing technological innovation to develop, strengthen, and maintain our proprietary position in the field of inflammaging and the diseases it promotes that may be important for the development of our business.

As with other biotechnology and pharmaceutical companies, our ability to secure and maintain intellectual property protection for our product candidates, future products, and other internally-developed technologies will depend on our success in obtaining effective patent coverage and enforcing those patents if granted. However, we cannot guarantee that our pending patent applications, and any patent applications that we may in the future file, will result in the issuance of patents, or that any issued patents we may obtain will provide sufficient proprietary protection from competitors. Any issued patents that we obtain may be challenged, invalidated, or circumvented by third parties.

In addition to patents, we also rely on trade secrets, know-how and continuing technological innovation to develop and maintain our competitive position. We seek to protect our internally-developed technology, in part, through confidentiality agreements and invention assignment agreements with our employees, consultants, scientific advisors, contractors and potential collaboratorWe also rely on trade secrets relating to our manufacturing process and on know-how, continuing technological innovation and in-licensing opportunities to develop, strengthen, and maintain our proprietary position in the field of inflammaging that may be important for the development of our business. We additionally may rely on regulatory protection afforded through data exclusivity, market exclusivity, and patent term extensions, where available.

Internally-Developed Intellectual Property

As of December 31, 2021, we own 61 pending patent applications worldwide, including 11 pending U.S. utility patent applications, one pending provisional U.S. patent application, six pending PCT applications, four Hong Kong applications, and 39 pending non-U.S. national phase patent applications. Our policy is to file patent applications to protect technology, inventions and improvements to inventions that are commercially important to the development of our business. We seek United States and foreign patent protection for a variety of technologies, including: our internally-developed platform, specific chimeric polypeptides developed using our platform, methods of using the chimeric polypeptides both *in vivo* and in cellular therapy to treat various conditions, methods for treating diseases of interest, and methods for manufacturing our products. We also intend to seek patent protection or rely upon trade secret rights to protect other technologies that may be used in combination with our products in the development of novel products or methods of use. We seek protection, in part, through confidentiality and proprietary information agreements.

Our intellectual property portfolio is in its early stages and is continually evolving during prosecution of our applications. We own multiple families of patent applications that are directed to our TOBI™ platform technology and our single-chain and multi-chain chimeric polypeptides and methods of use of these polypeptides alone and in combination.

Single-Chain Chimeric Polypeptides Patent Family

This family includes patent applications with claims directed to compositions of various single-chain chimeric polypeptides created using the TOBI™ platform. These applications also include methods of use and manufacture thereof and methods of promoting the activation and proliferation of a NK cell or a T cell using our single-chain chimeric polypeptides. As of December 2021, this family, which includes HCW9302, includes one pending U.S. utility patent application, and 11 pending patent applications filed in Europe, Australia, Canada, Israel, Japan, New Zealand, Korea, China, Singapore, Hong Kong and Taiwan. The earliest predicted expiration date of any patent issuing from a patent application in this family is 2039.

Multi-Chain Chimeric Polypeptides Patent Family

This family includes patent applications with claims directed to compositions of various multi-chain chimeric polypeptides created using the TOBI™ platform. These applications also include methods of use and manufacture thereof and methods of promoting the activation and proliferation of a NK cell or a T cell using our multi-chain chimeric polypeptides. As of December 2021, this family, which includes claims encompassing HCW9218, HCW9201, HCW9206, HCW9228, HCW9207, and HCW9212, includes three pending U.S. utility patent applications, and 11 pending patent applications filed in Europe, Australia, Canada, Israel, Japan, New Zealand, Korea, China, Singapore, Hong Kong and Taiwan. The earliest predicted expiration date of any patent issuing from a patent application in this family is 2039.

With respect to HCW9218, the composition is claimed in one pending U.S. utility patent application and 11 pending patent applications filed in Europe, Australia, Canada, Israel, Japan, New Zealand, Korea, China, Singapore, Hong Kong and Taiwan.

With respect to HCW9201, the composition is claimed in one pending U.S. utility patent application and 11 pending patent applications filed in Europe, Australia, Canada, Israel, Japan, New Zealand, Korea, China, Singapore, Hong Kong and Taiwan. Wugen has obtained an exclusive license to these patent applications limited to use of the licensed chimeric polypeptides in manufacturing of certain cellular therapy products.

With respect to HCW 9206, the composition is claimed in one pending U.S. utility patent application and 11 pending patent applications filed in Europe, Australia, Canada, Israel, Japan, New Zealand, Korea, China, Singapore, Hong Kong and Taiwan. Wugen has obtained an exclusive license to these patent applications limited to use of the licensed polypeptides in manufacturing of certain cellular therapy products.

Methods of Culturing and Methods of Expansion and Proliferation

These two families include patent applications with claims directed to methods of promoting the activation and proliferation of NK cells through the use of our single-chain or multi-chain chimeric polypeptides for *ex vivo* cell therapy use. As of December 2021, these two families, which include methods of using HCW9201 and HCW9206, includes two pending U.S. utility patent applications and 14 pending patent applications filed in Europe, Australia, Canada, Israel, Japan, South Korea, Singapore, Hong Kong and China. The earliest predicted expiration date of any patent issuing from a patent application in the first of these two families is 2039. The earliest predicted expiration date of any patent issuing from a patent application in the second of these two families is 2040. Wugen has obtained an exclusive license to these two patent families limited to use in manufacturing of certain cellular therapy products.

Treating Age Related Disorders

These four families include patent applications with claims directed to methods of killing or reducing the number of senescent cells in a subject using our single-chain or multi-chain chimeric polypeptides. As of December 2021, these four families, which include methods of using HCW9218, HCW9228 and HCW9302, include three pending U.S. utility patent applications, one pending provisional U.S. patent application, three pending PCT applications, and six pending patent applications filed in Europe, Australia, Canada, Israel, Japan, Hong Kong and China. The earliest predicted expiration date of any patent issuing from a patent application in the first of these three families is 2039. The earliest predicted expiration date of any patent issuing from a patent application in the second of these families is 2041. The earliest predicted expiration date of any patent issuing from a patent application in the third of these families is 2040. The earliest predicted expiration date of any patent issuing from a patent application in the fourth of these families is 2042.

Methods of Activating Regulatory T cells

This family includes patent applications with claims directed to methods of promoting the activation and proliferation of Regulatory T cells through the use of our single-chain or multi-chain chimeric polypeptides for *ex vivo* cell therapy use. As of December 2021, this family, which includes methods of using HCW9213 and HCW9302, includes one pending U.S. utility patent application and one pending PCT application. The earliest predicted expiration date of any patent issuing from a patent application in this family of applications is 2041.

Antibodies

This family includes patent applications with claims directed to anti-CD26 scFv antibodies. As of December 2021, this family, which includes composition claims for HCW9106, includes one pending PCT application. The earliest predicted expiration date of any patent issuing from a patent application in this family of applications is 2041.

The various methods of use of our chimeric polypeptides covered in our portfolio broadly include: *ex vivo* cellular therapy use; *in vivo* or injectable use; methods of inducing differentiation of an immune cell into a memory or memory-like immune cell (*in vitro* or *in vivo*); methods of stimulating an immune cell (*in vitro* or i*n vivo*); and methods of inducing or increasing proliferation of an immune cell (*in vitro* or *in vivo*). Indications covered in the portfolio broadly include cancers, including solid and hematological cancers; age-related diseases; and infectious diseases. We are also pursuing innovative combinations of use with our chimeric polypeptides and antibodies, which include both known and internally-developed antibodies. Patents that may issue from these HCW Biologics, Inc. owned applications are generally expected to expire between the years 2039 to 2041, subject to possible patent term adjustment and/or extension.

The term of individual future patents may vary based on the countries in which they are obtained. Generally, patents issued from applications filed in the United States are effective for 20 years from the earliest effective non-provisional filing date. In certain cases, a patent term can be extended to recapture a portion of the term effectively lost as a result of the FDA regulatory review period. The Hatch-Waxman Act permits a patent term extension of up to five years beyond the expiration of a U.S. patent, though the total patent term, including any extension, must not exceed 14 years following FDA approval. A U.S. patent can only be extended once, such that, if a single patent is applicable to multiple products, it can only be extended based on one product.

The term of patents outside of the United States varies in accordance with provisions of applicable local law, but typically is also 20 years from the earliest effective national filing date. Similar patent term extension provisions are available in Europe and other foreign jurisdictions to extend the term of a patent covering an approved drug. When possible, we expect to apply for patent term extensions for future patents covering our product candidates and their methods of use.

Trademarks

We have filed five U.S. trademark applications for our corporate name, corporate logo, and the TOBI™ platform. In the future, we intend to file applications for trademark registrations in connection with our Company, our product candidates, and other technologies in various jurisdictions, including the United States as the products are further developed.

Trade Secret Protection

Finally, we may rely, in some circumstances, on trade secrets to protect our technology. We seek to protect our internally-developed technology and processes, in part, by entering into confidentiality agreements with our employees, consultants, scientific advisors, and contractors. We also seek to preserve the integrity and confidentiality of our data and trade secrets by maintaining physical security of our premises and physical and electronic security of our information technology systems.

In addition to the above, we have established expertise and development capabilities focused in the areas of preclinical research and development, manufacturing and manufacturing process development, quality control, quality assurance, regulatory affairs, and clinical trial design and implementation. We believe that our focus and expertise will help us develop products based on our internally-developed intellectual property.

Contracts and Agreements

Wugen Exclusive License Agreement

In December 2020, we entered into an exclusive worldwide license agreement with Wugen (the “Wugen License”), for rights to use certain HCW fusion protein molecules to develop, manufacture, and commercialize their cellular therapy products. The term of the agreement will expire on a product-by-product and country-by-country basis, upon the later of (i) the expiration of the last-to-expire valid patent claim or (ii) ten (10) years from the first commercial sale of such product.

As consideration for the Wugen License, HCW received shares of Wugen's common stock equivalent to a 10% ownership interest in Wugen as of the effective date of the Wugen License. The upfront payment for the license fee consisted of common stock of Wugen that had a fair value of $1.6 million on the effective date of the Wugen License. We also agreed to sell Wugen non-financial assets for $2.5 million, including cGMP-grade clinical materials needed in order to begin Phase 2 clinical trials in January 2021. We may receive additional payments in the future, based upon the occurrence of certain development milestones with a value of over $200 million. We will be eligible to receive additional payments for commercialization milestones as well as single-digit royalties for commercial sales once product sales commence.

We retained all other rights and use of the licensed molecules outside of Wugen's right to use the molecules to develop, manufacture, and commercialize cellular therapy products. Wugen's rights are limited to use of the licensed molecules in cellular therapy products, which products are a pharmaceutical or biological product, process or therapy that contains or comprises cells (including without limitation, CIML NK cells or T cells) that have been engineered, modified, or otherwise manipulated *ex vivo*, but excludes regulatory T cell-based cellular therapy products. Our retained rights include use of the molecules for injectable therapy product, regulatory T cell-based cellular therapy products, and manufacturing rights to the licensed molecules. We oversee manufacturing and supply of these licensed molecules to Wugen, utilizing our internally-developed manufacturing process, under supply agreements with Wugen that have industry-standard terms. Wugen funds all future clinical development and commercialization activities for the cellular therapy treatments developed by Wugen using the licensed molecules.

Contract Research Agreements

We have certain contract research agreements with contractors that were entered into the two years ended December 31, 2021 for the (i) screening and identification of specific human antibodies to three particular proteins that influence the cellular-senescence process, (ii) hybridoma development, (iii) cell line improvement, and (iv) research to support pre-clinical studies. We own all rights to the resulting intellectual property, including the antibodies, sequences, and data. To date, we have received several sequences and hybridomas from the contractors. For certain contractors, we are obligated to pay one (1) future milestone payment upon filing and acceptance of an IND for each respective human antibody or protein from cell line, however no additional future development or financial obligations are due under these contractor research agreements.

Competition

The biotechnology and pharmaceutical industries are characterized by rapidly advancing technologies, intense competition, and a strong emphasis on internally-developed products. We believe that our immunotherapeutic approach, internally-developed technology, expertise, scientific knowledge, track record in successfully developing drugs from bench to commercialization and intellectual property provide us with competitive advantages. We face potential competition from many different sources, including major pharmaceutical, specialty pharmaceutical and biotechnology companies, academic institutions, governmental agencies, and public and private research institutions. Any product candidates that we successfully develop and commercialize may compete with existing therapies and new therapies that may become available in the future.

Many of the companies which we are competing against, or which we may compete against in the future, 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. In addition, we face a constantly changing competitive landscape because of numerous mergers and acquisitions in the pharmaceutical and biotechnology industry, which will concentrate resources among a smaller number of large pharmaceutical companies. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements and co-development deals with large and established companies. These competitors also compete with us in establishing clinical trial sites and patient registration for clinical trials necessary to advance the clinical development of our product candidates.

Although our novel approach is unique from most other existing or investigational therapies across the disease areas where we are focusing our development, we will need to compete with currently approved therapies, and potentially those currently in development if they are approved. We are aware of several marketed and investigational products in our leading disease areas, including but not limited to the products and competitors discussed below.

We compete in the segments of the pharmaceutical, biotechnology, and other related markets that develop cancer therapies. There are many other companies that have commercialized or are developing cancer therapies, including large pharmaceutical and biotechnology companies, such as AstraZeneca/MedImmune, Bristol Myers Squibb, Merck, Novartis, Pfizer, and Roche/Genentech. We face significant competition from pharmaceutical and biotechnology companies that target specific tumor-associated antigens using immune cells or other cytotoxic modalities. These generally include immune cell redirecting therapeutics (e.g., T cell engagers), adoptive cellular therapies (e.g., CAR-Ts), antibody drug conjugates, targeted radiopharmaceuticals, targeted immunotoxin, and targeted cancer vaccines.

As we expand to other indications, we will focus on the treatment of fibrotic diseases, including NAFLD, or non-alcoholic fatty liver disease. NAFLD is an umbrella term that encompasses the entire spectrum of fatty liver disease, from isolated steatosis to NASH, or non-alcoholic steatohepatitis. There are currently no FDA approved therapies for the treatment of NAFLD. Instead, doctors will treat the underlying condition, such as obesity. Most of the drugs currently in development for NAFLD are focused on decreasing liver fat or improving liver inflammation as opposed to direct liver anti-fibrotic approaches. There are a number of companies developing product candidates for NAFLD including Pliant Therapeutics, Intercept, Pfizer Inc., Gilead, AbbVie, Novartis, AstraZeneca plc, Eli Lilly & Company, GlaxoSmithKline plc, Amgen, Inc., BMS, Johnson & Johnson, Merck & Co., Inc., Roche, Sanofi S.A., Takeda Pharmaceuticals, Novo Nordisk, Genfit SA, Madrigal Pharmaceuticals, Inc., Viking Therapeutics, Inc., Cirius Therapeutics, Inc., NGM Biopharmaceuticals, Akero Therapeutics, Inc. and Metacrine, Inc.

With respect to our lead internally-developed product candidate, HCW9218, we are not aware of any other competing clinical-stage companies with a first-in-class immunotherapeutic that utilizes multiple mechanisms of action, including the cytokine-based activation of immune cells and neutralization of TGF-ß immunosuppression.

With respect to our second lead product candidate, HCW9302, there is a growing momentum behind modulating T_{reg} cells as a potential treatment for autoimmune diseases. We are not aware of other competing clinical-stage companies with a first-in-class immunotherapeutic for deactivation of inflammasomes and reduction of inflammatory cytokines they release through the activation of T_{reg} cells.

We are aware of several other companies developing programs that utilize IL-2 for the selective expansion of T_{reg} cells, including Amgen Inc., Nektar Therapeutics (in partnership with Eli Lilly & Company), Roche, Merck & Co., Bristol Myers Squibb, and Celgene Corporation ("Celgene"). We are also aware of other companies with research or preclinical-stage programs in this area, including Synthorx, Inc., Moderna, Inc., and Xencor, Inc. We are also aware of other companies with PD-1 agonist programs for the treatment of autoimmune diseases, including AnaptysBio, Inc., Celgene, and Eli Lilly & Company.

We could see a reduction or elimination of our commercial opportunity if our competitors develop and commercialize products that are safer, more effective, have fewer or less severe side effects, are more convenient or are less expensive than any products that we or our collaborators may develop. Our competitors also may obtain FDA or foreign regulatory approval for their products more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we or our collaborators are able to enter the market. Key product features that would affect our ability to effectively compete with other therapeutics include the efficacy, safety, and convenience of our therapeutics, the ease of use and effectiveness of any complementary diagnostics and/or companion diagnostics, and price and levels of reimbursement.

Government Regulation

Government authorities in the United States, at the federal, state, and local level, and in other countries and jurisdictions, extensively regulate, among other things, the research, development, testing, manufacture, quality control, approval, packaging, storage, recordkeeping, labeling, advertising, promotion, distribution, marketing, post-approval monitoring and reporting, and import and export of pharmaceutical products. The processes for obtaining regulatory approvals in the United States and in foreign countries and jurisdictions, along with subsequent compliance with applicable statutes and regulations and other regulatory authorities, require the expenditure of substantial time and financial resources.

FDA Approval Process

In the United States, biological products are subject to extensive regulation by the FDA. The Federal Food, Drug, and Cosmetic Act (the "FDC Act"), and other federal and state statutes and regulations, govern, among other things, the research, development, testing, manufacture, storage, recordkeeping, approval, labeling, promotion and marketing, distribution, post-approval monitoring and reporting, sampling, and import and export of pharmaceutical products. Biological products used for the prevention, treatment, or cure of a disease or condition of a human being are subject to regulation under the FDC Act, with the exception that the section of the FDC Act which governs the approval of drugs via New Drug Applications ("NDAs"), does not apply to the approval of biologics. In contrast, biologics are approved for marketing under provisions of the Public Health Service Act ("PHSA"), via a Biologics License Application ("BLA"). However, the application process and requirements for approval of BLAs are very similar to those for NDAs. Failure to comply with applicable U.S. requirements may subject a company to a variety of administrative or judicial sanctions, such as clinical hold, FDA refusal to approve pending BLAs, warning or untitled letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, civil penalties, and criminal prosecution.

Biological product development for a new product in the United States typically involves preclinical laboratory and animal tests, the submission to the FDA of an IND, which must become effective before clinical testing may commence, and adequate and well-controlled clinical trials to establish the safety and effectiveness of the drug or biologic for each indication for which FDA approval is sought. Satisfaction of FDA pre-market approval requirements typically takes many years and the actual time required may vary substantially based upon the type, complexity, and novelty of the product or disease.

Preclinical tests include laboratory evaluation of product chemistry, formulation, and toxicity, as well as animal trials to assess the characteristics and potential safety and efficacy of the product. The conduct of the preclinical tests must comply with federal regulations and requirements, including Good Laboratory Practices. The results of preclinical testing are submitted to the FDA as part of an IND along with other information, including information about product chemistry, manufacturing and controls, and a proposed clinical trial protocol. Long-term preclinical tests, such as tests of reproductive toxicity and carcinogenicity in animals, may continue after the IND is submitted. A 30-day waiting period after the submission of each IND is required prior to the commencement of clinical testing in humans. If the FDA has neither commented on nor questioned the IND within this 30-day period, the clinical trial proposed in the IND may begin. Clinical trials involve the administration of the investigational drug or biologic to healthy volunteers or patients under the supervision of a qualified investigator. Clinical trials must be conducted: (i) in compliance with federal regulations; (ii) in compliance with Good Clinical Practice ("GCP"), an international standard meant to protect the rights and health of patients and to define the roles of clinical trial sponsors, administrators, and monitors; as well as (iii) under protocols detailing the objectives of the trial, the parameters to be used in monitoring safety, and the effectiveness criteria to be evaluated. Each protocol involving testing on U.S. patients and subsequent protocol amendments must be submitted to the FDA as part of the IND.

The FDA may order the temporary or permanent discontinuation of a clinical trial at any time, or impose other sanctions, if it believes that the clinical trial either is not being conducted in accordance with FDA regulations or presents an unacceptable risk to the clinical trial patients. Imposition of a clinical hold may be full or partial. The study protocol and informed consent information for patients in clinical trials must also be submitted to an institutional review board ("IRB"), for approval. The IRB will also monitor the clinical trial until completed. An IRB may also require the clinical trial at the site to be halted, either temporarily or permanently, for failure to comply with the IRB's requirements, or may impose other conditions. Additionally, some clinical trials are overseen by an independent group of qualified experts organized by the clinical trial sponsor, known as a data safety monitoring board or committee. This group provides authorization for whether a trial may move forward at designated checkpoints based on access to certain data from the trial.

Clinical trials to support BLAs for marketing approval are typically conducted in three sequential phases. In Phase 1, the initial introduction of the drug or biologic into patients, the product is tested to assess safety, dosage tolerance, metabolism, pharmacokinetics, pharmacological actions, side effects associated with drug or biologic exposure, and to obtain early evidence of a treatment effect if possible.

Phase 2 usually involves trials in a limited patient population to determine the effectiveness of the biologic for a particular indication, determine optimal dose and regimen, and to identify common adverse effects and safety risks. If a compound demonstrates evidence of effectiveness and an acceptable safety profile in Phase 2 evaluations, Phase 3 trials are undertaken to obtain additional information about clinical effects and confirm efficacy and safety in a larger number of patients, typically at geographically dispersed clinical trial sites, to permit the FDA to evaluate the overall benefit-risk relationship of the biologic and to provide adequate information for the labeling of the product.

In most cases, the FDA requires two adequate and well-controlled Phase 3 clinical trials to demonstrate the safety and efficacy of the biologic. In rare instances, a single Phase 3 trial may be sufficient when either (1) the trial is a large, multicenter trial demonstrating internal consistency and a statistically very persuasive finding of a clinically meaningful effect on mortality, irreversible morbidity or prevention of a disease with a potentially serious outcome and confirmation of the result in a second trial would be practically or ethically impossible or (2) the single trial is supported by other confirmatory evidence. Approval on the basis of a single trial may be subject to a requirement for additional post-approval studies.

These phases may overlap or be combined. For example, a Phase 1/2 clinical trial may contain both a dose-escalation stage and a dose-expansion stage, the latter of which may confirm tolerability at the recommended dose for expansion in future clinical trials (as in traditional Phase 1 clinical trials) and provide insight into the anti-tumor effects of the investigational therapy in selected subpopulation(s). Typically, during the development of oncology therapies, all subjects enrolled in Phase 1 clinical trials are disease-affected patients and, as a result, considerably more information on clinical activity may be collected during such trials than during Phase 1 clinical trials for non-oncology therapies.

In addition, the manufacturer of an investigational biologic in a Phase 2 or Phase 3 clinical trial for a serious or life-threatening disease is required to make available, such as by posting on its website, its policy on evaluating and responding to requests for expanding access to such investigational drug or biologic.

After completion of the required clinical testing, a Biologics License Application ("BLA") is prepared and submitted to the FDA. FDA approval of the BLA is required before marketing and distribution of the product may begin in the United States. The BLA must include the results of all preclinical, clinical, and other testing and a compilation of data relating to the product's pharmacology, chemistry, manufacture, and controls. The cost of preparing and submitting a BLA is substantial. The submission of most BLAs is additionally subject to a substantial application user fee. Under an approved BLA, the applicant is also subject to an annual program fee. These fees typically increase annually. A BLA for a biologic that has been designated as an orphan drug is not subject to an application fee, unless the BLA includes an indication for other than a rare disease or condition. The FDA has 60 days from its receipt of a BLA to determine whether the application will be filed based on the FDA's determination that it is adequately organized and sufficiently complete to permit substantive review. Once the submission is filed, the FDA begins an in-depth review. The FDA has agreed to certain performance goals to complete the review of BLAs. Most applications are classified as Standard Review products that are reviewed within ten months of the date the FDA files the BLA; applications classified as Priority Review are reviewed within six months of the date the FDA files the BLA. A BLA can be classified for Priority Review when the FDA determines the biologic has the potential to treat a serious or life-threatening condition and, if approved, would be a significant improvement in safety or effectiveness compared to available therapies. The review process for both standard and priority reviews may be extended by the FDA for three or more additional months to consider certain late-submitted information, or information intended to clarify information already provided in the BLA submission.

The FDA may also refer applications for novel biologic products, as well as biologic products that present difficult questions of safety or efficacy, to be reviewed by an advisory committee—typically a panel that includes clinicians, statisticians and other experts—for review, evaluation, and a recommendation as to whether the BLA should be approved. The FDA is not bound by the recommendation of an advisory committee, but generally follows such recommendations. Before approving a BLA, the FDA will typically inspect one or more clinical sites to assure compliance with GCP. Additionally, the FDA will inspect the facility or the facilities at which the biologic product is manufactured. The FDA will not approve the product unless compliance with cGMP is satisfactory and the BLA contains data that provide substantial evidence that the drug is safe and effective, or the biologic is safe, pure, potent, and effective, in the respective claimed indication.

After the FDA evaluates the BLA and completes any clinical and manufacturing site inspections, it issues either an approval letter or a complete response letter. A complete response letter generally outlines the deficiencies in the BLA submission and may require substantial additional testing, or information, in order for the FDA to reconsider the application for approval. If, or when, those deficiencies have been addressed to the FDA's satisfaction in a resubmission of the BLA, the FDA will issue an approval letter. The FDA has committed to reviewing such resubmissions in two or six months depending on the type of information included. An approval letter authorizes commercial marketing and distribution of the biologic with specific prescribing information for specific indications. As a condition of BLA approval, the FDA may require a risk evaluation and mitigation strategy ("REMS"), to help ensure that the benefits of the biologic outweigh the potential risks to patients. A REMS can include medication guides, communication plans for healthcare professionals, and elements to assure a product's safe use ("ETASU"). An ETASU can include, but is not limited to, special training or certification for prescribing or dispensing the product, dispensing the product only under certain circumstances, special monitoring, and the use of patient-specific registries. The requirement for a REMS can materially affect the potential market and profitability of the product. Moreover, the FDA may require substantial post-approval testing and surveillance to monitor the product's safety or efficacy.

Once granted, product approvals may be withdrawn if compliance with regulatory standards is not maintained or problems are identified following initial marketing. Changes to some of the conditions established in an approved BLA, including changes in indications, product labeling, manufacturing processes or facilities, require submission and FDA approval of a new BLA, or supplement to an approved BLA, before the change can be implemented. A BLA supplement for a new indication typically requires clinical data similar to that in the original application, and the FDA uses the same procedures and actions in reviewing BLA supplements as it does in reviewing original BLAs.

Disclosure of Clinical Trial Information

Sponsors of clinical trials of FDA regulated products, including biologics, are required to register and disclose certain clinical trial information on the website www.clinicaltrials.gov. Information related to the product, patient population, phase of investigation, study sites and investigators, and other aspects of the clinical trial is then made public as part of the registration. Sponsors are also obligated to discuss the results of their clinical trials after completion. Disclosure of the results of these trials can be delayed in certain circumstances for up to two years after the date of completion of the trial. Competitors may use this publicly available information to gain knowledge regarding the progress of development programs.

Expedited Development and Review Programs

Fast Track Designation and Priority Review

Fast track designation may be granted for a product that is intended to treat a serious or life-threatening disease or condition for which there is no effective treatment and preclinical or clinical data demonstrate the potential to address unmet medical needs for the condition. Fast track designation applies to both the product and the specific indication for which it is being studied.

The sponsor of an investigational biological product may request that FDA designate the product candidate for a specific indication as a fast track product concurrent with, or after, the submission of the IND for the product candidate. FDA must determine if the product candidate qualifies for fast track designation within 60 days of receipt of the sponsor's request. For fast track products, sponsors may have more frequent interactions with the FDA and the FDA may initiate review of sections of a fast track product's BLA before the application is complete. This "rolling review" is available if the FDA determines, after preliminary evaluation of clinical data submitted by the sponsor, that a fast track product may be effective. The sponsor must also provide, and the FDA must approve, a schedule for the submission of the remaining information and the sponsor must pay applicable user fees. Fast track designation may be withdrawn if FDA believes that the designation is no longer supported by data emerging in the clinical trial process.

Priority review may be granted for products that are intended to treat a serious or life-threatening condition and, if approved, would provide a significant improvement in safety and effectiveness compared to available therapies. FDA determines at the time of the filing the BLA whether the proposed product would be a significant improvement and therefore receive a priority review designation. FDA will attempt to direct additional resources to the evaluation of an application designated for priority review in an effort to facilitate the review.

Breakthrough Therapy Designation

FDA is also required to expedite the development and review of applications for approval of biologics that are intended to treat a serious or life-threatening disease or condition where preliminary clinical evidence indicates that the biologic may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints. Under the breakthrough therapy program, the sponsor of a new product candidate may request that FDA designate the product candidate for a specific indication as a breakthrough therapy concurrent with, or after, the filing of the IND for the product candidate. FDA must determine if the product candidate qualifies for breakthrough therapy designation within 60 days of receipt of the sponsor's request. The FDA may take certain actions with respect to breakthrough therapies, including holding meetings with the sponsor throughout the development process, providing timely advice to the product sponsor regarding development and approval, involving more senior staff in the review process, assigning a cross-disciplinary project lead for the review team and taking other steps to design the clinical studies in an efficient manner.

Accelerated Approval

Accelerated approval may be granted for a product that is intended to treat a serious or life-threatening condition and that generally provides a meaningful therapeutic advantage to patients over existing treatments. A product eligible for accelerated approval may be approved on the basis of either 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. The accelerated approval pathway is most often used in settings in which the course of a disease is long, and an extended period of time is required to measure the intended clinical benefit of a product, even if the effect on the surrogate or intermediate clinical endpoint occurs rapidly. Thus, accelerated approval has been used extensively in the development and approval of products for treatment of a variety of cancers in which the goal of therapy is generally to improve survival or decrease morbidity and the duration of the typical disease course requires lengthy and sometimes large studies to demonstrate a clinical or survival benefit. The accelerated approval pathway is contingent on a sponsor's agreement to conduct additional post-approval confirmatory studies to verify and describe the product's clinical benefit. These confirmatory trials must be completed with due diligence and, in some cases, the FDA may require that the trial be designed, initiated, and/or fully enrolled prior to approval. Failure to conduct required post-approval studies, or to confirm a clinical benefit during post-marketing studies, would allow the FDA to withdraw the product from the market on an expedited basis. All promotional materials for product candidates approved under accelerated regulations are subject to prior review by the FDA.

Regenerative Medicine Advanced Therapy Designation

The Regenerative Medicine Advanced Therapy ("RMAT") designation is an expedited program for the advancement and approval of regenerative medicine products that are intended to treat, modify, reverse, or cure a serious condition and where preliminary clinical evidence indicates the potential to address unmet medical needs for life-threatening diseases or conditions. Similar to Breakthrough Therapy designation, the RMAT allows companies developing regenerative medicine therapies to work earlier, more closely, and frequently with the FDA, and RMAT-designated products may be eligible for priority review and accelerated approval. Regenerative medicine therapies include cell therapies, therapeutic tissue engineering products, human cell and tissue products, and combination products using any such therapies or products, except for those regulated solely under section 361 of the PHSA and Title 21 of the Code of Federal Regulations Part 1271. For product candidates that have received a RMAT designation, interaction and communication between the FDA and the sponsor of the trial can help to identify the most efficient path for clinical development while minimizing the number of patients placed in ineffective control regimens.

Pediatric Information

Under the Pediatric Research Equity Act ("PREA"), BLAs or supplements to BLAs must contain data to assess the safety and effectiveness of the biological product for the claimed indications in all relevant pediatric subpopulations and to support dosing and administration for each pediatric subpopulation for which the biological product is safe and effective. FDA may grant full or partial waivers, or deferrals, for submission of data. Unless otherwise required by regulation, PREA does not apply to any biological product for an indication for which orphan designation has been granted except that PREA will apply to an original BLA for a new active ingredient that is orphan-designated if the drug is a molecularly targeted cancer product intended for the treatment of an adult cancer and is directed at a molecular target that FDA determines to be substantially relevant to the growth or progression of a pediatric cancer.

Additional Controls for Biologics

To help reduce the increased risk of the introduction of adventitious agents, the PHSA emphasizes the importance of manufacturing controls for products whose attributes cannot be precisely defined. The PHSA also provides authority to the FDA to immediately suspend biologics licenses in situations where there exists a danger to public health, to prepare or procure products in the event of shortages and critical public health needs, and to authorize the creation and enforcement of regulations to prevent the introduction or spread of communicable diseases within the United States.

After a BLA is approved, the product may also be subject to official lot release as a condition of approval. As part of the manufacturing process, the manufacturer is required to perform certain tests on each lot of the product before it is released for distribution. If the product is subject to official release by the FDA, the manufacturer submits samples of each lot of product to the FDA together with a release protocol showing a summary of the lot manufacturing history and the results of all of the manufacturer's tests performed on the lot. The FDA may also perform certain confirmatory tests on lots of some products, such as viral vaccines, before allowing the manufacturer to release the lots for distribution. In addition, the FDA conducts laboratory research related to the regulatory standards on the safety, purity, potency, and effectiveness of biological products. After approval of a BLA, biologics manufacturers must address any safety issues that arise, are subject to recalls or a halt in manufacturing, and are subject to periodic inspection after approval.

Post-Approval Requirements

Once a BLA is approved, a product will be subject to certain post-approval requirements. For instance, FDA closely regulates the post-approval marketing and promotion of biologics, including standards and regulations for direct-to-consumer advertising, off-label promotion, industry-sponsored scientific and educational activities, and promotional activities involving the internet. Biologics may be marketed only for the approved indications and in a manner consistent with the approved labeling.

Adverse event reporting and submission of periodic reports are required following FDA approval of a BLA. FDA also may require post-marketing testing, known as Phase 4 testing, REMS, and surveillance to monitor the effects of an approved product, or FDA may place conditions on an approval that could restrict the distribution or use of the product. In addition, quality control, biological product manufacture, packaging, and labeling procedures must continue to conform to cGMP after approval. Biologics manufacturers and certain of their subcontractors are required to register their establishments with FDA and certain state agencies. Registration with FDA subjects entities to periodic unannounced inspections by FDA, during which the Agency inspects manufacturing facilities to assess compliance with cGMPs. Accordingly, manufacturers must continue to expend time, money, and effort in the areas of production and quality control to maintain compliance with cGMPs. Regulatory authorities may withdraw product approvals or request product recalls if a company fails to comply with regulatory standards, if it encounters problems following initial marketing, or if previously unrecognized problems are subsequently discovered.

Biosimilars

The Biologics Price Competition and Innovation Act of 2009 ("BPCIA") creates an abbreviated approval pathway for biological products shown to be highly similar to or interchangeable with an FDA-licensed reference biological product. Biosimilarity sufficient to reference a prior FDA-approved product requires that there be no differences in conditions of use, route of administration, dosage form, and strength, and no clinically meaningful differences between the biological product and the reference product in terms of safety, purity, and potency. Biosimilarity must be shown through analytical trials, animal trials, and a clinical trial or trials, unless the Secretary of Health and Human Services waives a required element. A biosimilar product may be deemed interchangeable with a previously approved product if it meets the higher hurdle of demonstrating that it can be expected to produce the same clinical results as the reference product and, for products administered multiple times, the biologic and the reference biologic may be switched after one has been previously administered without increasing safety risks or risks of diminished efficacy relative to exclusive use of the reference biologic. The first biosimilar was approved in 2015, and the first interchangeable product was approved July 28, 2021. Complexities associated with the larger, and often more complex, structures of biological products, as well as the process by which such products are manufactured, pose significant hurdles to biosimilar product implementation, which is still being evaluated by the FDA.

A reference biologic is granted 12 years of exclusivity from the time of first licensure, or BLA approval, of the reference product, and no application for a biosimilar can be submitted for four years from the date of licensure of the reference product. The first biologic product submitted under the biosimilar abbreviated approval pathway that is determined to be interchangeable with the reference product has exclusivity against a finding of interchangeability for other biologics for the same condition of use for the lesser of (i) one year after first commercial marketing of the first interchangeable biosimilar, (ii) 18 months after the first interchangeable biosimilar is approved if there is no patent challenge, (iii) eighteen months after resolution of a lawsuit over the patents of the reference biologic in favor of the first interchangeable biosimilar applicant, or (iv) 42 months after the first interchangeable biosimilar's application has been approved if a patent lawsuit is ongoing within the 42-month period.

Other Healthcare Laws

In addition to FDA restrictions on marketing of pharmaceutical products, several other types of state and federal laws have been applied to restrict certain general business and marketing practices in the pharmaceutical industry. These laws include anti-kickback, false claims, transparency and health information privacy laws, and other healthcare laws and regulations.

The federal Anti-Kickback Statute prohibits, among other things, knowingly and willfully offering, paying, soliciting or receiving remuneration to induce, or in return for, purchasing, leasing, ordering or arranging for the purchase, lease or order of any healthcare item or service reimbursable under Medicare, Medicaid, or other federally financed healthcare programs. The Patient Protection and Affordable Care Act as amended by the Health Care and Education Reconciliation Act, collectively, the ACA, amended the intent element of the federal Anti-Kickback Statute so that a person or entity no longer needs to have actual knowledge of the statute or specific intent to violate it in order to commit a violation. This statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand and prescribers, purchasers and formulary managers, among others, on the other. Although there are a number of statutory exceptions and regulatory safe harbors protecting certain common activities from prosecution or other regulatory sanctions, the exceptions and safe harbors are drawn narrowly, and practices that involve remuneration intended to induce prescribing, purchases or recommendations may be subject to scrutiny if they do not qualify for an exception or safe harbor. Additionally, the ACA amended the federal Anti-Kickback Statute such that a violation of that statute can serve as a basis for liability under the federal civil False Claims Act.

Federal civil and criminal false claims laws, including the federal civil False Claims Act, prohibit any person or entity from knowingly presenting, or causing to be presented, a false claim for payment to the federal government, or knowingly making, or causing to be made, a false statement to have a false claim paid. This includes claims made to programs where the federal government reimburses, such as Medicare and Medicaid, as well as programs where the federal government is a direct purchaser, such as when it purchases off the Federal Supply Schedule. Pharmaceutical and other healthcare companies have been prosecuted under these laws for, among other things, allegedly inflating drug prices they report to pricing services, which in turn are used by the government to set Medicare and Medicaid reimbursement rates, and for allegedly providing free product to customers with the expectation that the customers would bill federal programs for the product. In addition, certain marketing practices, including off-label promotion, may also violate false claims laws. Most states also have statutes or regulations similar to the federal Anti-Kickback Statute and civil False Claims Act, which apply to items and services reimbursed under Medicaid and other state programs, or, in several states, apply regardless of the payor.

Other federal statutes pertaining to healthcare fraud and abuse include the civil monetary penalties statute, which prohibits, among other things, the offer or payment of remuneration to a Medicaid or Medicare beneficiary that the offeror or payor knows or should know is likely to influence the beneficiary to order or receive a reimbursable item or service from a particular supplier, and the additional federal criminal statutes created by the Health Insurance Portability and Accountability Act of 1996 (“HIPAA”), which prohibit, among other things, knowingly and willfully executing or attempting to execute a scheme to defraud any healthcare benefit program or obtain by means of false or fraudulent pretenses, representations or promises any money or property owned by or under the control of any healthcare benefit program in connection with the delivery of or payment for healthcare benefits, items or services.

In addition, HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, including the Final Omnibus Rule published on January 25, 2013, impose obligations on certain healthcare providers, health plans, and healthcare clearinghouses, known as covered entities, as well as their business associates and their subcontractors that perform certain services involving the storage, use or disclosure of individually identifiable health information, including mandatory contractual terms, with respect to safeguarding the privacy, security, and transmission of individually identifiable health information, and require notification to affected individuals and regulatory authorities of certain breaches of security of individually identifiable health information. HITECH increased the civil and criminal penalties that may be imposed against covered entities, business associates and possibly other persons, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorney’s fees and costs associated with pursuing federal civil actions. In addition, many state laws govern the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and may not have the same effect, and often are not preempted by HIPAA.

Further, pursuant to the ACA, the Centers for Medicare & Medicaid Services (“CMS”), issued a final rule that requires certain manufacturers of prescription drugs to collect and annually report information on certain payments or transfers of value to physicians (defined to include doctors, dentists, optometrists, podiatrists, and chiropractors), physician assistants, certain types of advance practice nurses and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members. The reported data is made available in searchable form on a public website on an annual basis. Failure to submit required information may result in civil monetary penalties.

We may also be subject to analogous state and foreign anti-kickback and false claims laws that may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers, or that apply regardless of payor. In addition, several states now require prescription drug companies to report certain expenses relating to the marketing and promotion of drug products and to report gifts and payments to individual healthcare practitioners in these states. Other states prohibit various marketing-related activities, such as the provision of certain kinds of gifts or meals.

Further, certain states require the posting of information relating to clinical studies and their outcomes. Some states require the reporting of certain drug pricing information, including information pertaining to and justifying price increases. In addition, certain states require pharmaceutical companies to implement compliance programs and/or marketing codes. Several additional states are considering similar proposals. Certain states and local jurisdictions also require the registration of pharmaceutical sales representatives. Additionally, we may also be subject to state and foreign laws governing the privacy and security of health information in some circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

Efforts to ensure that business arrangements with third parties comply with applicable state, federal, and foreign healthcare laws and regulations involve substantial costs. If a drug company's operations are found to be in violation of any such requirements, it may be subject to significant penalties, including civil, criminal and administrative penalties, damages, fines, disgorgement, imprisonment, the curtailment or restructuring of its operations, loss of eligibility to obtain approvals from the FDA, exclusion from participation in government contracting, healthcare reimbursement or other federal or state government healthcare programs, including Medicare and Medicaid, integrity oversight and reporting obligations, imprisonment, and reputational harm. Although effective compliance programs can mitigate the risk of investigation and prosecution for violations of these laws, these risks cannot be entirely eliminated. Any action for an alleged or suspected violation can cause a drug company to incur significant legal expenses and divert management's attention from the operation of the business, even if such action is successfully defended.

Data Privacy and Security

Numerous state, federal and foreign laws, govern the collection, dissemination, use, access to, confidentiality, and security of personal information, including health-related information. In the United States, numerous federal and state laws and regulations, including state data breach notification laws, state health information privacy laws, and federal and state consumer protection laws and regulations, govern the collection, use, disclosure, and protection of health-related and other personal information could apply to our operations or the operations of our partners. For example, HIPAA, as amended by HITECH, and their respective implementing regulations, imposes privacy, security and breach notification obligations on certain health care providers, health plans, and health care clearinghouses, known as covered entities, as well as their business associates that perform certain services that involve creating, receiving, maintaining or transmitting individually identifiable health information for or on behalf of such covered entities. Entities that are found to be in violation of HIPAA 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.

Even when HIPAA does not apply, according to the FTC, violating consumers' privacy rights or failing to take appropriate steps to keep consumers' personal information secure may constitute unfair acts or practices in or affecting commerce in violation of Section 5(a) of the Federal Trade Commission Act.

In addition, certain state and non-U.S. laws, such as the GDPR govern the privacy and security of personal information, including health-related information, in certain circumstances. Failure to comply with these laws, where applicable, can result in the imposition of significant civil and/or criminal penalties and private litigation. For example, the CCPA, which went into effect on January 1, 2020, creates new data privacy obligations for covered companies and provides new privacy rights to California residents. In Europe, the GDPR went into effect in May 2018 and introduces strict requirements for processing the personal data of individuals within the EEA. Further, recent legal developments in Europe have created complexity and compliance uncertainty regarding certain transfers of personal data from the EEA. For example, on July 16, 2020, the CJEU invalidated the Privacy Shield under which personal data could be transferred from the EEA to United States entities who had self-certified under the Privacy Shield scheme. Moreover, it is uncertain whether the standard contractual clauses will also be invalidated by the European courts or legislature.

Companies that must comply with the GDPR face increased compliance obligations and risk, including more robust regulatory enforcement of data protection requirements and potential fines for noncompliance of up to €20 million or 4% of the annual global revenues of the noncompliant company, whichever is greater. Additionally, following the United Kingdom's withdrawal from the European Union and the EEA, companies have to comply with the GDPR and the GDPR as incorporated into United Kingdom national law, the latter regime having the ability to separately fine up to the greater of £17.5 million or 4% of global turnover. The relationship between the United Kingdom and the European Union in relation to certain aspects of data protection law remains unclear, for example around how data can lawfully be transferred between each jurisdiction, which exposes us to further compliance risk.

Coverage and Reimbursement

Significant uncertainty exists as to the coverage and reimbursement status of any pharmaceutical or biological product for which we obtain regulatory approval. Sales of any product, if approved, depend, in part, on the extent to which such product will be covered by third-party payors, such as federal, state, and foreign government healthcare programs, commercial insurance, and managed healthcare organizations, and the level of reimbursement, if any, for such product by third-party payors. Decisions regarding whether to cover any of our product candidates, if approved, the extent of coverage and amount of reimbursement to be provided are made on a plan-by-plan basis. Further, no uniform policy for coverage and reimbursement exists in the United States, and coverage and reimbursement can differ significantly from payor to payor. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own reimbursement rates, but also have their own methods and approval process apart from Medicare determinations. As a result, the coverage determination process is often a time-consuming and costly process that will require us to provide scientific and clinical support for the use of our product candidates to each payor separately, with no assurance that coverage and adequate reimbursement will be applied consistently or obtained in the first instance.

For products administered under the supervision of a physician, obtaining coverage and adequate reimbursement may be particularly difficult because of the higher prices often associated with such drugs. Additionally, separate reimbursement for the product itself or the treatment or procedure in which the product is used may not be available, which may impact physician utilization. In addition, 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 or biological products, will apply to companion diagnostics.

In addition, the U.S. government, state legislatures and foreign governments have continued implementing cost-containment programs, including price controls, restrictions on coverage and reimbursement, and requirements for substitution of generic products. Third-party payors are increasingly challenging the prices charged for medical products and services, examining the medical necessity and reviewing the cost effectiveness of pharmaceutical or biological products, medical devices, and medical services, in addition to questioning safety and efficacy. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit sales of any product that receives approval. Decreases in third-party reimbursement for any product or a decision by a third-party not to cover a product could reduce physician usage and patient demand for the product.

U.S. Healthcare Reform

Healthcare reforms that have been adopted, and that may be adopted in the future, could result in further reductions in coverage and levels of reimbursement for pharmaceutical products, increases in rebates payable under U.S. government rebate programs and additional downward pressure on pharmaceutical product prices. On September 9, 2021, the Biden administration published a wide-ranging list of policy proposals, most of which would need to be carried out by Congress, to reduce drug prices and drug payment. The Depart of Health and Human Services, or HHS, plan includes, among other reform measures, proposals to lower prescription drug prices, including by allowing Medicare to negotiate prices and disincentivizing price increases, and to support market changes that strengthen supply chains, promote biosimilars and generic drugs, and increase price transparency. Many similar proposals, including the plans to give Medicare Part D authority to negotiate drug prices, require drug manufacturers to pay rebates on drugs whose prices increase greater than the rate of inflation, and cap out-of-pocket costs, have already been included in policy statements and legislation currently being considered by Congress. It is unclear to what extent these and other statutory, regulatory, and administrative initiatives will be enacted and implemented.

Other Government Regulation Outside of the United States

In addition to regulations in the United States, we are subject to a variety of regulations in other jurisdictions governing, among other things, research and development, clinical trials, testing, manufacturing, safety, efficacy, quality control, labeling, packaging, storage, record keeping, distribution, reporting, export and import, advertising, marketing, and other promotional practices involving biological products as well as authorization, approval as well as post-approval monitoring and reporting of our products. Because biologically sourced raw materials are subject to unique contamination risks, their use may be restricted in some countries.

Whether or not we obtain FDA approval for 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 (a "CTA"), much like the IND prior to the commencement of human clinical trials.

The requirements and process governing the conduct of clinical trials, including requirements to conduct additional clinical trials, product licensing, safety reporting, post-authorization requirements, marketing and promotion, interactions with healthcare professionals, pricing, and reimbursement may vary widely from country to country. No action can be taken to market any product in a country until an appropriate approval application has been approved by the regulatory authorities in that country. The current approval process varies from country to country, and the time spent in gaining approval varies from that required for FDA approval. In certain countries, the sales price of a product must also be approved. The pricing review period often begins after market approval is granted. Even if a product is approved by a regulatory authority, satisfactory prices may not be approved for such product, which would make launch of such products commercially unfeasible in such countries.

Regulation in the European Union

Drug and Biologic Development Process

The conduct of clinical trials is currently governed by the EU Clinical Trials Directive 2001/20/EC ("Clinical Trials Directive"), and will be replaced by the EU Clinical Trials Regulation (EU) No. 536/2014 ("Clinical Trials Regulation"), once the latter comes into effect. The Clinical Trials Regulation introduces a complete overhaul of the existing regulation of clinical trials for medicinal products in the EU. Currently it is not expected to come into force before December 2021.

Under the current regime, before a clinical trial can be initiated, it must be approved in each EU Member State where there is a site at which the trial is to be conducted. The approval must be obtained from two separate entities: the National Competent Authority ("NCA"), and one or more Ethics Committees. The NCA of the EU Member States in which the clinical trial will be conducted must authorize the conduct of the trial, and the independent Ethics Committee must grant a positive opinion in relation to the conduct of the clinical trial in the relevant EU Member State before the commencement of the trial. Any substantial changes to the trial protocol or other information submitted with the clinical trial applications must be submitted to or approved by the relevant NCA and Ethics Committees. Under the current regime all suspected unexpected serious adverse reactions to the investigated drug that occur during the clinical trial must be reported to the NCA and to the Ethics Committees of the EU Member State where they occur.

A more unified procedure will apply under the new Clinical Trials Regulation. A sponsor will be able to submit a single application for approval of a clinical trial through a centralized EU clinical trials portal. One national regulatory authority (the reporting EU Member State proposed by the applicant) will take the lead in validating and evaluating the application and the other regulatory authorities will have limited involvement. If an application is rejected, it may be amended and resubmitted through the EU clinical trials portal. If an approval is issued, the sponsor may start the clinical trial in all concerned Member States. However, a concerned EU Member State may in limited circumstances declare an "opt-out" from an approval and prevent the clinical trial form being conducted in such Member State. The Clinical Trials Regulation also aims to streamline and simplify the rules on safety reporting, and introduces enhanced transparency requirements such as mandatory submission of a summary of the clinical trial results to the EU Database.

Under both the current regime and the new Clinical Trials Regulation, national laws, regulations, and the applicable Good Clinical Practice and Good Laboratory Practice standards must also be respected during the conduct of the trials, including the International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use ("ICH"), guidelines on Good Clinical Practice ("GCP"), and the ethical principles that have their origin in the Declaration of Helsinki.

During the development of a medicinal product, the European Medicines Agency ("EMA"), and national regulators within the EU provide the opportunity for dialogue and guidance on the development program, usually in the form of scientific advice. A fee is incurred with each scientific advice procedure. Advice from the EMA is typically provided based on questions concerning, for example, quality (chemistry, manufacturing, and controls testing), nonclinical testing and clinical studies, and pharmacovigilance plans and risk-management programs.

Drug Marketing Authorization

In the European Union, medicinal products, including advanced therapy medicinal products ("ATMPs"), are subject to extensive pre- and post-market regulation by regulatory authorities at both the European Union and national levels. ATMPs comprise gene therapy products, somatic cell therapy products, and tissue engineered products, which are genes, cells, or tissues that have undergone substantial manipulation and that are administered to human beings in order to cure, diagnose or prevent diseases or regenerate, repair or replace a human tissue. Pursuant to the ATMP Regulation, the Committee on Advanced Therapies ("CAT"), is responsible in conjunction with the CHMP for the evaluation of ATMPs. The CHMP and CAT are also responsible for providing guidelines on ATMPs. These guidelines provide additional guidance on the factors that the EMA will consider in relation to the development and evaluation of ATMPs and include, among other things, the preclinical studies required to characterize ATMPs; the manufacturing and control information that should be submitted in a marketing authorization application; and post-approval measures required to monitor patients and evaluate the long term efficacy and potential adverse reactions of ATMPs. Although such guidelines are not legally binding, compliance with them is often necessary to gain and maintain approval for product candidates.

In the European Union and in Iceland, Norway, and Liechtenstein (together the European Economic Area, or EEA), after completion of all required clinical testing, medicinal products may only be placed on the market after a related Marketing Authorization ("MA"), has been granted. MAs can be obtained through, amongst others, a centralized procedure, which is compulsory for certain medicinal products such as ATMPs. The centralized procedure provides for the grant of a single MA by the European Commission ("EC"), that is valid for all 27 EU Member States and, after respective national implementing decisions, in the three additional EEA Member States (Iceland, Norway, and Liechtenstein). The centralized procedure is compulsory for certain medicinal products, including medicinal products derived from biotechnological processes, orphan medicinal products, ATMPs, and products with a new active substance indicated for the treatment of AIDS, cancer, neurodegenerative disorders, diabetes, autoimmune diseases, and viral diseases. It is optional for medicinal products containing a new active substance not yet authorized in the EEA before May 20, 2004, that constitute significant therapeutic, scientific or technical innovations, or for which the grant of a MA through the centralized procedure would be in the interest of public health at EU level. The timeframe for the evaluation of an application under the centralized procedure is 210 days, excluding clock stops. Typically, the overall process takes a year or more unless the application is eligible for an accelerated assessment.

All new marketing authorization applications must include a Risk Management Plan ("RMP"), describing the risk management system that the company will put in place and documenting measures to prevent or minimize the risks associated with the product. The regulatory authorities may also impose specific obligations as a condition of the MA. RMPs and Periodic Safety Update Reports ("PSURs"), are routinely available to third parties requesting access, subject to limited redactions.

Additionally, the holder of a marketing authorization for an ATMP must put in place and maintain a system to ensure that each individual product and its starting and raw materials, including all substances coming into contact with the cells or tissues it may contain, can be traced through the sourcing, manufacturing, packaging, storage, transport, and delivery to the relevant healthcare institution where the product is used.

MAs have an initial duration of five years. The authorization may subsequently be renewed for an unlimited period unless the EC or the national competent authority grants only a five-year renewal.

Data and Market Exclusivity

As in the United States, the European Union also provides opportunities for market and/or data exclusivity. For example, new Chemical Entities ("NCE"), approved in the European Union generally qualify for eight years of data exclusivity and ten years of market exclusivity. Data exclusivity is the period during which another applicant cannot rely on the MA holder's pharmacological, toxicological, and clinical data in support of another MA for the purposes of submitting an application, obtaining marketing authorization or placing the product on the market. But after eight years, a generic or biosimilar product application may be submitted and generic companies may rely on the MA holder's data.

However, even if a generic or biosimilar product is authorized it cannot be placed on the market in the European Union until the expiration of the 10-year market exclusivity period. An additional non-cumulative one-year period of marketing exclusivity is possible if during the data exclusivity period (the first eight years of the 10-year marketing exclusivity period), the MA holder obtains an authorization for one or more new therapeutic indications that are deemed to bring a significant clinical benefit compared to existing therapies.

Products may not be granted data exclusivity since there is no guarantee that a product will be considered by the European Union's regulatory authorities to include a NCE. Even if a compound is considered to be a NCE and the MA applicant is able to gain the prescribed period of data exclusivity, another company nevertheless could also market another version of the medicinal product if such company can complete a full marketing authorization application with their own complete database of pharmaceutical tests, preclinical studies, and clinical trials and obtain MA of its product.

Post-Approval Regulation

Similar to the United States, both MA holders and manufacturers of medicinal products are subject to comprehensive regulatory oversight by the EMA, the European Commission, and/or the competent regulatory authorities of the EU Member States. This oversight applies both before and after grant of manufacturing licenses and marketing authorizations. It includes control of compliance with EU good manufacturing practices rules, manufacturing authorizations, pharmacovigilance rules, and requirements governing advertising, promotion, sale, and distribution, recordkeeping, importing, and exporting of medicinal products.

Failure by us or by any of our third-party partners, including suppliers, manufacturers, and distributors to comply with EU laws and the related national laws of individual EU Member States governing the conduct of clinical trials, manufacturing approval, marketing authorization of medicinal products, and marketing of such products, both before and after grant of marketing authorization, statutory health insurance, bribery and anti-corruption, or other applicable regulatory requirements may result in administrative, civil, or criminal penalties.

These penalties could include delays or refusal to authorize the conduct of clinical trials or to grant marketing authorization, product withdrawals and recalls, product seizures, suspension, withdrawal or variation of the marketing authorization, total or partial suspension of production, distribution, manufacturing or clinical trials, operating restrictions, injunctions, suspension of licenses, fines, and criminal penalties.

The holder of a marketing authorization for a medicinal product must also comply with EU pharmacovigilance legislation and its related regulations and guidelines, which entail many requirements for conducting pharmacovigilance, or the assessment and monitoring of the safety of medicinal products. These pharmacovigilance rules can impose on holders of MAs the obligation to conduct a labor intensive collection of data regarding the risks and benefits of marketed medicinal products and to engage in ongoing assessments of those risks and benefits, including the possible requirement to conduct additional clinical studies or post-authorization safety studies to obtain further information on a medicine's safety, or to measure the effectiveness of risk-management measures, which may be time consuming and expensive and could impact our profitability. MA holders must establish and maintain a pharmacovigilance system and appoint an individual qualified person for pharmacovigilance, who is responsible for oversight of that system. Key obligations include expedited reporting of suspected serious adverse reactions and submission of PSURs in relation to medicinal products for which they hold MAs. The EMA reviews PSURs for medicinal products authorized through the centralized procedure. If the EMA has concerns that the risk benefit profile of a product has varied, it can adopt an opinion advising that the existing MA for the product be suspended, withdrawn or varied. The agency can advise that the MA holder be obliged to conduct post-authorization Phase IV safety studies. If the EC agrees with the opinion, it can adopt a decision varying the existing MA. Failure by the marketing authorization holder to fulfill the obligations for which the EC's decision provides can undermine the ongoing validity of the MA.

More generally, non-compliance with pharmacovigilance obligations can lead to the variation, suspension or withdrawal of the MA for the product or imposition of financial penalties or other enforcement measures.

Sales and Marketing Regulations

The advertising and promotion of our products is also subject to EU laws concerning promotion of medicinal products, interactions with physicians, misleading and comparative advertising and unfair commercial practices. In addition, other national legislation of individual EU Member States may apply to the advertising and promotion of medicinal products and may differ from one country to another. These laws require that promotional materials and advertising in relation to medicinal products comply with the product's SmPC as approved by the competent regulatory authorities.

The SmPC is the document that provides information to physicians concerning the safe and effective use of the medicinal product. It forms an intrinsic and integral part of the marketing authorization granted for the medicinal product. Promotion of a medicinal product that does not comply with the SmPC is considered to constitute off-label promotion. All advertising and promotional activities for the product must be consistent with the approved SmPC and therefore all off-label promotion is prohibited. Direct-to-consumer advertising of prescription-only medicines is also prohibited in the European Union. Violations of the rules governing the promotion of medicinal products in the European Union could be penalized by administrative measures, fines, and imprisonment. These laws may further limit or restrict the advertising and promotion of our products to the general public and may also impose limitations on its promotional activities with healthcare professionals.

Anti-Corruption Legislation

In the EU, interactions between pharmaceutical companies and physicians are also governed by strict laws, regulations, industry self-regulation codes of conduct and physicians' codes of professional conduct both at EU level and in the individual EU Member States. The provision of benefits or advantages to physicians to induce or encourage the prescription, recommendation, endorsement, purchase, supply, order or use of medicinal products is prohibited in the European Union. The provision of benefits or advantages to physicians is also governed by the national anti-bribery laws of the EU Member States. Violation of these laws could result in substantial fines and imprisonment.

Payments made to physicians in certain EU Member States also must be publicly disclosed. Moreover, agreements with physicians must often be the subject of prior notification and approval by the physician's employer, his/her regulatory professional organization, and/or the competent authorities of the individual EU Member States. These requirements are provided in the national laws, industry codes, or professional codes of conduct, applicable in the individual EU Member States. Failure to comply with these requirements could result in reputational risk, public reprimands, administrative penalties, fines or imprisonment.

Other Markets

Following the UK's formal departure from the EU on January 31, 2020, the UK entered a transition period to last until December 31, 2020, during which time EU medicines laws will remain applicable to the UK. After the transition period however, changes may be forthcoming as the terms of the UK and EU's future relationship are negotiated. The UK Medicines and Healthcare Products Regulatory Agency has proposed that, subject to being approved by the UK Parliament, a centralized MA will automatically convert into a UK MA. However, the draft of the "Medicines and Medical Devices Bill 2019-21" currently discussed in the UK House of Lords does not contain such a provision, but would only authorize the UK government to become active in the field of legislation concerning market authorizations in relation to human medicines.

For other countries outside of the European Union, 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 fail to comply with applicable foreign regulatory requirements, we may be subject to, among other things, fines, suspension of clinical trials, suspension or withdrawal of regulatory approvals, product recalls, seizure of products, operating restrictions, and criminal prosecution.

Human Capital Management

Our approach to human capital resource management starts with our mission to discover and develop novel immunotherapies to lengthen health span by disrupting the link between chronic, low-grade inflammation and age-related diseases. Our industry exists in a complex regulatory environment. The unique demands of our industry, together with the challenges of running an enterprise focused on the discovery, development, manufacture and commercialization of innovative medicines, require talent that is highly educated and/or has significant industry experience. Additionally, for certain key functions, we require specific scientific expertise to oversee and conduct R&D activities and the complex manufacturing requirements for biopharmaceutical products.

Our human capital resources objectives include, as applicable, identifying, recruiting, retaining, incentivizing and integrating our existing and additional employees. We recognize that attracting, motivating and retaining talent at all levels is vital to our continued success. Our employees are a significant asset and we aim to create an equitable, inclusive and empowering environment in which our employees can grow and advance their careers, with the overall goal of developing, expanding and retaining our workforce to support our current pipeline and future business goals. By focusing on employee retention and engagement, we also improve our ability to support our clinical trials, our pipeline, our platform technologies, business and operations, and also protect the long-term interests of our stockholders. Our success also depends on our ability to attract, engage and retain a diverse group of employees.

Our base pay program aims to compensate management and staff members relative to the value of the contributions of their role, which takes into account the skills, knowledge and abilities required to perform each position, as well as the experience brought to the job. We also provide annual incentive programs to reward our management team and staff members in alignment with achievement of Company-wide goals that are established annually and designed to drive aspects of our strategic priorities that support and advance our strategy across our Company. Our management team and staff members are eligible for the grant of equity awards under our long-term incentive program that are designed to align the experience of these staff with that of our stockholders. All management team and staff members also participate in a regular performance measurement process that aligns pay to performance and through which they receive performance and development feedback.

Our benefit programs are also generally broad-based, promote health and overall well-being and emphasize saving for retirement. All management team and regular staff members are eligible to participate in the same core health and welfare and retirement savings plans. Other employee benefits include medical plans, health savings plan, dental plans, vacation and sick-pay plans, employee assistance programs, life and accident insurance and short and long-term disability benefits.

Our Compensation Committee provides oversight of our compensation plans, policies and programs.

As of December 31, 2021, we had 44 full-time employees, 34 of whom were engaged in research, clinical development, manufacturing, and quality control activities, and 10 of whom were engaged in administrative activities. None of our employees are represented by labor unions or covered by collective bargaining agreements. We consider our relationship with our employees to be good.

Corporate Information

We were incorporated in Delaware on April 2, 2018. Our principal executive offices are located at 2929 N Commerce Parkway, Miramar, FL 33025. Our telephone number at that location is (954) 842-2024. References in this Annual Report on Form 10-K to “we,” “our,” “us,” “HCW Biologics,” and the “Company” refer to HCW Biologics Inc. Our corporate website address is www.hcwbiologics.com. Information contained on our website is not a part of this Annual Report on Form 10-K and the inclusion of our website address in this Annual Report on Form 10-K is an inactive textual reference only.

HCW BIOLOGICS INC. and TOBI are trademarks of HCW Biologics Inc. All other brand names or trademarks appearing in this Annual Report on Form 10-K are the property of their respective holders. Solely for convenience, the trademarks and trade names in this Annual Report on Form 10-K are referred to without the ® and ™ symbols, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

Available Information

We make available, free of charge through our website, our annual reports on Form 10-K, quarterly reports on Form 10-Q, and current reports on Form 8-K, and amendments to those reports, filed or furnished pursuant to Sections 13(a) or Section 15(d) of the Securities Exchange Act of 1934, as amended, as soon as reasonably practicable after they have been electronically filed with, or furnished to, the SEC.

The SEC maintains an internet site (http://www.sec.gov) that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC.

Item 1A Risk Factors.

Our operations and financial results are subject to various risks and uncertainties, including those described below that could adversely affect our business, financial condition, results of operations, cash flows and the trading price of our common stock. It is not possible to predict or identify all such risks; our operations could also be affected by factors, events or uncertainties that are not presently known to us or that we currently do not consider to present significant risks to our operations. Therefore, while you should carefully consider the following risks, together with all of the other information in this Annual Report on Form 10-K, including the section titled "Management's Discussion and Analysis of Financial Condition and Results of Operations," our financial statements and the related notes thereto. You should not consider the following risks to be a complete statement of all the potential risks or uncertainties we could face.

Summary of Key Risk Factors

- We are an early-stage biopharmaceutical company and have incurred significant losses since our inception, and we expect to incur losses for the foreseeable future. We have no products approved for commercial sale and may never achieve or maintain profitability.
- Our limited operating history may make it difficult for you to evaluate the success of our business to date and to assess our future viability
- We will require additional funding in order to complete development of our product candidates and commercialize our products, if approved. Additional funding may not be available on acceptable terms, or at all. If we are unable to raise capital when needed, we could be forced to delay, reduce, or eliminate our product development programs, our efforts to access manufacturing capacity and our commercialization efforts.
- Raising additional capital may cause dilution to our existing stockholders, restrict our operations, or require us to relinquish rights to our technologies or product candidates.
- Public health crises such as pandemics or other events could materially and adversely affect our business operations, workforce, product development activities, research and development activities, preclinical and clinical trials, toxicology studies, and financial condition.
- Our TOBI™ platform is based on novel technologies that are unproven and may not result in approvable or marketable products, which exposes us to unforeseen risks and makes it difficult for us to predict the time and cost of product development and potential for regulatory approval. We may not be successful in our efforts to use and expand our technology platform to develop and commercialize our product candidates, or may experience significant delays in doing so.
- Our clinical trials may fail to demonstrate substantial evidence of the safety and efficacy of our product candidates or any future product candidates, which would prevent or delay or limit the scope of regulatory approval and commercialization.
- Preliminary data from our clinical trials that we announce or publish from time to time may change as more patient data becomes available and are subject to audit and verification procedures that could result in material changes in the final data.
- Clinical drug development is a lengthy and expensive process with uncertain outcomes. If clinical trials of our product candidates are prolonged or delayed, we or any collaborators may be unable to obtain required regulatory approvals, and therefore be unable to commercialize our product candidates on a timely basis or at all.
- Our product candidates may have serious adverse, undesirable, or unacceptable side effects or other properties that may delay or prevent marketing approval.
- If we experience delays or difficulties enrolling patients in our clinical trials, our research and development efforts and business, financial condition, and results of operations could be materially adversely affected.
- The development and commercialization of biopharmaceutical products is subject to extensive regulation, and the regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time-consuming, and

inherently unpredictable. If we are ultimately unable to obtain regulatory approval for our product candidates on a timely basis if at all, our business will be substantially harmed. We operate in highly competitive and rapidly changing industries, which may result in others discovering, developing or commercializing competing products before or more successfully than we do.

- We rely on third parties to manufacture biological materials and our product candidates. The manufacture of our product candidates is complex.

- We rely on patents and other intellectual property rights to protect our technology, including product candidates from our TOBI™ platform, methods used to manufacture those product candidates, formulations thereof, and the methods for treating patients using those product candidates.

Risks Related to our Financial Position and Need for Additional Capital

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

Since our inception, we have devoted substantially all of our financial resources and efforts to research and development, including preclinical studies and our clinical trials, and have incurred significant operating losses. For the years ended December 31, 2020 and 2021, we reported a net loss of $5.8 million and $12.9 million, respectively. As of December 31, 2021, we had $11.7 million in cash and cash equivalents, $25.0 million in short-term investments held in U.S. Treasury bills, and $9.9 million in long-term investments held in U.S. Treasury notes. From inception to December 31, 2021, we incurred cumulative net losses of $27.9 million. To date, we have financed our operations primarily through our initial public offering, or the IPO, the sale of our redeemable preferred stock, and to a lesser extent, upfront payments received under our exclusive worldwide license with Wugen Inc. ("Wugen License") for certain rights to two of our internally-developed molecules and proceeds from an SBA Paycheck Protection Loan ("PPP loan") obtained through the Coronavirus Aid, Relief, and Economic Security Act ("CARES Act") which was forgiven.

Our losses have resulted principally from expenses incurred in the research and development of our product candidates and from management and administrative costs and other expenses that we have incurred while building our business infrastructure. We expect to continue to incur significant operating losses for the foreseeable future. The only revenue we have generated to date relates to our Wugen License. We have not generated any revenues from product sales. We anticipate that our expenses will increase substantially as we:

- undertake our initial Phase 1b/2 clinical trial for HCW9218 in pancreatic cancer;

- continue to advance the preclinical and clinical development in pursuit of immunotherapeutic treatments for other indications such as fibrotic diseases and autoimmune diseases using our lead product candidates, HCW9218 and HCW9302;

- initiate preclinical studies and clinical trials for additional product candidates that we may identify in the future;

- scale up our manufacturing process and capabilities to support our clinical trials of our product candidates;

- expand our operational, financial, and management systems and increase personnel, including personnel to support our clinical development, manufacturing, and commercialization efforts;

- continue to develop, perfect, and defend our intellectual property portfolio; and

- incur additional legal, accounting, or other expenses in operating our business, including the additional costs associated with operating as a public company.

We have no products for which we have obtained marketing approval and have not generated any revenue from product sales. Even if we obtain marketing approval for, and are successful in commercializing, one or more of our product candidates, we expect to incur substantial additional research and development and other expenditures to develop and market additional product candidates or to expand the approved indications of any marketed product. We may encounter unforeseen expenses, difficulties, complications, delays, and other unknown factors that may adversely affect our business. The size of our future net losses will depend, in part, on the rate of future growth of our expenses and our ability to generate revenue.

To become and remain profitable, we must succeed in developing and eventually commercializing products that generate significant revenue. This will require us to be successful in a range of challenging activities, including completing preclinical testing and clinical trials of our product candidates, discovering and developing additional product candidates, obtaining regulatory approval for any product candidates that successfully complete clinical trials, accessing manufacturing capacity, establishing marketing capabilities, and ultimately selling any products for which we may obtain regulatory approval. We may never succeed in these activities and, even if we do, we may never generate revenue that is sufficient to achieve profitability.

Because of the numerous risks and uncertainties associated with pharmaceutical products and biological development, we are unable to accurately predict the timing or amount of increased expenses or when, or if, we will be able to achieve profitability. If we are required by the FDA, or other regulatory authorities to perform studies in addition to those we currently anticipate, if there are any delays in completing our clinical trials or the development of any of our product candidates or if there are any third-party challenges to our intellectual property or we need to defend against any intellectual property-related claim, our expenses could increase and commercial revenue could be further delayed and more uncertain.

Our limited operating history may make it difficult for you to evaluate the success of our business to date and to assess our future viability.

Since our inception in 2018, we have devoted a significant portion of our resources to identifying and developing our product candidates emerging from our internally-developed immunotherapy platform technology, our other research and development efforts, building our intellectual property portfolio, raising capital, and providing general and administrative support for these operations. We have not yet demonstrated our ability to successfully complete clinical trials, obtain regulatory 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 product commercialization. Additionally, we expect our financial condition and operating results to continue to fluctuate significantly from period to period due to a variety of factors, many of which are beyond our control. Consequently, any predictions you may make about our future success or viability may not be as accurate as they could be if we had a longer operating history.

We will require additional funding in order to complete development of our product candidates and commercialize our products, if approved. However, this additional financing may not be available on acceptable terms, or at all. If we are unable raise capital when needed, we could be forced to delay, reduce, or eliminate our product development programs or commercialization efforts.

Based on our current business plans, including anticipated revenues from out-license agreements, we believe that our existing cash and cash equivalents and short-term investments, will enable us to fund our operating expenses through the end of 2023. We have based this estimate on assumptions that may prove to be wrong, and we could use our capital resources sooner than we currently expect, requiring us to seek additional funds sooner than planned, through public or private equity or debt financings or other sources, such as strategic collaborations. In addition, we may seek additional capital due to favorable market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. Attempting to secure additional financing may divert our management from our day-to-day activities, which may adversely affect our ability to develop our product candidates. Our future capital requirements will depend on many factors, including:

- the scope, timing, progress, costs, and results of discovery, preclinical development, laboratory testing, and clinical trials for our product candidates;
- the costs, timing, and outcome of regulatory review of any of our product candidates;
- the cost of manufacturing clinical supplies of our product candidates;
- the costs and timing of future commercialization activities, including manufacturing, marketing, sales, and distribution, for any of our product candidates for which we receive marketing approval;
- the extent to which we earn additional revenues under our licensing agreement with Wugen to develop certain cellular therapy products or enter into, maintain, and derive revenues from other licensing agreements, including agreements to out-license HCW9302 and HCW9213 and other product candidates, research and other collaborations, joint ventures and other business arrangements;
- the costs and timing of preparing, filing, and prosecuting patent applications, maintaining and enforcing our intellectual property rights, and defending any intellectual property-related claims, including any claims by third parties that we are infringing upon their intellectual property rights;

- the cost of building a sales force in anticipation of product commercialization;
- the revenue, if any, received from commercial sales of our product candidates for which we receive marketing approval;
- the effect of competing technological and market developments; and
- the extent to which we acquire or invest in business, products, and technologies.

Our ability to raise additional funds will depend on financial, economic, and market conditions and other factors, over which we may have no or limited control. Market volatility resulting from the COVID-19 pandemic or other factors could also adversely impact our ability to access capital as and when needed. Additional funds may not be available when we need them, on terms that are acceptable to us or at all. If adequate funds are not available to us on a timely basis, we could be required to:

- delay, limit, reduce, or terminate preclinical studies, clinical trials, or other research and development activities, or eliminate one or more of our development programs altogether; or
- delay, limit, reduce, or terminate our efforts to access manufacturing capacity, establish sales and marketing capabilities or other activities that may be necessary to commercialize our product candidates, or reduce our flexibility in developing or maintaining our sales and marketing strategy.

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

Until such time, if ever, as we can generate substantial product revenues, we expect to finance our operations with our existing cash and cash equivalents and accounts receivable, equity or debt financings, and upfront and milestone and royalty payments, if any, received from future licenses or collaborations. If we raise additional capital through the sale of equity or convertible debt securities, our stockholders' ownership interest will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect your rights as a holder of our common stock. In addition, the possibility of such issuance may cause the market price of our common stock to decline. Debt financing, if available, may result in increased fixed payment obligations and involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures, declaring dividends, or acquiring, selling, or licensing intellectual property rights, which could adversely impact our ability to conduct our business.

If we raise additional funds through collaborations, strategic alliances or marketing, distribution, or licensing arrangements with third parties, we may have to relinquish valuable rights to our intellectual property, technology, future revenue streams, or product candidates or grant licenses on terms that may not be favorable to us. We could also be required to seek funds through arrangements with collaborators or others at an earlier stage than otherwise would be desirable. Any of these occurrences may have a material adverse effect on our business, operating results, and prospects.

Public health crises such as pandemics or similar outbreaks could materially and adversely affect our preclinical and clinical trials, business, financial condition, and results of operations.

In March 2020, the World Health Organization declared COVID-19 a global pandemic and the United States declared a national emergency with respect to COVID-19. In response to the COVID-19 pandemic, we have implemented recommended public health guidance measures, limited the number of on-site staff and operated on a staggered schedule, which has altered our operations and processes. Similar changes from normal business activities have occurred at our key vendors and partners. We have experienced delays in the development of our lead product candidates as a result of the ongoing COVID-19 pandemic as new variants spread and prolong its impacts, including delays with certain third-party vendors conducting preclinical IND-enabling studies. Additionally, the worldwide demand and rapid development of COVID-19 diagnostics, vaccines and therapeutics has limited and may continue to limit the availability of services and materials necessary for our product candidates' manufacture and testing. While we are using our best efforts to mitigate these disruptions, we expect that our clinical development program timelines, including the timing of the IND submissions, may continue to be negatively affected by COVID-19, which could materially and adversely affect our business, financial condition, and results of operations.

As a result of the COVID-19 pandemic, or similar pandemics, and related public health guidance measures and orders, we have and may in the future experience disruptions that could materially and adversely impact our clinical trials, business, financial condition, and results of operations.

Potential disruptions include but are not limited to:

- COVID-19-related delays or interruptions at the contract testing or manufacturing operations, our laboratories, or in the supply chain;
- delays or difficulties in enrolling patients in our clinical trials;
- delays or difficulties in initiating or expanding clinical trials, including delays or difficulties with clinical site initiation and recruiting clinical site investigators and clinical site staff;
- patients withdrawing from our future clinical trials following enrollment as a result of contracting COVID-19 or other health conditions or being forced to quarantine;
- delays in clinical sites receiving the supplies and materials needed to conduct our planned clinical trials;
- interruption of key clinical trial activities, such as clinical trial site data monitoring and efficacy, safety and translational data collection, processing and analyses, due to limitations on travel imposed or recommended by federal, state, or local governments, employers, and others or interruption of clinical trial subject visits, which may impact the collection and integrity of subject data and clinical study endpoints;
- diversion of healthcare resources away from the conduct of clinical trials, including the diversion of hospitals serving as our clinical trial sites and hospital staff supporting the conduct of our clinical trials;
- delays or disruptions in preclinical experiments and IND-enabling studies including toxicology studies due to restrictions of on-site staff and unforeseen circumstances at vendors;
- interruption or delays in the operations of the FDA and comparable foreign regulatory agencies;
- delays in receiving approval from local regulatory authorities to initiate our planned clinical trials;
- limitations on employee or other resources that would otherwise be focused on the conduct of our clinical trials and preclinical work, including because of sickness of employees or their families, the desire of employees to avoid travel or contact with large groups of people, an increased reliance on working from home, school closures, or mass transit disruptions;
- changes in regulations as part of a response to the COVID-19 pandemic which may require us to change the ways in which our clinical trials are conducted, which may result in unexpected costs, or to discontinue the clinical trials altogether;
- delays in necessary interactions with regulators, ethics committees, and other important agencies and contractors due to limitations in employee resources or forced furlough of government or contractor personnel; and
- refusal of the FDA to accept data from clinical trials in affected geographies outside the United States.

The extent to which the COVID-19 or outbreaks of its variants may affect our clinical trials, business, financial condition, and results of operations will depend on future developments, which are highly uncertain and cannot be predicted at this time, such as the potential spread of the vaccine/treatment-resistant disease, the duration of the outbreaks, travel restrictions, and actions to contain the outbreaks or treat their impact, such as social distancing and quarantines or lock-downs in the United States and other countries, business closures, or business disruptions and the effectiveness of actions taken in the United States and other countries to contain and treat the disease. Future developments in these and other areas present material uncertainty and risk with respect to our clinical trials, business, financial condition, and results of operations.

If we or any collaborators we work with in the future are unable to successfully develop and commercialize our product candidates, or experience significant delays in doing so, our business, financial condition, and results of operations will be materially adversely affected.

Our ability to generate product and royalty revenues, which we do not expect will occur for at least the next several years, if ever, will depend heavily on the successful development and eventual commercialization of our product candidates, which may never occur. We currently generate no revenue from sales of any products, and we may never be able to develop or commercialize a marketable product. Each of our product candidates and any future product candidates we develop will require significant clinical development; management of clinical, preclinical, and manufacturing activities; regulatory approval in multiple jurisdictions; establishing manufacturing supply, including commercial manufacturing supply; and require us to build a commercial organization and make substantial investment and significant marketing efforts before we generate any revenue from product sales. We are not permitted to market or promote any of our product candidates before we receive regulatory approval from the FDA or comparable foreign regulatory authorities, and we may never receive such regulatory approval for any of our product candidates.

The successful development of our product candidates will depend on several factors, including the following:

- timely completion of successful clinical trials and preclinical studies for which the FDA, or any comparable foreign regulatory authority agree with the design, endpoints, or implementation;
- sufficiency of our financial and other resources to complete the necessary preclinical studies and clinical trials;
- receiving regulatory approvals or authorizations for conducting our planned clinical trials or future clinical trials;
- initiation and successful patient enrollment in, and completion of, additional clinical trials on a timely basis;
- our ability to demonstrate to the satisfaction of the FDA or any comparable foreign regulatory authority that the applicable product candidate is safe and effective as a treatment for our targeted indications or, in the case of an applicable product candidate which is regulated as a biological product, that the applicable product is safe, pure, and potent for our targeted indications;
- our ability to demonstrate to the satisfaction of the FDA or any comparable foreign regulatory authority that the applicable product candidate's risk-benefit ratio for its proposed indication is acceptable;
- timely receipt of marketing approvals for our product candidates from applicable regulatory authorities;
- the extent of any required post-marketing approval commitments to applicable regulatory authorities; and
- establishing and scaling up, either alone or with third-party manufacturers, manufacturing capabilities of clinical supply for our clinical trials and commercial manufacturing, if any of our product candidates are approved.

If we do not achieve one or more of these factors in a timely manner or at all, we could experience significant delays or an inability to successfully develop and commercialize our product candidates, which would materially adversely affect our business, financial condition, and results of operations.

A key element of our strategy is to enter into out-licensing arrangements for certain rights to HCW internally-developed molecules that we do not intend to develop into lead product candidates on our own or together with co-development partners. We may not be able to identify licensees, which could lower any return on our investments and increase our need for external funding.

Since we have already generated over 30 immunotherapeutic molecules, and plan to develop additional molecules, through our immunotherapy platform technology, our strategy includes funding operations in part through revenues derived from out-licensing molecules that are outside our oncological and anti-aging focus to third parties. Despite our efforts, we may be unable to enter into such licensing agreements. Supporting diligence activities conducted by potential licensors and negotiating the financial and other terms of a license agreement are long and complex processes with uncertain results, and we may fail to derive any revenues from these activities. Further, our potential licensors may develop alternative products or pursue alternative technologies either on their own or in collaboration with others, potentially resulting in our receiving no future milestone or royalty payments under any such licenses. For example, we have an exclusive worldwide license arrangement with Wugen pursuant to the development of certain cellular therapy products under which we may earn additional milestone or royalty payments, but there can be no assurance that Wugen will be successful in commercializing any products related to this license or that any such payments will ever be earned. If we fail to successfully out-license to third parties internally-developed molecules that are outside our focus areas, our revenues and return on our research and development activities would be negatively affected and we could be required to seek additional funding of our operations through the issuance of additional shares of common stock, or other equity or debt securities convertible into common stock, which could result in substantial dilution to our existing stockholders and could cause the price of our common stock to decline.

Our immunotherapy platform technology is based on novel technology that is unproven and may not result in approvable or marketable products, which exposes us to unforeseen risks and makes it difficult for us to predict the time and cost of product development and potential for regulatory approval.

We are developing a pipeline of product candidates using our internally-developed immunotherapy platform technology. We have not received regulatory approval for any of our product candidates. The scientific research that forms the basis of our efforts to develop product candidates with our immunotherapy platform technology is still ongoing. Further, the scientific evidence to support the feasibility of developing therapeutic treatments based on our immunotherapy platform technology is both preliminary and limited. Given the novelty of our technology, we intend to work closely with the FDA and other regulatory authorities to perform the requisite scientific analyses and evaluation of our methods to obtain regulatory approval for our product candidates. The validation process takes time and resources, may require independent third-party analyses, and may not be accepted by the FDA and other regulatory authorities. We cannot be certain that our approach will lead to the development of approvable or marketable products, alone or in combination with other therapies. Moreover, the FDA or other regulatory agencies may lack experience in evaluating the safety and efficacy of our immunotherapy platform technology, which could result in a longer than expected regulatory review process, increase our expected development costs, and delay or prevent commercialization of our product candidates. Additionally, even if our lead product candidates, such as HCW9218 and HCW9302, are approved, we will need to educate medical personnel regarding the potential efficacy and safety benefits of incorporating product candidates, such as HCW9218 and HCW9302 into existing treatment regimens, including in combination with other treatments for certain types of cancer. If we do not continue to successfully develop and begin to commercialize product candidates, we will face difficulty in obtaining product revenues in future periods, which could result in significant harm to our financial position and adversely affect our share price.

The potential long-term growth of our business depends on our efforts to leverage our immunotherapy platform technology to expand our portfolio of molecules and product candidates, which may require substantial financial resources and may ultimately be unsuccessful.

The potential long-term growth of our business depends upon our ability to utilize our internally-developed immunotherapy technology platform to build a pipeline of molecules and product candidates and either progress those product candidates through clinical development for the treatment of a variety of different types of diseases or out-license those molecules to third parties. Although our research and development efforts to date have resulted in a pipeline of product candidates directed at various cancers and aging-associated diseases, as well as other immunotherapy molecules, we may not be able to develop product candidates that are safe and effective. Research programs to identify new molecules, indications, and product candidates require substantial technical, financial, and human resources whether or not we ultimately identify any product candidates. Our research programs may initially show promise in identifying potential product candidates, yet fail to yield product candidates for clinical development for a number of reasons, including:

- the research methodology used may not be successful in identifying potential product candidates; or
- potential product candidates may on further study be shown to have harmful side effects or other characteristics that indicate they are unlikely to be effective drugs.

Even if we are successful in continuing to build our pipeline, the potential product candidates that we identify may not be suitable for clinical development, including as a result of being shown to have harmful side effects or other characteristics that indicate that they are unlikely to be products that will receive marketing approval and achieve market acceptance. There are a number of FDA requirements that we must satisfy before we can commence a clinical trial. If we are able to identify additional potential product candidates, satisfaction of these regulatory requirements will entail substantial time, effort, and financial resources. We may never satisfy these requirements. Any time, effort, and financial resources we expend on development of other product candidates may impair our ability to continue development and commercialization of HCW9218 for oncological and other indications, and we may never commence clinical trials of such development programs despite expending significant resources in pursuit of their development. If we do commence clinical trials of other product candidates, these product candidates may never demonstrate sufficient safety and efficacy to be approved by the FDA or other regulatory authorities. If any of these events occur, we may be forced to abandon our development efforts for such program or programs, which would harm our business.

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

As of December 31, 2021, we had 44 full-time employees. We expect to experience continued growth in the number of our employees and the scope of our operations, particularly in the areas of drug development and regulatory affairs. 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 public company with such anticipated growth, we may not be able to effectively manage the expansion of our operations or recruit and train additional qualified personnel. The 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.

In addition, future growth imposes significant added responsibilities on members of management, including: identifying, recruiting, integrating, maintaining, and motivating additional employees; managing our internal development efforts effectively, including the clinical and FDA review process for our product candidates, while complying with our contractual obligations to contractors and other third parties; and improving our operational, financial and management controls, reporting systems, and procedures.

We currently rely on certain independent organizations, advisors, and consultants to provide certain services, including strategic, financial, business development services, as well as certain aspects of regulatory approval, clinical management, manufacturing, and preparation for a potential commercial launch. There can be no assurance that the services of independent organizations, advisors, and consultants will continue to be available to us on a timely basis when needed, or that we can find qualified replacements. In addition, if we are unable to effectively manage our outsourced activities or if the quality or accuracy of the services provided by consultants or contract manufacturing organizations is compromised for any reason, our clinical trials may be extended, delayed, or terminated, and we may not be able to obtain regulatory approval of our product candidates or otherwise advance our business. There can be no assurance that we will be able to manage our existing consultants or find other competent outside contractors and consultants on economically reasonable terms, or at all.

Our future growth and ability to compete depends on retaining our key personnel and recruiting additional qualified personnel.

Our success depends upon the continued contributions of our key management, scientific, and technical personnel, many of whom have been instrumental for us and have substantial experience with our product candidates and related technology. The loss of key managers and senior scientists could delay our research and development activities. Despite our efforts to retain valuable employees, members of our management, scientific, and development teams may terminate their employment with us on short notice. Although we have employment agreements with certain of our key employees, these employment agreements provide for at-will employment, which means that any of our employees could leave our employment at any time, with or without notice. In addition, the competition for qualified personnel in the biotechnology and pharmaceutical industries is intense, and our future success depends upon our ability to attract, retain, and motivate highly-skilled scientific, technical, and managerial employees. We face competition for personnel from other companies, universities, public and private research institutions, and other organizations. If our recruitment and retention efforts are unsuccessful in the future, it may be difficult for us to implement our business strategy, which could have a material adverse effect on our business.

Risks Related to the Development and Clinical Testing of Our Product Candidates

Our clinical trials may fail to demonstrate substantial evidence of the safety and efficacy of our product candidates or any future product candidates, which would prevent or delay or limit the scope of regulatory approval and commercialization.

To obtain the requisite regulatory approvals to market and sell any product candidates, we must demonstrate through extensive preclinical studies and clinical trials that our investigational drug products are safe and effective for use in each targeted indication. Clinical testing is expensive and can take many years to complete, and its outcome is inherently uncertain. Failure can occur at any time during the clinical development process. Most product candidates that begin clinical trials are never approved by regulatory authorities for commercialization. We may be unable to establish clinical endpoints that applicable regulatory authorities would consider clinically meaningful, and a clinical trial can fail at any stage of testing.

Further, the process of obtaining regulatory approval is expensive, often takes many years following the commencement of clinical trials, and can vary substantially based upon the type, complexity, and novelty of the product candidates involved, as well as the target indications, patient population, and regulatory agency. Prior to obtaining approval to commercialize our product candidates and any future product candidates in the United States or abroad, we, our collaborators or our potential future collaborators must demonstrate with substantial evidence from adequate and well-controlled clinical trials, and to the satisfaction of the FDA or comparable foreign regulatory authorities, that such product candidates are safe and effective for their intended uses.

Clinical trials that we conduct may not demonstrate the efficacy and safety necessary to obtain regulatory approval to market our product candidates. In some instances, there can be significant variability in safety or efficacy results between different clinical trials of the same product candidate due to numerous factors, including changes in trial procedures set forth in protocols, differences in

the size and type of the patient populations, changes in and adherence to the clinical trial protocols, and the rate of dropout among clinical trial participants. If the results of our clinical trials are inconclusive with respect to the efficacy of our product candidates, if we do not meet the clinical endpoints with statistical and clinically meaningful significance, or if there are safety concerns associated with our product candidates, we may be delayed in obtaining marketing approval, if at all. Additionally, any safety concerns observed in any one of our clinical trials could limit the prospects for regulatory approval of that product candidate or other product candidates in any indications.

Even if the trials are successfully completed, clinical data are often susceptible to varying interpretations and analyses, and we cannot guarantee that the FDA or comparable foreign regulatory authorities will interpret the results as we do, and more trials could be required before we submit our product candidates for approval. We cannot guarantee that the FDA or comparable foreign regulatory authorities will view our product candidates as having efficacy even if positive results are observed in clinical trials. Moreover, results acceptable to support approval in one jurisdiction may be deemed inadequate by another regulatory authority to support regulatory approval in that other jurisdiction. To the extent that the results of the trials are not satisfactory to the FDA or comparable foreign regulatory authorities for support of a marketing application, approval of our product candidates, and any future product candidates may be significantly delayed, or we may be required to expend significant additional resources, which may not be available to us, to conduct additional trials in support of potential approval of our product candidates. Even if regulatory approval is secured for a product candidate, the terms of such approval may limit the scope and use of the specific product candidate, which may also limit its commercial potential.

In the near term, we are dependent on the success of HCW9218. If we are unable to complete the clinical development of, obtain marketing approval for or successfully commercialize HCW9218, or if we experience significant delays in doing so, our business would be substantially harmed.

We do not currently have products approved for sale and are investing a significant portion of our efforts and financial resources in the development of HCW9218. Although we have other programs in preclinical development and we intend to develop additional product candidates in the coming years, it will take additional investment and time for such product candidates to reach the same stage of development as HCW9218, and there can be no assurance that they will ever do so. Our prospects are substantially dependent on our ability to develop and obtain marketing approval for, and successfully commercialize, HCW9218 in one or more disease indications.

Preliminary, topline or interim data from our clinical trials that we announce or publish from time to time may change as more patient data becomes available and are subject to audit and verification procedures that could result in material changes in the final data.

From time to time, we may publicly disclose preliminary or topline data from our preclinical studies and clinical trials, which is based on a preliminary analysis of then-available data, and the results and related findings and conclusions are subject to change following a more comprehensive review of the data related to the particular study or trial. We also make assumptions, estimations, calculations, and conclusions as part of our analyses of data, and we may not have received or had the opportunity to fully and carefully evaluate all data. As a result, the topline results that we report may differ from future results of the same studies, or different conclusions or considerations may qualify such results, once additional data have been received and fully evaluated. Topline data also remain subject to audit and verification procedures that may result in the final data being materially different from the preliminary data we previously published. As a result, topline data should be viewed with caution until the final data are available.

From time to time, we may also disclose data from planned interim analyses of our clinical trials. Interim data 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. Adverse differences between interim data and final data could significantly harm our business prospects. Further, disclosure of interim data by us or by our competitors could result in volatility in the price of our common stock.

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. If the interim, topline, or preliminary data that we report differ from actual results, or if others, including regulatory authorities, 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.

Results of preclinical studies of our product candidates may not be predictive of the results of future preclinical studies or clinical trials.

To obtain the requisite regulatory approvals to market and sell any of our product candidates, we or any collaborator for such candidates must demonstrate through extensive preclinical studies and clinical trials that our product candidates are safe, pure, and potent in humans. Before IND can be submitted to the FDA and become effective, which is a prerequisite for conducting clinical trials on human subjects in the United States, a product candidate must successfully progress through extensive preclinical studies, which include preclinical laboratory testing, animal studies, and formulation studies in accordance with Good Laboratory Practices.

Success in preclinical studies does not ensure that later preclinical studies or clinical trials will be successful. A number of companies in the biotechnology and pharmaceutical industries have suffered significant setbacks in clinical trials, even after positive results in earlier preclinical studies. These setbacks have been caused by, among other things, preclinical findings made while clinical trials were underway and safety or efficacy observations made in clinical trials, including previously unreported adverse events. The design of a clinical trial can determine whether its results will support approval of a product, and flaws in the design of a clinical trial may not become apparent until the clinical trial is well advanced. In addition, preclinical and clinical data are often susceptible to varying interpretations and analyses. Notwithstanding any potential promising results in earlier studies, we cannot be certain that we will not face similar setbacks. In addition, the results of our preclinical animal studies, including our non-human primate studies, may not be predictive of the results of outcomes in subsequent clinical trials on human subjects. Product candidates in clinical trials may fail to show the desired pharmacological properties or safety and efficacy traits despite having progressed through preclinical studies.

If we fail to receive positive results in preclinical studies or clinical trials of our product candidates, the development timeline and regulatory approval and commercialization prospects for our most advanced product candidates, and, correspondingly, our business and financial prospects would be negatively impacted.

All of our product candidates are in preclinical or early-stage clinical development. Clinical drug development is a lengthy and expensive process with uncertain timelines and uncertain outcomes. If clinical trials of our product candidates are prolonged or delayed, we or any collaborators may be unable to obtain required regulatory approvals, and therefore be unable to commercialize our product candidates on a timely basis or at all.

Clinical testing is expensive and can take many years to complete, and its outcome is inherently uncertain. Failure can occur at any time during the clinical trial process. Product candidates in later stages of clinical trials may fail to produce the same results or to show the desired safety and efficacy traits despite having progressed through preclinical studies and initial clinical trials. Our future clinical trial results may not be successful.

To date, we have not completed any clinical trials required for the approval of our product candidates. We may experience delays in our clinical trials, and we do not know whether planned clinical trials will begin on time, need to be redesigned, enroll patients on time, or be completed on schedule, if at all. Clinical trials can be delayed, suspended, or terminated for a variety of reasons, including the following:

- delays in or failure to obtain regulatory authorization to commence a trial;
- delays in or failure to obtain institutional review board (“IRB”), approval at each site;
- delays in or failure to reach agreement on acceptable terms with prospective clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different trial sites — we are currently engaged in negotiations with a sponsor for an IND for HCW9218, but these negotiations, and any other discussions with potential clinical sites may not reach an agreement;
- difficulty in recruiting clinical trial investigators of appropriate competencies and experience;
- delays in establishing the appropriate dosage levels in clinical trials;
- delays in or failure to recruit and enroll suitable patients to participate in a trial, particularly considering study inclusion and exclusion criteria and patients’ prior lines of therapy and treatment;
- the difficulty in certain countries in identifying the sub-populations that we are trying to treat in a particular trial, which may delay enrollment and reduce the power of a clinical trial to detect statistically significant results;

- lower than anticipated retention rates of patients in clinical trials;
- failure to have patients complete a trial or return for post-treatment follow-up;
- clinical sites deviating from trial protocol or dropping out of a trial;
- delays adding new investigators or clinical trial sites;
- safety or tolerability concerns could cause us or our collaborators or governmental authorities, as applicable, to suspend or terminate a trial if it is found that the participants are being exposed to unacceptable health risks, undesirable side effects, or other unfavorable characteristics of the product candidate, or if such undesirable effects or risks are found to be caused by a chemically or mechanistically similar therapeutic or therapeutic candidate;
- our third-party research contractors failing to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;
- changes in regulatory requirements, policies, and guidelines;
- manufacturing sufficient quantities of a product candidate for use in clinical trials;
- the quality or stability of a product candidate falling below acceptable standards;
- changes in the treatment landscape for our target indications that may make our product candidates no longer relevant;
- third-party actions claiming infringement by our product candidates in clinical trials outside the United States and obtaining injunctions interfering with our progress; and
- business interruptions resulting from geo-political actions, including war and terrorism, natural disasters including earthquakes, typhoons, floods, and fires, or disease, including the COVID-19 pandemic.

In addition, even if the regulatory authorities agree with the design and implementation of the clinical trials set forth in an IND or similar application, we cannot guarantee that such regulatory authorities will not change their requirements in the future. These considerations also apply to new clinical trials we may submit as amendments to existing INDs.

Clinical trials must be conducted in accordance with the FDA and other applicable regulatory authorities' legal requirements, regulations or guidelines, and are subject to oversight by these governmental agencies and Ethics Committees or IRBs at the medical institutions where the clinical trials are conducted. We could encounter delays if a clinical trial is suspended or terminated by us, by the IRBs or Ethics Committees of the institutions in which such trials are being conducted, by the Data Review Committee or Data Safety Monitoring Board for such trial or by the FDA, or other regulatory authorities. Such authorities may impose such a suspension or termination due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a drug, changes in governmental regulations or administrative actions, or lack of adequate funding to continue the clinical trial. If we experience delays in the completion of, or termination of, any clinical trial of our product candidates, the commercial prospects of our product candidates will be harmed, and our ability to generate product revenues from any of these product candidates will be delayed. In addition, any delays in completing our clinical trials will increase our costs, slow down our product candidate development and approval process, and jeopardize our ability to commence product sales and generate revenues. Significant clinical trial delays could also allow our competitors to bring products to market before we do or shorten any periods during which we have the exclusive right to commercialize our product candidates and impair our ability to commercialize our product candidates and may harm our business and results of operations.

In addition, clinical trials must be conducted with supplies of our product candidates produced under current good manufacturing practices, or cGMP, requirements and other regulations. Furthermore, we rely on clinical trial sites to ensure the proper and timely conduct of our clinical trials and while we have agreements governing their committed activities, we have limited influence over their actual performance. We depend on our collaborators and on medical institutions to conduct our clinical trials in compliance with good clinical practice ("GCP") requirements. To the extent our collaborators fail to enroll participants for our clinical trials, fail to conduct the study in accordance with GCP, or are delayed for a significant time in the execution of trials, including achieving full

enrollment, we may be affected by increased costs, program delays, or both, which may harm our business. In addition, clinical trials that are conducted in countries outside the United States may subject us to further delays and expenses as a result of increased shipment costs, and additional regulatory requirements, as well as expose us to risks associated with clinical investigators who are unknown to the FDA, and different standards of diagnosis, screening, and medical care.

Our lead product candidate, HCW9218, has been cleared by the FDA to proceed with two initial Phase 1/1(b) clinical trials in cancer indications. If we experience delays in the commencement or completion of our clinical trials, or if we terminate a clinical trial prior to completion, the commercial prospects of HCW9218 could be harmed, and our ability to generate revenues from HCW9218 may be delayed. In addition, any delays in our clinical trials could increase our costs, slow down the development and approval process and jeopardize our ability to commence product sales and generate revenues. Any of these occurrences may harm our business, financial condition and results of operations. In addition, many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may also ultimately lead to the denial of regulatory approval of our product candidates.

We may incur unexpected costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of our product candidates.

We 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 our product candidates, including:

- regulators or IRBs or independent ethics committees may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;
- we may experience delays in reaching, or fail to reach, agreement on acceptable clinical trial contracts or clinical trial protocols with prospective trial sites;
- regulators may decide the design of our clinical trials is flawed, for example if our trial protocol does not evaluate treatment effects in trial subjects for a sufficient length of time;
- clinical trials of our 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 programs;
- preclinical testing may produce results based on which we may decide, or regulators may require us, to conduct additional preclinical studies before we proceed with certain clinical trials, limit the scope of our clinical trials, halt ongoing clinical trials or abandon product development programs;
- the number of patients required for clinical trials of our product candidates may be larger than we anticipate, enrollment in these clinical trials may be slower than we anticipate or participants 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 ethics committees may require us to perform additional or unanticipated clinical trials to obtain approval or we may be subject to additional post-marketing testing requirements to maintain regulatory approval;
- regulators may revise the requirements for approving our product candidates, or such requirements may not be as we anticipate;
- the cost of clinical trials of our product candidates may be greater than we anticipate;
- the supply or quality of our product candidates or other materials necessary to conduct clinical trials of our product candidates may be insufficient or inadequate;
- new lots of our product candidates may not be approved for use in clinical trials;
- our product candidates may have undesirable side effects or other unexpected characteristics, causing us or our investigators, regulators, IRBs or ethics committees to suspend or terminate the trials; and

- regulators may withdraw their approval of a product or impose restrictions on its distribution, such as in the form of a risk evaluation and mitigation strategy ("REMS").

We could encounter delays if a clinical trial is suspended or terminated by us, by the IRBs of the institutions in which such trials are conducted or their ethics committees, by the data review committee or data safety monitoring board for such trial or by the FDA, European Medicines Agency ("EMA") or other foreign regulatory authorities. Such authorities may suspend or terminate a clinical trial due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA, EMA or other foreign regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, including those relating to the class of products to which our product candidates belong.

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

- be delayed in obtaining marketing approval for our product candidates;
- not obtain marketing approval at all;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- obtain approval with labeling or a REMS that includes significant use or distribution restrictions or safety warnings;
- be subject to additional post-marketing testing requirements; or
- have the product removed from the market after obtaining marketing approval.

Our development costs will also increase if we experience delays in preclinical studies or clinical trials or in obtaining marketing approvals. We do not know whether any of our preclinical studies or clinical trials will begin as planned, will need to be restructured or will be completed on schedule, or at all. We may also determine to change the design or protocol of one or more of our clinical trials, including to add additional patients or arms, which could result in increased costs and expenses and/or delays. Significant preclinical study or clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize our product candidates or allow our competitors to bring products to market before we do and impair our ability to successfully commercialize our product candidates and may harm our business and results of operations.

We may not be able to file INDs or IND amendments to commence additional clinical trials on the timelines we expect, and even if we are able to, the FDA or a comparable foreign regulatory may not permit us to proceed.

We may not be able to file INDs for any of our product candidates on the timelines we expect, if at all. Moreover, we cannot be sure that submission of an IND will result in the FDA allowing further clinical trials to begin, or that, once begun, issues will not arise that require us to suspend or terminate clinical trials. Commencing each of these clinical trials will be subject to finalizing the trial design and selection of relevant endpoints based on discussions with the FDA and other regulatory authorities. Any guidance we receive from the FDA or other regulatory authorities is subject to change. These regulatory authorities could change their position, including, on the acceptability of our trial designs or the clinical endpoints selected, which may require us to complete additional clinical trials or impose stricter approval conditions than we currently expect. Successful completion of our clinical trials is a prerequisite to submitting a BLA to the FDA for each drug candidate and, consequently, the ultimate approval and commercial marketing of each drug candidate. There is also no assurance that, even if completed, our ongoing or any future clinical trials of drug candidates will be successful or will generate positive clinical data.

Our product candidates may have serious adverse, undesirable, or unacceptable side effects or other properties that may delay or prevent marketing approval. If such side effects are identified following approval, if any, the commercial profile of any approved label may be limited, or we may be subject to other significant negative consequences following marketing approval, if any.

Undesirable side effects that may be 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 other comparable foreign authorities.

Results of our clinical trials could reveal a high and unacceptable severity and prevalence of side effects. In such an event, our clinical trials could be suspended or terminated, and the FDA or comparable foreign regulatory authorities could order us to cease further development of or deny approval of our product candidates for any or all targeted indications. The drug-related side effects could affect patient recruitment or the ability of enrolled patients to complete the clinical trial or result in potential product liability claims. Any of these occurrences may harm our business, financial condition, and prospects significantly.

Further, clinical trials by their nature utilize a sample of the potential patient population. With a limited number of patients and limited duration of exposure, rare and severe side effects of our product candidates may only be uncovered with a significantly larger number of patients exposed to the product candidate.

In the event that any of our product candidates receives marketing approval and we or others later identify undesirable or unacceptable side effects caused by such products, a number of potentially significant negative consequences could result, including:

- regulatory authorities may withdraw or limit approvals of such products and require us to take our approved product off the market;
- regulatory authorities may require the addition of labeling statements, specific warnings, a contraindication or field alerts to physicians and pharmacies, or issue other communications containing warnings or other safety information about the product;
- regulatory authorities may require a medication guide outlining the risks of such side effects for distribution to patients, or that we implement a REMS to ensure that the benefits of the product outweigh its risks;
- we may be required to change the dose or the way the product is administered, conduct additional clinical trials, or change the labeling of the product;
- we may be subject to limitations on how we may promote or manufacture the product;
- sales of the product may decrease significantly;
- we may be subject to litigation or product liability claims; and
- our reputation may suffer.

Any of these events could prevent us, our collaborators, or our potential future partners from achieving or maintaining market acceptance of the affected product or could substantially increase commercialization costs and expenses, which in turn could delay or prevent us from generating significant revenue from the sale of any products.

The manufacture of our product candidates is complex. Our third-party manufacturers may encounter difficulties in production, which could delay or entirely halt their ability to supply our product candidates for clinical trials or, if approved, for commercial sale.

Our product candidates are considered to be biologics and the process of manufacturing biologics is complex and requires significant expertise and capital investment, including the development of advanced manufacturing techniques and process controls. We do not own or operate any cGMP manufacturing facilities. We rely, and expect to continue to rely, on third-party contract development and manufacturing organizations for the manufacture of our product candidates for preclinical and clinical testing. To date, we and our contract manufacturers have limited experience in the manufacturing of cGMP batches of our product candidates. Our contract manufacturers must comply with cGMP, regulations, and guidelines for the manufacturing of biologics used in clinical trials and, if approved, marketed products. To date, we and our contract manufacturers have only produced smaller cGMP batches of our product candidates and have not scaled up the manufacturing process for later-stage clinical trials and commercialization. Some of our product candidates may require the development of new processes to scale up, which could cause delays in the scale-up of manufacturing, as well as greater costs that could negatively impact the financial viability of our product candidates.

The process of manufacturing our biologic product candidates is extremely susceptible to product loss due to contamination, oxidation, equipment failure, or improper installation or operation of equipment, vendor or operator error, inconsistency in yields, variability in product characteristics, and difficulties in scaling the production process. 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 the manufacturing facilities in which our product candidates are

made, this could lead to withdrawal of our products from the market, and such manufacturing facilities may need to be closed for an extended period of time to investigate and remedy the contamination. Moreover, if the FDA determines that our third-party manufacturers are not in compliance with FDA laws and regulations, including those governing cGMP, the FDA may not approve our BLA until the deficiencies are corrected, or we replace the manufacturer in our BLA with a manufacturer that is in compliance.

Any adverse developments affecting manufacturing operations for our product candidates, if any are approved, may result in shipment delays, inventory shortages, lot failures, product withdrawals or recalls, or other interruptions in the supply of our products. We may also have to take inventory write-offs and incur other charges and expenses for products that fail to meet specifications as a result of defects or storage over an extended period of time, undertake costly remediation efforts, or seek more costly manufacturing alternatives. As part of our process development efforts, we also may make changes to our manufacturing processes at various points during development, for various reasons, such as controlling costs, achieving scale, decreasing processing time, increasing manufacturing success rate, or other reasons. Such changes carry the risk that they will not achieve their intended objectives, and any of these changes could cause our product candidates to perform differently and affect the results of our clinical trials or future clinical trials. In some circumstances, changes in the manufacturing process may require us to perform *ex vivo* comparability studies and to collect additional data from patients prior to undertaking more advanced clinical trials.

We depend on enrollment of patients in our clinical trials for our product candidates. If we experience delays or difficulties enrolling in our clinical trials, our research and development efforts and business, financial condition, and results of operations could be materially adversely affected.

Successful and timely completion of clinical trials will require that we enroll a sufficient number of patient candidates. These trials and other trials we conduct may be subject to delays for a variety of reasons, including as a result of patient enrollment taking longer than anticipated, patient withdrawal, or adverse events. For example, there were delays in commencing clinical trials of HCW9201 as a result of the ongoing pandemic. These types of developments could cause us to delay the trial or halt further development.

Our clinical trials will compete with other clinical trials that are in the same therapeutic areas as our product candidates, and this competition reduces the number and types of patients available to us, as some patients who might have opted to enroll in our trials may instead opt to enroll in a trial being conducted by one of our competitors. Moreover, enrolling patients in clinical trials for cancer therapies is challenging, as cancer patients will first receive the applicable standard of care. This may limit the number of eligible patients able to enroll in our clinical trials who have the potential to benefit from our drug candidates and could extend development timelines or increase costs for these programs. Patients who fail to respond positively to the standard of care treatment will be eligible for clinical trials of unapproved drug candidates. However, these patients may have either compromised immune function from prior administration of chemotherapy or an enhanced immune response from the prior administration of checkpoint inhibitors. Either of these prior treatment regimens may render our therapies less effective in clinical trials. Additionally, patients who have failed approved therapies will typically have more advanced cancer and a poorer long-term prognosis.

Because the number of qualified clinical investigators and clinical trial sites is limited, we expect to conduct some of our clinical trials at the same clinical trial sites that some of our competitors use, which will reduce the number of patients who are available for our clinical trials at such clinical trial sites.

Patient enrollment depends on many factors, including:

- the size and nature of the patient population;
- the severity of the disease under investigation;
- eligibility criteria for the trial;
- the proximity of patients to clinical sites;
- the design of the clinical protocol;
- the ability to obtain and maintain patient consents;
- the ability to recruit clinical trial investigators with the appropriate competencies and experience;

- the risk that patients enrolled in clinical trials will drop out of the trials before the administration of our product candidates or trial completion;
- the availability of competing clinical trials;
- the availability of new drugs approved for the indication the clinical trial is investigating; and
- clinicians' and patients' perceptions as to the potential advantages of the drug being studied in relation to other available therapies.

These factors may make it difficult for us to enroll enough patients to complete our clinical trials in a timely and cost-effective manner. Delays in the completion of any clinical trial of our product candidates will increase our costs, slow down our product candidate development and approval process, and delay or potentially jeopardize our ability to commence product sales and generate revenue. In addition, some of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may also ultimately lead to the denial of regulatory approval of our product candidates.

We may become exposed to costly and damaging liability claims, either when testing our product candidates in the clinic or at the commercial stage, and our product liability insurance may not cover all damages from such claims.

We are exposed to potential product liability and professional indemnity risks that are inherent in the research, development, manufacturing, marketing, and use of pharmaceutical products. While we currently have no products that have been approved for commercial sale, the current and future use of product candidates by us and our partners in clinical trials, and the sale of any approved products in the future, may expose us to liability claims. These claims might be made by patients that use the product, healthcare providers, pharmaceutical companies, our partners, or others selling such products. Any claims against us, regardless of their merit, could be difficult and costly to defend and could materially adversely affect the market for our product candidates or any prospects for commercialization of our product candidates.

Although the clinical trial process is designed to identify and assess potential side effects, it is always possible that a drug, even after regulatory approval, may exhibit unforeseen side effects. If any of our product candidates were to cause adverse side effects during clinical trials or after approval of the product candidate, we may be exposed to substantial liabilities. Physicians and patients may not comply with any warnings that identify known potential adverse effects and patients who should not use our product candidates.

Even successful defense against product liability claims would require significant financial and management resources. Regardless of the merits or eventual outcome, liability claims may result in: decreased demand for our product candidates; injury to our reputation; withdrawal of clinical trial participants; initiation of investigations by regulators; costs to defend the related litigation; a diversion of management's time and our resources; substantial monetary awards to trial participants or patients; product recalls, withdrawals or labeling, marketing or promotional restrictions; loss of revenue; exhaustion of any available insurance and our capital resources; the inability to commercialize any product candidate; and a decline in our share price.

Although we maintain adequate product liability insurance for our product candidates, it is possible that our liabilities could exceed our insurance coverage. We intend to expand our insurance coverage to include the sale of commercial products if we obtain marketing approval for any of our product candidates. However, we may be unable to maintain insurance coverage at a reasonable cost or obtain insurance coverage that will be adequate to satisfy any liability that may arise. If a successful product liability claim or series of claims is brought against us for uninsured liabilities or in excess of insured liabilities, our assets may not be sufficient to cover such claims, and our business operations could be impaired.

Risks Related to Our Regulatory Environment

The development and commercialization of biopharmaceutical products is subject to extensive regulation, and the regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time-consuming, and inherently unpredictable. If we are ultimately unable to obtain regulatory approval for our product candidates on a timely basis if at all, our business will be substantially harmed.

The clinical development, manufacturing, labeling, packaging, storage, recordkeeping, advertising, promotion, export, import, marketing, distribution, adverse event reporting, including the submission of safety and other post-marketing information and reports, and other possible activities relating to our product candidates are subject to extensive regulation. In the United States, marketing approval of biologics requires the submission of a BLA to the FDA, and we are not permitted to market any product

candidate in the United States until we obtain approval from the FDA of the BLA for that product candidate. A BLA must be supported by extensive clinical and preclinical data, as well as extensive information regarding pharmacology, chemistry, manufacturing, and controls. Outside the United States, many comparable foreign regulatory authorities employ similar approval processes.

We have not previously submitted a BLA to the FDA or similar regulatory approval filings to comparable foreign authorities, for any product candidate, and we cannot be certain that any of our product candidates will receive regulatory approval. Obtaining approval of a BLA can be a lengthy, expensive, and uncertain process, and as a company we have no experience with the preparation of a BLA submission or any other application for marketing approval. In addition, the FDA has the authority to require a REMS as part of a BLA or after approval, which may impose further requirements or restrictions on the distribution or use of an approved biologic, such as limiting prescribing to certain physicians or medical centers that have undergone specialized training, limiting treatment to patients who meet certain safe-use criteria and requiring treated patients to enroll in a registry. We also would not be permitted to market our product candidates in countries outside of the United States until we receive marketing approval from applicable regulatory authorities in those countries.

Our product candidates could fail to receive regulatory approval for many reasons, including the following:

- the FDA or comparable foreign regulatory authorities may disagree with the design or implementation of our clinical trials;
- we may be unable to demonstrate to the satisfaction of the FDA or comparable foreign regulatory authorities that a product candidate is safe and effective for its proposed indication;
- the results of clinical trials may not meet the level of statistical significance required by the FDA or comparable foreign regulatory authorities for approval;
- we may be unable to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;
- the FDA or comparable foreign regulatory authorities may disagree with our interpretation of data from preclinical studies or clinical trials;
- the data collected from clinical trials of our product candidates may not be sufficient to support the submission of a BLA or other submission or to obtain regulatory approval in the United States or elsewhere, or regulatory authorities may not accept a submission due to, among other reasons, the content or formatting of the submission;
- the FDA or comparable foreign regulatory authorities may fail to approve the manufacturing processes or facilities of third-party manufacturers with which we contract for clinical and commercial supplies; and
- the approval policies or regulations of the FDA or comparable foreign regulatory authorities may significantly change in a manner rendering our clinical data insufficient for approval.

This lengthy approval process, as well as the unpredictability of future clinical trial results, may result in our failing to obtain regulatory approval to market any of our product candidates, which would significantly harm our business, results of operations, and prospects. The FDA and other regulatory authorities have substantial discretion in the approval process, and determining when or whether regulatory approval will be obtained for any of our product candidates. As a result, we may be required to conduct additional preclinical studies, alter our proposed clinical trial designs, or conduct additional clinical trials to satisfy the regulatory authorities in each of the jurisdictions in which we hope to conduct clinical trials and develop and market our products, if approved. Further, even if we believe the data collected from clinical trials of our product candidates are promising, such data may not be sufficient to support approval by the FDA or any other regulatory authority.

In addition, even if we were to obtain approval, regulatory authorities may approve any of our product candidates for fewer or more limited indications than we request, may not approve the price we intend to charge for our products, may grant approval contingent on the performance of costly post-marketing clinical trials, or may approve a product candidate with a label that does not include the labeling claims necessary or desirable for the successful commercialization of that product candidate. Any of the foregoing scenarios could materially harm the commercial prospects for our product candidates.

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

If the FDA or a comparable foreign regulatory authority approves any of our product candidates, the manufacturing processes, labeling, packaging, distribution, import, export, adverse event reporting, storage, advertising, promotion, and recordkeeping for the product will be subject to extensive and ongoing regulatory requirements. These requirements include submissions of safety and other post-marketing information and reports, registration, as well as continued compliance with cGMP and GCP for any clinical trials that we conduct post-approval, all of which may result in significant expense and limit our ability to commercialize such products. In addition, any regulatory approvals that we receive for our product candidates may also be subject to limitations on the approved indicated uses for which the product may be marketed or to the conditions of approval, or contain requirements for potentially costly post-marketing testing, including Phase 4 clinical trials, and surveillance to monitor the safety and efficacy of the product candidate.

Manufacturers and manufacturers' facilities are required to comply with extensive FDA and comparable foreign regulatory authority requirements, including ensuring that quality control and manufacturing procedures conform to cGMP regulations. As such, we and our contract manufacturers will be subject to continual review and inspections to assess compliance with cGMP and adherence to commitments made in any approved marketing application. Accordingly, we and others with whom we work must continue to expend time, money, and effort in all areas of regulatory compliance, including manufacturing, production, and quality control.

If there are changes in the application of legislation or regulatory policies, or if problems are discovered with a product or our manufacture of a product, or if we or one of our distributors, licensees or co-marketers fails to comply with regulatory requirements, the regulators could take various actions. These include issuing warning letters or untitled letters, imposing fines on us, imposing restrictions on the product or its manufacture, and requiring us to recall or remove the product from the market. The regulators could also suspend or withdraw our marketing authorizations, requiring us to conduct additional clinical trials, change our product labeling, or submit additional applications for marketing authorization. If any of these events occurs, our ability to sell such product may be impaired, and we may incur substantial additional expense to comply with regulatory requirements, which could materially adversely affect our business, financial condition, and results of operations.

In addition, if we have any product candidate approved, our product labeling, advertising, and promotion will be subject to regulatory requirements and continuing regulatory review. In the United States, the FDA and the Federal Trade Commission ("FTC"), strictly regulate the promotional claims that may be made about pharmaceutical products to ensure that any claims about such products are consistent with regulatory approvals, not misleading or false in any particular, and adequately substantiated by clinical data. The promotion of a drug product in a manner that is false, misleading, unsubstantiated, or for unapproved (or off-label) uses may result in enforcement letters, inquiries and investigations, and civil and criminal sanctions by the FDA or the FTC. In particular, a product may not be promoted for uses that are not consistent with the uses approved by the FDA as reflected in the product's approved labeling. If we receive marketing approval for a product candidate, physicians may nevertheless prescribe it to their patients in a manner that is inconsistent with the approved label. If we are found to have promoted such off-label uses, we may become subject to significant liability. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant sanctions and may result in false claims litigation under federal and state statutes, which can lead to consent decrees, civil monetary penalties, restitution, criminal fines and imprisonment, and exclusion from participation in Medicare, Medicaid, and other federal and state healthcare programs. The federal government has levied large civil and criminal fines against companies for alleged improper promotion and has enjoined several companies from engaging in off-label promotion. The FDA has also requested that companies enter into consent decrees or permanent injunctions under which specified promotional conduct is changed or curtailed.

If a regulatory agency discovers previously unknown problems with a product, such as adverse events of unanticipated severity or frequency, or problems with the facility where the product is manufactured, or disagrees with the promotion, marketing or labeling of a product, such regulatory agency may impose restrictions on that product or us, including requiring withdrawal of the product from the market. If we fail to comply with applicable regulatory requirements, a regulatory agency or enforcement authority may, among other things:

- issue warning or untitled letters;
- issue, or require us to issue, safety-related communications, such as safety alerts, field alerts, "Dear Doctor" letters to healthcare professionals, or import alerts;

- impose civil or criminal penalties;
- suspend, limit, or withdraw regulatory approval;
- suspend any of our preclinical studies and clinical trials;
- refuse to approve pending applications or supplements to approved applications submitted by us;
- impose restrictions on our operations, including closing our contract manufacturers' facilities; or
- seize or detain products, refuse to permit the import or export of products, or require us to conduct a product recall.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response, and could generate negative publicity. Any failure to comply with ongoing regulatory requirements may significantly and adversely affect our ability to commercialize and generate revenue from our products, if approved. If regulatory sanctions are applied or if regulatory approval is withdrawn, the value of our company and our operating results will be adversely affected.

Moreover, the policies of the FDA and of other regulatory authorities may change and additional government regulations may be enacted that could prevent, limit, or delay regulatory approval of our product candidates. We cannot predict the likelihood, nature, or extent of government regulation that may arise from future legislation or administrative or executive action, either in the United States or abroad. In addition, if we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained and we may not achieve or sustain profitability.

Disruptions at the FDA and other government agencies caused by funding shortages or global health concerns could hinder their ability to hire, retain, or deploy key leadership and other personnel, or otherwise prevent new or modified products from being developed, 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. 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 licensed biologics to be reviewed and/or approved by necessary government agencies, which would adversely affect our business. For example, over the last several years, including for 35 days beginning on December 22, 2018, the U.S. government has shut down several times and certain regulatory agencies, such as the FDA, have had to furlough critical FDA employees and stop critical activities.

Separately, in response to the COVID-19 pandemic, on March 10, 2020, the FDA announced its intention to postpone most inspections of foreign manufacturing facilities, and on March 18, 2020, the FDA temporarily postponed routine surveillance inspections of domestic manufacturing facilities. Subsequently, on July 10, 2020, the FDA announced its intention to resume certain on-site inspections of domestic manufacturing facilities subject to a risk-based prioritization system. The FDA intends to use this risk-based assessment system to identify the categories of regulatory activity that can occur within a given geographic area, ranging from mission critical inspections to resumption of all regulatory activities. Regulatory authorities outside the United States may adopt similar restrictions or other policy measures in response to the COVID-19 pandemic. If a prolonged government shutdown occurs, or if global health concerns continue to prevent the FDA or other regulatory authorities from conducting their regular inspections, including product pre-approval inspections reviews, or other regulatory activities, it could significantly impact the ability of the FDA or other regulatory authorities to timely review and process our regulatory submissions, which could have a material adverse effect on our business.

Our research and development activities could be affected or delayed as a result of possible restrictions on animal testing.

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

Our business operations and current and future relationships with healthcare professionals, principal investigators, consultants, vendors, customers, and third-party payors in the United States and elsewhere are subject to applicable anti-kickback, fraud and abuse, false claims, physician payment transparency, and other healthcare laws and regulations, which could expose us to substantial penalties, contractual damages, reputation harm, administrative burdens, and diminished profits.

Healthcare providers, healthcare facilities and institutions, physicians, and third-party payors in the United States and elsewhere will 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 professionals, healthcare facilities and institutions, principal investigators, consultants, customers, and third-party payors may expose us to broadly applicable fraud and abuse and other healthcare laws, including, without limitation, the federal Anti-Kickback Statute and the federal False Claims Act, that may constrain the business or financial arrangements and relationships through which we research, sell, market, and distribute any product candidates for which we obtain marketing approval. In addition, we may be subject to physician payment transparency laws and regulation by the federal government and by the states and foreign jurisdictions in which we conduct our business. The applicable federal, state, and foreign healthcare laws that affect our ability to operate include, but are not limited to, the following:

- the federal Anti-Kickback Statute, which prohibits, among other things, persons or entities from knowingly and willfully soliciting, offering, receiving, or providing any remuneration (including any kickback, bribe, or certain rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, lease, order or recommendation of, any good, facility, item or service, for which payment may be made, in whole or in part, under any U.S. federal healthcare program, such as Medicare and Medicaid. The term "remuneration" has been broadly interpreted to include anything of value, including stock options. The federal Anti-Kickback Statute has also been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand and prescribers, purchasers and formulary managers on the other the other hand. Any arrangements with prescribers must be for *bona fide* services and compensated at fair market value. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;

- the U.S. federal civil and criminal false claims and civil monetary penalties laws, including the civil False Claims Act, which prohibit, among other things, including through civil whistleblower or qui tam actions, individuals or entities from knowingly presenting, or causing to be presented, to the U.S. federal government, claims for payment or approval that are false or fraudulent, knowingly making, using, or causing to be made or used, a false record or statement material to a false or fraudulent claim, or from knowingly making a false statement to avoid, decrease, or conceal an obligation to pay money to the U.S. federal government. Pharmaceutical manufacturers can cause false claims to be presented to the U.S. federal government by, among other things, engaging in impermissible marketing practices, such as the off-label promotion of a product for an indication for which it has not received FDA approval. In addition, the government may assert that a claim including items and services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the civil False Claims Act;

- the federal Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), which imposes criminal and civil liability for, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program, or knowingly and willfully falsifying, concealing, or covering up a material fact or making any materially false statement, in connection with the delivery of, or payment for, healthcare benefits, items, or services. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the healthcare fraud statute implemented under HIPAA or specific intent to violate it in order to have committed a violation;

- the U.S. Physician Payments Sunshine Act and its implementing regulations, which requires, among other things, certain manufacturers of drugs, devices, biologics, and medical supplies that are reimbursable under Medicare, Medicaid, or the Children's Health Insurance Program, with specific exceptions, to report annually to the Centers for Medicare and Medicaid Services ("CMS"), information related to certain payments and other transfers of value to physicians, as defined by statute, physician assistant, certain types of advance practice nurses and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members;

- analogous U.S. state laws and regulations, including: state anti-kickback and false claims laws, which may apply to our business practices, including but not limited to, research, distribution, sales and marketing arrangements, and claims involving healthcare items or services reimbursed by any third-party payor, including private insurers; state laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the U.S. federal government, or otherwise restrict payments that may be made to healthcare providers and other potential referral sources; state laws and regulations that require drug manufacturers to file reports relating to pricing and marketing information, which requires tracking gifts and other

remuneration and items of value provided to healthcare professionals and entities; and state and local laws requiring the registration of pharmaceutical sales representatives; and

- similar healthcare laws and regulations in foreign jurisdictions, including reporting requirements detailing interactions with and payments to healthcare providers.

Ensuring that our internal operations and future business arrangements with third parties comply with applicable healthcare laws and regulations will involve substantial costs. It is not always possible to identify and deter employee misconduct or business noncompliance, and the precautions we take to detect and prevent inappropriate conduct may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. Efforts to ensure that our business arrangements will comply with applicable healthcare laws may involve substantial costs. We have entered into consulting and scientific advisory board arrangements with physicians and other healthcare providers, including some who could influence the use of our product candidates, if approved. Compensation under some of these arrangements includes the provision of stock or stock options in addition to cash consideration. Because of the complex and far-reaching nature of these laws, it is possible that governmental authorities could conclude that our payments to physicians may not be fair market value for *bona fide* services or that our business practices do not comply with current or future statutes, regulations, agency guidance or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our operations are found to be in violation of any of the laws described above or any other governmental laws and regulations that may apply to us, we may be subject to significant penalties, including civil, criminal, and administrative penalties, damages, fines, exclusion from government-funded healthcare programs, such as Medicare and Medicaid, or similar programs in other countries or jurisdictions, integrity oversight and reporting obligations to resolve allegations of noncompliance, disgorgement, individual imprisonment, contractual damages, reputational harm, diminished profits, and the curtailment or restructuring of our operations. If any of the physicians or other providers or entities with whom we expect to do business are found to not be in compliance with applicable laws, they may be subject to criminal, civil or administrative sanctions, including exclusions from government funded healthcare programs and imprisonment, which could affect our ability to operate our business. Further, defending against any such actions can be costly, time-consuming, and may require significant personnel resources. Therefore, even if we are successful in defending against any such actions that may be brought against us, our business may be impaired.

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

We are exposed to the risk of employee fraud or other misconduct. We cannot ensure that our compliance controls, policies, and procedures will in every instance protect us from acts committed by our employees, agents, contractors, or collaborators that would violate the laws or regulations of the jurisdictions in which we operate, including, without limitation, employment, foreign corrupt practices, trade restrictions and sanctions, environmental, competition, and patient privacy and other privacy laws and regulations. Misconduct by employees could include failures to comply with FDA regulations, provide accurate information to the FDA, comply with manufacturing standards we may establish, comply with federal and state healthcare fraud and abuse laws and regulations, 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, kickbacks, self-dealing, and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, labeling, marketing and promotion, sales commission, customer incentive programs, and other business arrangements. Employee misconduct could also involve the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions and serious harm to our reputation. It is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations.

If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a material and adverse effect on our business, financial condition, results of operations, and prospects, including the imposition of significant civil, criminal and administrative penalties, damages, monetary fines, individual imprisonment, disgorgement of profits, possible exclusion from participation in Medicare, Medicaid, and other federal healthcare programs, contractual damages, reputational harm, diminished profits and future earnings, additional reporting or oversight obligations if we become subject to a corporate integrity agreement or other agreement to resolve allegations of noncompliance with the law, and curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and pursue our strategy.

Current and future legislation may increase the difficulty and cost for us and any future collaborators to obtain marketing approval of and commercialize our product candidates and affect the prices we, or they, may obtain.

In the United States and other jurisdictions, there have been, and we expect there will continue to be, a number of legislative and regulatory changes and proposed changes to the healthcare system that could affect our future results of operations. In particular, there have been and continue to be a number of initiatives at the U.S. federal and state levels that seek to reduce healthcare costs and improve the quality of healthcare. For example, in March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act (collectively the "ACA"), was enacted, which substantially changed the way healthcare is financed by both governmental and private payors. Among the provisions of the ACA of importance to the pharmaceutical and biotechnology industries, which includes biologics, are those which increased manufacturers' rebate liability under the Medicaid Drug Rebate Program, imposed a significant annual fee on companies that manufacture or import branded prescription drug products, required manufacturers to provide a discount off the negotiated price of prescriptions filled by beneficiaries in the Medicare Part D coverage gap, referred to as the "donut hole," which is now 70% of the negotiated price, required the reporting certain payments or transfers of values (described above), and provided a licensure framework for follow-on biologics.

Since its enactment, there have been judicial and Congressional challenges to certain aspects of the ACA, and there may be additional challenges and amendments to the ACA in the future. For example, the Tax Cuts and Jobs Act of 2017, repealed the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage that is commonly referred to as the "individual mandate." 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. Thus, the ACA will remain in effect in its current form.

In addition, other legislative changes have been proposed and adopted in the United States since the ACA was enacted which, among other things, have reduced Medicare payments to several types of providers, including hospitals and cancer treatment centers.
These new laws or any other similar laws introduced in the future, as well as regulatory actions that may be taken by CMS, may result in additional reductions in Medicare and other healthcare funding, which could negatively affect our customers and accordingly, our financial operations. Moreover, payment methodologies may be subject to changes in healthcare legislation and regulatory initiatives. For example, in July 2021, President Biden issued an executive order pertaining to drug pricing, which expressed support for legislation allowing direct negotiation in Medicare Part D and inflationary rebates and directed various executive branch agencies to take actions to lower drug prices and promote generic competition. Several pending legislative efforts, including President Biden's larger Build Back Better legislative agenda and draft bill text, incorporate these drug pricing reforms in addition to inflationary rebates on Part B and Part D drugs that would be payable on commercial and governmental program utilization, policies aimed at redesigning the Medicare Part D benefit and adopting drug price transparency measures. Drug manufacturers who are unwilling to negotiate with Medicare would be subject to additional excise taxes. Additionally, the plan would impose tax penalties on drug manufacturers that increase the prices of drug products faster than the rate of inflation. If elements of the recently announced prescription drug pricing plan become law, our pricing strategy and commercial prospects may be adversely affected.

Additionally, on September 9, 2021, the Biden administration published a wide-ranging list of policy proposals, most of which would need to be carried out by Congress, to reduce drug prices and drug payment. This plan includes, among other reform measures, proposals to lower prescription drug prices, including by allowing Medicare to negotiate prices and disincentivizing price increases, and to support market changes that strengthen supply chains, promote biosimilars and generic drugs, and increase price transparency. Many similar proposals, including the plans to give Medicare Part D authority to negotiate drug prices, require drug manufacturers to pay rebates on drugs whose prices increase greater than the rate of inflation, and cap out-of-pocket costs, have already been included in policy statements and legislation currently being considered by Congress. It is unclear to what extent these new proposals or any future legislation or regulations by the Biden Administration will have on our business.

Additionally, individual states in the United States have passed legislation and implemented regulations designed to control pharmaceutical and biological product pricing and costs. Similar developments have occurred outside of the United States, including in the European Union where healthcare budgetary constraints have resulted in restrictions on the pricing and reimbursement of medicines by relevant health service providers. To obtain reimbursement or pricing approval in some European Union member states, we may be required to conduct studies that compare the cost-effectiveness of our product candidates to other therapies that are considered the local standard of care.

We cannot predict the likelihood, nature, or extent of government regulation that may arise from future legislation or administrative action in the United States or any other jurisdiction. If we or any third parties we may engage are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we or such third parties are not able to maintain regulatory compliance, our product candidates may lose any regulatory approval that may have been obtained and we may not achieve or sustain profitability.

Even if we are able to commercialize any product candidate, coverage and adequate reimbursement may not be available or such product candidate may become subject to unfavorable pricing regulations or third-party coverage and reimbursement policies, which would harm our business.

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

Our ability to commercialize any products successfully also will depend in part on the extent to which coverage and adequate reimbursement for these products and related treatments will be available from third-party payors, such as government authorities, private health insurers, and other organizations. Even if we succeed in bringing one or more products to the market, these products may not be considered cost-effective, and the amount reimbursed for any products may be insufficient to allow us to sell our products on a competitive basis. Because our programs are in the early stages of development, we are unable at this time to determine their cost effectiveness or the likely level or method of coverage and reimbursement. Increasingly, the third-party payors who reimburse patients or healthcare providers are requiring that drug companies provide them with predetermined discounts from list prices, and are seeking to reduce the prices charged or the amounts reimbursed for drug products. If the price we are able to charge for any products we develop, or the coverage and reimbursement provided for such products, is inadequate in light of our development and other costs, our return on investment could be affected adversely.

There may be significant delays in obtaining reimbursement for newly-approved drug products, and coverage may be more limited than the purposes for which the drug product is approved by the FDA or similar foreign regulatory authorities. Moreover, eligibility for reimbursement does not imply that any drugs product will be reimbursed in all cases or at a rate that covers our costs, including research, development, manufacture, sale, and distribution.

Interim reimbursement levels for new drug products, if applicable, may also be insufficient to cover our costs and may not be made permanent. Reimbursement rates may be based on payments allowed for lower cost drug products that are already reimbursed, may be incorporated into existing payments for other services and may reflect budgetary constraints or imperfections in Medicare data. Net prices for drug products may be reduced by mandatory discounts or rebates required by third-party payors and by any future relaxation of laws that presently restrict imports of drug products from countries where they may be sold at lower prices than in the United States. Obtaining coverage and adequate reimbursement for our product candidates may be particularly difficult because of the higher prices often associated with drugs administered under the supervision of a physician. Similarly, because some of our product candidates will be physician-administered subcutaneous injectables, separate reimbursement for the product itself may or may not be available. Instead, the administering physician may or may not be reimbursed for providing the treatment or procedure in which our product is used.

Further, no uniform policy for coverage and reimbursement exists in the United States, and coverage and reimbursement can differ significantly from payor to payor. Third-party payors often follow Medicare coverage policy and payment limitations in setting their own reimbursement rates, but also have their own methods and approval process apart from Medicare determinations. As a result, the coverage determination process is often a time-consuming and costly process that will require us to provide scientific and clinical support for the use of our product candidates to each payor separately, with no assurance that coverage and adequate reimbursement will be applied consistently or obtained in the first instance. Decisions regarding the extent of coverage and amount of reimbursement to be provided for any product candidates that we develop will be made on a payor-by-payor basis. One payor's determination to provide coverage for a drug does not assure that other payors will also provide coverage and adequate reimbursement for the drug. Additionally, a third-party payor's decision to provide coverage for a therapy does not imply that an adequate reimbursement rate will be approved.

There have been, and likely will continue to be, legislative and regulatory proposals at the foreign, federal, and state levels directed at broadening the availability of healthcare and containing or lowering the cost of healthcare. We cannot predict the initiatives that may be adopted in the future, including repeal, replacement, or significant revisions to the ACA. The continuing efforts of the government, insurance companies, managed care organizations, and other payors of healthcare services to contain or reduce costs of healthcare and/or impose price controls may adversely affect:

- the demand for our product candidates, if we obtain regulatory approval;

- our ability to set a price that we believe is fair for our products;
- our ability to obtain coverage and reimbursement approval for a product;
- our ability to generate revenue and achieve or maintain profitability;
- the level of taxes that we are required to pay; and
- the availability of capital.

We face potential liability related to the privacy of health information we obtain from clinical trials sponsored by us or our collaborators, from research institutions and our collaborators, and directly from individuals.

We and our partners and vendors are subject to various federal, state, and foreign data protection laws and regulations (i.e., laws and regulations that address data privacy and security). If we fail to comply with these laws and regulations we may be subject to litigation, regulatory investigations, enforcement notices, enforcement actions, fines, and criminal or civil penalties, as well as negative publicity and a potential loss of business.

In the United States, numerous federal and state laws and regulations, including state data breach notification laws, state health information privacy laws, and federal and state consumer protection laws and regulations that govern the collection, use, disclosure, and protection of health-related and other personal information could apply to our operations or the operations of our partners. For example, most healthcare providers, including research institutions from which we or our collaborators obtain patient health information, are subject to privacy and security regulations promulgated under HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009 ("HITECH"). Under HIPAA, we could potentially face substantial criminal or civil penalties if we knowingly receive individually identifiable health information from a HIPAA-covered healthcare provider or research institution that has not satisfied HIPAA's requirements for disclosure of individually identifiable health information, or otherwise violate applicable HIPAA requirements related to the protection of such information. Even when HIPAA does not apply, failing to take appropriate steps to keep consumers' personal information secure may constitute a violation of the Federal Trade Commission Act.

In addition, we may maintain sensitive personally identifiable information, including health information, that we receive throughout the clinical trial process, in the course of our research collaborations, and directly from individuals (or their healthcare providers) who enroll in our patient assistance programs. As such, we may be subject to state laws requiring notification of affected individuals and state regulators in the event of a breach of personal information. These state laws include the recently enacted California Consumer Privacy Act, which establishes additional data privacy rights for residents of the State of California. Similar laws have been proposed in other states and at the federal level, and if passed, such laws may have potentially conflicting requirements that would make compliance challenging.

Our clinical trial programs and research collaborations outside the United States may implicate international data protection laws, including, in Europe, the General Data Protection Regulation ("GDPR"), which became effective in 2018. The GDPR imposes stringent operational requirements for processors and controllers of personal data. Among other things, the GDPR requires detailed notices for clinical trial subjects and investigators, as well as requirements regarding the security of personal data and notification of data processing obligations or security incidents to appropriate data protection authorities or data subjects. If our privacy or data security measures fail to comply with the GDPR requirements, we may be subject to litigation, regulatory investigations, enforcement notices, and/or enforcement actions requiring us to change the way we use personal data and/or fines. In addition to statutory enforcement, a personal data breach can lead to negative publicity and a potential loss of business. Further, following the United Kingdom's withdrawal from the E.U. effective as of December 31, 2020, we have to comply with the GDPR and the GDPR as incorporated into United Kingdom national law, which may have differing requirements. If we fail to comply with United Kingdom data protection laws we may be subject to litigation, regulatory investigations, enforcement notices, and/or enforcement actions, as well as negative publicity and a potential loss of business.

We are also subject to evolving EEA laws on data export, as we may transfer personal data from the EEA to other jurisdictions. Recent legal developments in Europe have created complexity and uncertainty regarding transfers of personal data from the EEA to the United States. For example, on July 16, 2020, the Court of Justice of the European Union ("CJEU"), invalidated the EU-US Privacy Shield Framework ("Privacy Shield"), under which personal data could be transferred from the EEA to United States entities who had self-certified under the Privacy Shield scheme. Moreover, it is uncertain whether the standard contractual clauses will also be invalidated by the European courts or legislature. As government authorities issue further guidance on personal data export mechanisms and/or start taking enforcement action, we could suffer additional costs, complaints, and/or regulatory investigations or

fines, and/or if we are otherwise unable to transfer personal data between and among countries and regions in which we operate, it could affect the manner in which we provide our services, the geographical location or segregation of our relevant systems and operations, and could adversely affect our financial results. These laws and regulations may apply, not only to us, but also to vendors that store or otherwise process data on our behalf, such as information technology vendors. If such a vendor misuses data we have provided to it, or fails to safeguard such data, we may be subject to litigation, regulatory investigations, enforcement notices, and/or enforcement actions, as well as negative publicity and a potential loss of business.

We are likely to be required to expend significant capital and other resources to ensure ongoing compliance with applicable privacy and data security laws. Claims that we have violated individuals' privacy rights or breached our contractual obligations, even if we are not found liable, could be expensive and time-consuming to defend, and could result in adverse publicity that could harm our business. Moreover, even if we take all necessary action to comply with regulatory requirements, we could be subject to a hack or data breach, which could subject us to fines and penalties, as well as reputational damage.

If we or any collaborators fail to comply with applicable federal, state, or local regulatory requirements, we could be subject to a range of regulatory actions that could affect our or any collaborators' ability to seek to commercialize our clinical candidates. Any threatened or actual government enforcement action could also generate adverse publicity and require that we devote substantial resources that could otherwise be used in other aspects of our business.

If we fail to comply with environmental, health, and safety laws and regulations, we could become subject to fines or penalties or incur costs that could have a material adverse effect on the success of our business.

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

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

Risks Related to Commercialization of Our Product Candidates

We operate in highly competitive and rapidly changing industries, which may result in others discovering, developing or commercializing competing products before or more successfully than we do.

The biotechnology and pharmaceutical industries are highly competitive and subject to significant and rapid technological change. Our success is highly dependent on our ability to discover, develop, and obtain marketing approval for new and innovative products on a cost-effective basis and to market them successfully. In doing so, we face and will continue to face intense competition from a variety of businesses, including large pharmaceutical and biotechnology companies, academic institutions, government agencies, and other public and private research organizations. These organizations may have significantly greater resources than we do and conduct similar research, seek patent protection, and establish collaborative arrangements for research, development, manufacturing, and marketing of products that compete with our product candidates. Mergers and acquisitions in the biotechnology and pharmaceutical industries may result in even more resources being concentrated in our competitors. Competition may increase further as a result of advances in the commercial applicability of technologies and greater availability of capital for investment in these industries.

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

- have significantly greater financial, manufacturing, marketing, drug development, technical, and human resources than we do;
- develop and commercialize products that are safer, more effective, less expensive, more convenient or easier to administer, or have fewer or less severe side effects;
- obtain quicker regulatory approval;
- establish superior proprietary positions covering our products and technology;
- implement more effective approaches to sales and marketing; or
- form more advantageous strategic alliances.

Should any of these factors occur, our business, financial condition, and results of operations could be materially adversely affected.

In addition, any collaborators may decide to market and sell products that compete with the product candidates that we have agreed to license to them, and any competition by our collaborators could also have a material adverse effect on our future business, financial condition, and results of operations.

Smaller and other early stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These third parties compete with us in recruiting and retaining qualified scientific and management personnel, establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs.

If the market opportunity for any product candidate that we or our strategic partners develop is smaller than we believe, our revenue may be adversely affected and our business may suffer.

We intend to initially focus our product candidate development on treatments for various oncology indications. Our projections of addressable patient populations that may benefit from treatment with our product candidates are based on our estimates. These estimates, which have been derived from a variety of sources, including scientific literature, surveys of clinics, patient foundations, and market research, may prove to be incorrect. Further, new studies may change the estimated incidence or prevalence of these cancers. Additionally, the potentially addressable patient population for our product candidates may not ultimately be amenable to treatment with our product candidates. Our market opportunity may also be limited by future competitor treatments that enter the market. If any of our estimates prove to be inaccurate, the market opportunity for any product candidate that we or our strategic partners develop could be significantly diminished and have an adverse material impact on our business.

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

Because we have limited financial and managerial resources, we may forego or delay pursuit of opportunities with other product candidates or for other indications that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable products. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may 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 or the third-party to whom we relinquish such rights may not take full advantage or be properly qualified to take full advantage of such valuable rights. Failure to allocate resources or capitalize on strategies in a successful manner will have an adverse impact on our business.

Failure to successfully identify, develop and commercialize additional product candidates could impair our ability to grow.

Although a substantial amount of our efforts will focus on the continued preclinical and clinical testing and potential approval of our product candidates in our current pipeline, we expect to continue to innovate and potentially expand our portfolio. Because we have limited financial and managerial resources, research programs to identify product candidates may require substantial additional technical, financial and human resources, whether or not any new potential product candidates are ultimately identified. Our success

may depend in part upon our ability to identify, select, and develop promising product candidates and therapeutics. We may expend resources and ultimately fail to discover and generate additional product candidates suitable for further development. All product candidates are prone to risks of failure typical of biotechnology product development, including the possibility that a product candidate may not be suitable for clinical development as a result of its harmful side effects, limited efficacy or other characteristics indicating that it is unlikely to receive approval by the FDA, the EMA, and other comparable foreign regulatory authorities and achieve market acceptance. If we do not successfully develop and commercialize new product candidates we have identified and explored, our business, prospects, financial condition, and results of operations could be adversely affected.

Even if approved, our products may not gain market acceptance, in which case we may not be able to generate product revenues, which will materially adversely affect our business, financial condition, and results of operations.

Even if the FDA or any other regulatory authority approves the marketing of any product candidates that we develop on our own or with a collaborator, physicians, healthcare providers, patients, or the medical community may not accept or use them. Additionally, the product candidates that we are developing are based on our internally-developed immunotherapy platform technology, which is a new technology. If these products do not achieve an adequate level of acceptance, we may not generate significant product revenues or any profits from operations. The degree of market acceptance of any of our product candidates will depend on a variety of factors, including:

- the timing of market introduction;
- the terms of any approvals and the countries in which approvals are obtained;
- the number and clinical profile of competing products;
- our ability to provide acceptable evidence of safety and efficacy;
- the prevalence and severity of any side effects;
- relative convenience and ease of administration;
- cost-effectiveness;
- patient diagnostics and screening infrastructure in each market;
- marketing and distribution support;
- adverse publicity about our product candidates;
- availability of coverage, adequate reimbursement, and sufficient payment from health maintenance organizations and other insurers, both public and private, for our product candidates, or the procedures utilizing our product candidates, if approved;
- the willingness of patients to pay out-of-pocket in the absence of coverage by third-party payors and government authorities; and
- other potential advantages over alternative treatment methods.

If our product candidates fail to gain market acceptance, this will have a material adverse impact on our ability to generate revenues to provide a satisfactory, or any, return on our investments. Even if some products achieve market acceptance, the market may prove not to be large enough to allow us to generate significant revenues.

We currently have no marketing, sales, or distribution infrastructure and we intend to either establish a sales and marketing infrastructure or outsource this function to a third party. Either of these commercialization strategies carries substantial risks to us.

We currently have no marketing, sales, and distribution capabilities because all of our product candidates are still in clinical or preclinical development. If any of our product candidates are approved, we intend to either establish a sales and marketing

organization with technical expertise and supporting distribution capabilities to commercialize our product candidates in a legally compliant manner, or to outsource this function to a third party. There are risks involved if we decide to establish our own sales and marketing capabilities or enter into arrangements with third parties to perform these services. To the extent that we enter into collaboration agreements with respect to marketing, sales or distribution, our product revenue may be lower than if we directly marketed or sold any approved products. Such collaborative arrangements with partners may place the commercialization of our products outside of our control and would make us subject to a number of risks including that we may not be able to control the amount or timing of resources that our collaborative partner devotes to our products or that our collaborator's willingness or ability to complete its obligations, and our obligations under our arrangements may be adversely affected by business combinations or significant changes in our collaborator's business strategy.

If we are unable to enter into these arrangements on acceptable terms or at all, we may not be able to successfully commercialize any approved products. If we are not successful in commercializing any approved products, either on our own or through collaborations with one or more third parties, our future product revenue will suffer and we may incur significant additional losses, which would have a material adverse effect on our business, financial condition, and results of operations.

Our product candidates for which we intend to seek approval as biologic products may face competition sooner through an abbreviated pathway.

The ACA includes a subtitle called the Biologics Price Competition and Innovation Act of 2009 ("BPCIA"), which created an abbreviated approval pathway for biological products that are biosimilar to or interchangeable with an FDA-licensed reference biological product. Under the BPCIA, an application for a highly similar or "biosimilar" product may not be submitted to the FDA until four years following the date that the reference product was first approved 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 approved. During this 12-year period of exclusivity, another company may still market a competing version of the reference product if the FDA approves a full BLA for the competing product containing the sponsor's own preclinical data and data from adequate and well-controlled clinical trials to demonstrate the safety, purity, and potency of their product. The law is complex and is still being interpreted and implemented by the FDA. As a result, its ultimate impact, implementation, and meaning are subject to uncertainty.

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

Jurisdictions in addition to the United States have established abbreviated pathways for regulatory approval of biological products that are biosimilar to earlier approved reference products. For example, the European Union has had an established regulatory pathway for biosimilars since 2004. However, biosimilars can only be authorized once the period of data exclusivity on the reference biological medicine has expired.

The increased likelihood of biosimilar competition has increased the risk of loss of innovators' market exclusivity. Due to this risk, and uncertainties regarding patent protection, if our clinical candidates are approved for marketing, it is not possible to predict the length of market exclusivity for any particular product with certainty based solely on the expiration of the relevant patent(s) or the current forms of regulatory exclusivity. It is also not possible to predict changes in United States regulatory law that might reduce biological product regulatory exclusivity. The loss of market exclusivity for a product would likely materially and negatively affect revenues, and we may not generate adequate or sufficient revenues from them or be able to reach or sustain profitability.

Risks Related to Our Dependence on Third Parties

We rely on third-parties to manufacture our product candidates. Any failure by a third-party manufacturer to produce acceptable drug substance for us or to obtain authorization from the FDA or comparable regulatory authorities may delay or impair our ability to initiate or complete our clinical trials, obtain regulatory approvals or commercialize approved products.

We do not currently own or operate any cGMP manufacturing facilities nor do we have any in-house cGMP manufacturing capabilities. We rely on third-party contract manufacturers to produce sufficient quantities of materials required for the manufacture of our product candidates for preclinical testing and clinical trials, in compliance with applicable regulatory and quality standards, and intend to do so for the commercial manufacture of our products, if approved. If we are unable to arrange for such third-party

manufacturing sources, or fail to do so on commercially reasonable terms, we may not be able to successfully produce sufficient supply of product candidate or we may be delayed in doing so. Such failure or substantial delay could materially harm our business.

We rely on third parties for biological materials that are used in our discovery and development programs. These materials can be difficult to produce and occasionally have variability from the product specifications. Any disruption in the supply of these biological materials consistent with our product specifications could materially adversely affect our business. Although we have control processes and screening procedures, biological materials are susceptible to damage and contamination and may contain active pathogens. We may also have lower yields in manufacturing batches, which can increase our costs and slow our development timelines. Improper storage of these materials, by us or any third-party suppliers, may require us to destroy some of our biological raw materials or product candidates.

Reliance on third-party manufacturers entails risks to which we would not be subject if we manufactured product candidates ourselves, including reliance on the third party for regulatory compliance and quality control and assurance, volume production, the possibility of breach of the manufacturing agreement by the third party because of factors beyond our control (including a failure to synthesize and manufacture our product candidates in accordance with our product specifications), and the possibility of termination or nonrenewal of the agreement by the third party at a time that is costly or damaging to us.

In addition, the FDA and other regulatory authorities require that our product candidates be manufactured according to cGMP and similar foreign standards relating to methods, facilities, and controls used in the manufacturing, processing, and packing of the product, which are intended to ensure that biological products are safe and that they consistently meet applicable requirements and specifications.

Pharmaceutical manufacturers are required to register their facilities and list their products manufactured after beginning drug manufacturing and then annually thereafter with the FDA and certain state and foreign agencies. If the FDA or a comparable foreign regulatory authority does not approve the manufacture of our product candidates at any of our proposed contract manufacturer's facilities, or if any contract manufacturer fails to maintain a compliance status acceptable to the FDA or a comparable foreign authority, we may need to find alternative manufacturing facilities, which would significantly impact our ability to develop, obtain regulatory approval for, or market our product candidates, if approved. Any discovery of problems with a product, or a manufacturing or laboratory facility used by us or our strategic partners, may result in restrictions on the product or on the manufacturing or laboratory facility, including marketed product recall, suspension of manufacturing, product seizure, or a voluntary withdrawal of the drug from the market. We may have little to no control regarding the occurrence of third-party manufacturer incidents.

If we were unable to find an adequate replacement or another acceptable solution in time, our clinical trials could be delayed, or our commercial activities could be harmed. In addition, the fact that we are dependent on our collaborators, our suppliers, and other third parties for the manufacture, filling, storage, and distribution of our product candidates means that we are subject to the risk that the products may have manufacturing defects that we have limited ability to prevent or control. The sale of products containing such defects could adversely affect our business, financial condition, and results of operations. Any failure by our third-party manufacturers to comply with cGMP or failure to scale up manufacturing processes, including any failure to deliver sufficient quantities of product candidates in a timely manner, could lead to a delay in, or failure to obtain, regulatory approval of any of our product candidates.

Pharmaceutical manufacturers are also subject to extensive post-marketing oversight by the FDA and comparable regulatory authorities in the jurisdictions where the product is marketed, which include periodic unannounced and announced inspections by the FDA to assess compliance with cGMP requirements. If an FDA inspection of a manufacturer's facilities reveals conditions that the FDA determines not to comply with applicable regulatory requirements, the FDA may issue observations through a Notice of Inspectional Observations, commonly referred to as a "Form FDA 483". If observations in the Form FDA 483 are not addressed in a timely manner and to the FDA's satisfaction, the FDA may issue a Warning Letter or pursue other forms of enforcement action. Any failure by one of our contract manufacturers to comply with cGMP or to provide adequate and timely corrective actions in response to deficiencies identified in a regulatory inspection could result in enforcement action that could lead to a shortage of products and harm our business, including withdrawal of approvals previously granted, seizure, injunction or other civil or criminal penalties. The failure of a manufacturer to address any concerns raised by the FDA or foreign regulators could also lead to plant shutdown or the delay or withholding of product approval by the FDA in additional indications, or by foreign regulators in any indication. Certain countries may impose additional requirements on the manufacturing of drug products or drug substances, and on manufacturers, as part of the regulatory approval process for products in such countries. The failure by our third-party manufacturers to satisfy such requirements could impact our ability to obtain or maintain approval of our products in such countries.

We expect to rely on third parties, including independent clinical investigators, to conduct our preclinical studies and clinical trials. If these third parties do not successfully carry out their contractual duties, comply with applicable regulatory requirements, or meet expected deadlines, we may not be able to obtain regulatory approval for or commercialize our product candidates and our business could be substantially harmed.

We plan to rely upon third parties, including independent clinical investigators, to conduct our preclinical studies and clinical trials and to monitor and manage data for our preclinical and clinical programs. We will rely on these parties for execution of our preclinical studies and clinical trials, and control only certain aspects of their activities. Nevertheless, our reliance on these third parties will not relieve us of our regulatory responsibilities, and we are responsible for ensuring that each of our studies and trials is conducted in accordance with the applicable protocol, legal, regulatory, and scientific standards, including GCP requirements, which are regulations and guidelines enforced by the FDA and comparable foreign regulatory authorities for all of our products candidates in clinical development. Regulatory authorities enforce these GCP requirements through periodic inspections of trial sponsors, principal investigators, and trial sites. If we fail to comply with applicable GCP, the clinical data generated in our clinical trials may be deemed unreliable and the FDA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. We cannot assure you that upon inspection by a given regulatory authority, such regulatory authority will determine that any of our clinical trials comply with GCP regulations. In addition, our clinical trials must be conducted with product produced under cGMP regulations. Our failure to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory approval process.

Further, these investigators are not our employees and we will not be able to control, other than by contract, the amount of resources, including time, which they devote to our product candidates and clinical trials. If independent investigators fail to devote sufficient resources to the development of our product candidates, or if their performance is substandard, it may delay or compromise the prospects for approval and commercialization of any product candidates that we develop. In addition, the use of third-party service providers may require us to disclose our proprietary information to these parties, which could increase the risk that this information will be misappropriated.

There is a limited number of third-party service providers that specialize or have the expertise required to achieve our business objectives. If any of our relationships with these third-party laboratories, or clinical investigators terminate, we may not be able to enter into arrangements with alternative laboratories, or investigators or to do so in a timely manner or on commercially reasonable terms. If laboratories, or clinical investigators do not successfully carry out their contractual duties or obligations or meet expected deadlines, if they need to be replaced or if the quality or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our preclinical or clinical protocols, regulatory requirements or for other reasons, our preclinical or clinical trials may be extended, delayed, or terminated, and we may not be able to obtain regulatory approval for or successfully commercialize our product candidates. As a result, our results of operations and the commercial prospects for our product candidates would be harmed, our costs could increase, and our ability to generate revenues could be delayed. Switching or adding additional laboratories or investigators involves additional cost and requires management time and focus. In addition, there is a natural transition period when a new laboratory commences work. As a result, delays occur, which can materially impact our ability to meet our desired clinical development timelines.

In addition, clinical investigators may serve as scientific advisors or consultants to us from time to time and may receive cash or equity compensation in connection with such services. If these relationships and any related compensation result in perceived or actual conflicts of interest, or the FDA concludes that the financial relationship may have affected the interpretation of the preclinical study or clinical trial, the integrity of the data generated at the applicable preclinical study or clinical trial site may be questioned and the utility of the preclinical study or clinical trial itself may be jeopardized, which could result in the delay or rejection by the FDA. Any such delay or rejection could prevent us from commercializing our clinical-stage product candidate or any future product candidates.

We may not realize the benefits of any existing or future co-development or out-licensing arrangement, and if we fail to enter into new strategic relationships our business, financial condition, commercialization prospects, and results of operations may be materially adversely affected.

Our product development programs and the potential commercialization of our product candidates will require substantial additional cash to fund expenses. Therefore, for some of our product candidates, we may decide to enter into collaborations with pharmaceutical or biopharmaceutical companies for the development and potential commercialization of those product candidates.

We face significant competition in seeking appropriate collaborators. Collaborations are complex and time-consuming to negotiate and document. We may not be able to negotiate collaborations on acceptable terms, or at all. If our strategic 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. In instances where we do enter into collaborations, we could be subject to the following risks, each of which may materially harm our business, commercialization prospects, and financial condition:

- we may not be able to control the amount and timing of resources that is required of us to complete our development obligations or that the collaboration partner devotes to the product development or marketing programs;
- the collaboration partner may experience financial difficulties;
- 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;
- we may be required to relinquish important rights such as marketing, distribution, and intellectual property rights;
- collaborators may not properly maintain or defend our intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our intellectual property or proprietary information or expose us to litigation or potential liability;
- collaborators may infringe the intellectual property rights of third parties, which may expose us to litigation and potential liability;
- a collaborator could move forward with a competing product developed either independently or in collaboration with third parties, including our competitors;
- we and our collaboration partner may disagree regarding the development plan for product candidates on which we are collaborating (for example, we may disagree with a collaboration partner regarding target indications, inclusion or exclusion criteria for a clinical trial, or the decision to seek front line therapy approval versus second, third, or fourth line therapy approval);
- disputes may arise between the collaborators and us that result in the delay or termination of the research, development or commercialization of our product candidates or that result in costly litigation or arbitration that diverts management attention and resources;
- business combinations or significant changes in a collaborator's business strategy may adversely affect our willingness to complete our obligations under any arrangement; or
- 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.

If we license products or businesses, 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. We cannot be certain that, following a strategic transaction or license, we will achieve the results, revenue, or specific net income that justifies such transaction.

To date, we have relied on one third-party manufacturer for the cGMP production of our drug product candidates. The loss of this third-party manufacturer could negatively impact our ability to develop our product candidates and adversely affect our business.

We do not currently own any facility that may be used as our clinical-scale manufacturing and processing facility and currently rely on a single third-party vendor to manufacture supplies and process our product candidates. We have not yet caused our product candidates to be manufactured or processed on a commercial scale and may not be able to do so for any of our product candidates.

Although in the future we intend to develop our own manufacturing facility, we also intend to use third parties as part of our manufacturing process and may, in any event, never be successful in developing our own manufacturing facility.

Manufacturers of biologic products often encounter difficulties in production, particularly in scaling up or out, validating the production process, and assuring high reliability of the manufacturing process (including the absence of contamination). These

problems include logistics and shipping, difficulties with production costs and yields, quality control, including stability of the product, product testing, operator error, availability of qualified personnel, as well as compliance with strictly enforced federal, state and foreign regulations. Furthermore, if contaminants are discovered in our supply of our product candidates or in the manufacturing facilities, such manufacturing facilities may need to be closed for an extended period of time to investigate and remedy the contamination.

The lead time needed to establish relationships with new manufacturers can be lengthy, and we may experience delays in meeting demand in the event we must switch to a new manufacturer. The time and effort to qualify a new manufacturer could result in additional costs, diversion of resources, or reduced manufacturing yields, any of which would negatively impact our operating results. Our reliance on a single third-party manufacturer exposes us to certain risks, including the following:

- we may be unable to identify replacement manufacturers on acceptable terms or at all because the number of potential manufacturers is limited and the FDA must approve the use of any manufacturers of our product candidates. This approval would require new testing and cGMP compliance inspections by the FDA. In addition, a new manufacturer would have to be educated in, or develop substantially equivalent processes for, production of our products;

- initial replacement manufacturers may not be able to execute our manufacturing procedures and other logistical support requirements appropriately or timely;

- under our exclusive license agreement with Wugen, we are contractually obligated to oversee the manufacturing and supply of our internally-developed fusion molecules HCW9201 and HCW9206 in the manufacture of Wugen's cellular therapeutics, and if our single third-party manufacturer is unable to timely manufacture our product or produce the quantity and quality required to meet our and Wugen's clinical needs, then Wugen has priority over us which could result in our financial results and the commercial prospects for our product candidates being harmed, our costs could increase and our ability to generate revenue could be delayed; and

- our ability to develop our product candidates could be materially and adversely impacted if the single third-party manufacturer upon which we rely were to experience a significant business challenge, disruption or failure due to issues such as financial difficulties or bankruptcy, issues relating to other customers such as regulatory or quality compliance issues, or other financial, legal, regulatory, or reputational issues.

Moreover, to meet anticipated demand, our third-party manufacturer may need to increase manufacturing capacity, which could involve significant challenges. This may require us and our vendor to invest substantial additional funds and hire and retain the technical personnel who have the necessary experience. Neither we nor our third-party manufacturer may successfully complete any required increase to existing manufacturing capacity in a timely manner, or at all.

If we are unable to obtain sufficient raw and intermediate materials on a timely basis or if we experience other manufacturing or supply difficulties, our business may be adversely affected.

The manufacture of certain of our product candidates requires the timely delivery of sufficient amounts of raw and intermediate materials. We work closely with our suppliers to ensure the continuity of supply, but cannot guarantee these efforts will always be successful. Further, while efforts are made to diversify our sources of raw and intermediate materials, in certain instances we acquire raw and intermediate materials from a sole supplier. While we believe that alternative sources of supply exist where we rely on sole supplier relationships, there can be no assurance that we will be able to quickly establish additional or replacement sources for some materials. A reduction or interruption in supply, and an inability to develop alternative sources for such supply, could adversely affect our ability to manufacture our product candidates in a timely or cost-effective manner.

Supply sources could be interrupted from time to time and, if interrupted, there is no guarantee that supplies could be resumed within a reasonable time frame and at an acceptable cost or at all.

We rely on our manufacturers to purchase from third-party suppliers the materials necessary to produce our product candidates for our clinical trials. There are a limited number of suppliers for raw materials that we use to manufacture our drugs, and there may be a need to assess alternate suppliers to prevent a possible disruption of the manufacture of the materials necessary to produce our product candidates for our clinical trials, and if approved, ultimately for commercial sale. We do not have any control over the process or timing of the acquisition of these raw materials by our manufacturers. Moreover, we currently do not have any agreements for the commercial production of these raw materials. We cannot be sure that these suppliers will remain in business, or that they will not be purchased by one of our competitors or another company that is not interested in continuing to produce these materials for our intended purpose. In addition, the lead time needed to establish a relationship with a new supplier can be lengthy, and

we may experience delays in meeting demand in the event a new supplier must be used. The time and effort to qualify a new supplier could result in additional costs, diversion of resources, or reduced manufacturing yields, any of which would negatively impact our operating results. Although we will not begin a clinical trial unless we believe we have a sufficient supply of a product candidate to complete the clinical trial, any significant delay in the supply of a product candidate, or the raw material components thereof, for an ongoing clinical trial due to the need to replace a third-party manufacturer could considerably delay completion of our clinical trials, product testing, and potential regulatory approval of our product candidates. If our manufacturers or we are unable to purchase these raw materials after regulatory approval has been obtained for our product candidates, the commercial launch of our product candidates would be delayed or there would be a shortage in supply, which would impair our ability to generate revenues from the sale of our product candidates.

Risks Related to Intellectual Property and Information Technology

We expect to rely on patents and other intellectual property rights to protect our technology, including product candidates and our immunotherapy platform technology, the prosecution, enforcement, defense, and maintenance of which may be challenging and costly. Failure to protect or enforce these rights adequately could harm our ability to compete and impair our business.

Our commercial success depends in part on obtaining and maintaining patents and other forms of intellectual property rights for technology related to our product candidates, including, but not limited to, our immunotherapy platform technology, product candidates, methods used to manufacture those product candidates, formulations thereof, and the methods for treating patients using those product candidates. Given that the development of our technology and product candidates is at an early stage, our intellectual property portfolio with respect to certain aspects of our technology and product candidates is also at an early stage. We seek to protect our proprietary position by filing patent applications in the United States and abroad related to our novel platform technology and product candidates that are important to our business. The patent prosecution process is expensive and time-consuming, and we may not be able to prepare, file, and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. In addition, during the patent prosecution process, we may receive rejections. Although we would be given an opportunity to respond to those rejections, we may be unable to overcome such rejections.

The issuance, scope, validity, enforceability, and commercial value of our current or future patent rights are highly uncertain. It is possible that we will fail to identify patentable aspects of inventions made in the course of development and commercialization activities before it is too late to obtain patent protection on them. Our pending and future patent applications may not result in patents being issued which protect our technology or product candidates, in whole or in part, or which effectively prevent others from commercializing competitive technologies and product candidates. The patent examination process may require us to narrow the scope of the claims of our pending and future patent applications, which may limit the scope of patent protection that may be obtained. Further, even if we obtain patents with sufficient scope to protect our technology or product candidates in their present forms, future technical changes to our technology or product candidates may render the patent coverage inadequate.

We cannot assure you that all of the potentially relevant prior art relating to our patents and patent applications has been found. If such prior art exists, it can invalidate or narrow the scope of a patent or prevent a patent from issuing from a pending patent application. Even if patents do successfully issue and even if such patents cover our product candidates, third parties may initiate opposition, interference, re-examination, post-grant review, *inter partes* review, nullification, or derivation actions in court or before patent offices, or similar proceedings challenging the validity, ownership, enforceability, or scope of such patents, which may result in the patent claims being narrowed, invalidated, or held unenforceable or circumvented. Because patent applications in the United States and other jurisdictions are confidential for a period of time after filing, and some remain so until issued, 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 any patent applications related to such inventions. Our patent applications cannot be enforced against third parties practicing the technology claimed in such applications unless and until a patent issues from such applications, and then only to the extent the issued claims cover the technology. Furthermore, even where we have a valid and enforceable patent, we may not be able to exclude others from practicing our invention where the other party can show that they used the invention in commerce before our filing date or the other party benefits from a compulsory license. Additionally, our competitors or other third parties may be able to evade our patent rights by developing new biologics, biosimilars, or alternative technologies or products in a non-infringing manner.

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. As a result, our intellectual property may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours. Moreover, some of our owned patent applications may in the future 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 owned patents in order to enforce such patents

against third parties, and such cooperation may not be provided to us or our licensors. Any of the foregoing could have a material adverse effect on our competitive position, business, financial conditions, results of operations and prospects.

The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment, and other provisions during the patent application 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. The standards applied by the USPTO, foreign patent offices, and patent courts or other authorities in granting patents and ruling on claim scope and validity are not always applied uniformly or predictably. Patent positions of life sciences companies can be uncertain and involve complex factual, scientific, and legal questions. Changes in either the patent laws or their interpretation in any jurisdiction that we seek patent protection may diminish our ability to protect our inventions, maintain and enforce our intellectual property rights; and, more generally, may affect the value of our intellectual property, including the narrowing of the scope of our patents and any that we may license.

Failure to protect or to obtain, maintain or extend adequate patent and other intellectual property rights could materially adversely affect our ability to develop and market our product candidates.

We may become involved in lawsuits to protect or enforce our issued patents relating to one or more of our product candidates or our internally-developed platform, which could ultimately render our patents invalid or unenforceable and adversely affect our competitive position. Intellectual property litigation or other legal proceedings could cause us to spend substantial resources and distract our personnel from their normal responsibilities.

Competitors may infringe our patents or other intellectual property that relate to our immunotherapy platform technology and product candidates, their respective methods of use, manufacture, and formulations thereof. To protect our competitive position and counter infringement or unauthorized use, we may from time to time need to resort to litigation to enforce or defend any patents or other intellectual property rights owned or licensed by us by filing infringement claims. As enforcement of intellectual property rights is difficult, unpredictable, time-consuming, and expensive, we may fail in enforcing our rights, in which case our competitors may be permitted to use our technology without being required to pay us any license fees. In addition, litigation involving our patents carries the risk that one or more of our patents will be held invalid (in whole or in part, on a claim-by-claim basis) or held unenforceable. Such an adverse court ruling could allow third parties to commercialize our product candidates or methods, or our immunotherapy platform technology, and then compete directly with us, without payment to us.

Even if resolved in our favor, such litigation and other legal proceedings may cause us to incur significant expenses and would be likely to divert significant resources from our core business, including distracting our technical and management personnel from their normal responsibilities, and may impact our reputation. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments, and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Such litigation or proceedings could substantially increase our operating losses and reduce our resources available for development activities. We may not have sufficient financial or other resources to adequately conduct such litigation or proceedings. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their substantially greater financial resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace.

If we were to initiate legal proceedings against a third party to enforce a patent related to one of our product candidates, the defendant could counterclaim that our patent is invalid and/or unenforceable. In patent litigation in the United States or in certain jurisdictions in Europe, defendant counterclaims alleging invalidity and/or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, for example, novelty, non-obviousness, written description or enablement. Grounds for an unenforceability assertion could be an allegation that someone connected with prosecution of the patent withheld relevant information from the USPTO, or made a misleading statement, during prosecution. Third parties may also raise similar invalidity and/or unenforceability claims before administrative bodies in the United States or abroad, even outside the context of litigation through opposition, interference, re-examination, post-grant review, *inter partes* review, nullification, or derivation actions or proceedings. The outcome following legal assertions of invalidity and unenforceability during patent litigation or administrative proceedings is unpredictable. If a defendant were to prevail on a legal assertion of invalidity and/or unenforceability, we would lose at least part, and perhaps all, of the patent protection on one or more of our technologies, product candidates, methods or certain aspects of our immunotherapy platform technology. Such a loss of patent protection could have a material adverse impact on our business.

There is also a risk that, even if the validity of our patents is upheld, the court will construe our 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 our own products or the other party's products. 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. Patents and other intellectual property rights also will not protect our technology if competitors design around our protected technology without infringing our patents or other intellectual property rights.

We may fail to identify relevant third-party patents or may incorrectly interpret the relevance, scope, or expiration of a third-party patent which might adversely affect our ability to develop our immunotherapy platform technology and product candidates.

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

Numerous U.S. and foreign patents and pending patent applications exist in our market that are owned by third parties. Our competitors in both the United States and abroad, many of which have substantially greater resources and have made substantial investments in patent portfolios and competing technologies, may have applied for or obtained or may in the future apply for and obtain, patents that will prevent, limit, or otherwise interfere with our ability to make, use, and sell our product candidates or any products, if approved. We do not always conduct independent reviews of pending patent applications of and patents issued to third parties. Patent applications in the United States and elsewhere are typically published approximately 18 months after the earliest filing for which priority is claimed, with such earliest filing date being commonly referred to as the priority date. Certain U.S. applications that will not be filed outside the United States can remain confidential until patents are issued. In addition, patent applications in the United States and elsewhere can be pending for many years before issuance, and unintentionally abandoned patents or applications can be revived. Furthermore, pending patent applications that have been published can, subject to certain limitations, be later amended in a manner that could cover our technology, our product candidates, or the use thereof. As such, there may be applications of third parties now pending or recently revived patents of which we are unaware. These applications may later result in issued patents, or the revival of previously abandoned patents, that will prevent, limit, or otherwise interfere with our ability to make, use, or sell our product candidates or any products, if approved.

The scope of a patent claim is determined by an interpretation of law and, among other considerations, the written disclosure in a patent and the patent's prosecution history. The claim scope sought in a patent application can be significantly reduced before the patent is issued, and its scope can be reinterpreted or further altered even after patent issuance, including through interferences, post-grant proceedings, opposition proceedings, or other intellectual property proceedings to address issues or errors that may render claims of the issued patent either wholly or partially invalid or unenforceable. Our interpretation of the relevance or the scope of a patent or a pending application may be incorrect, which may negatively impact our ability to market our product candidates. We may incorrectly determine that our product candidates are not covered by a third-party patent or may incorrectly predict whether a third party's pending application will issue with claims of relevant scope. Our determination of the expiration date of any patent in the United States or abroad that we consider relevant may be incorrect, which may negatively impact our ability to develop and market our product candidates. We cannot provide any assurances that third-party patents do not exist which might be enforced against our current technology, including our immunotherapy platform technology, product candidates and their respective methods of use, manufacture, and formulations thereof, and could result in either an injunction prohibiting our manufacture or future sales, or, with respect to our future sales, an obligation on our part to pay royalties and/or other forms of compensation to third parties, which could be significant.

Intellectual property rights of third parties could adversely affect our ability to develop or commercialize our product candidates, such that we could be required to litigate or obtain licenses from third parties in order to develop or market our product candidates.

Our commercial success depends, in part, on our ability to develop, manufacture, market, and sell our product candidates or any products, if approved without infringing, or otherwise violating the intellectual property and other proprietary rights of third parties. Our competitive position may suffer if patents issued to third parties or other third-party intellectual property rights cover our methods or product candidates or elements thereof, our manufacture or uses relevant to our development plans, our product candidates or other attributes of our product candidates, or our immunotherapy platform technology. In such cases, we may not be in a position to develop or commercialize product candidates unless we successfully pursue litigation to nullify or invalidate the third-party

intellectual property right concerned, which can be expensive and time-consuming, or have to enter into a license agreement with the intellectual property right holder, if available on commercially reasonable terms at all.

There is a substantial amount of intellectual property litigation in the biotechnology and pharmaceutical industries, and we may become party to, or threatened with, litigation or other adversarial proceedings regarding intellectual property rights with respect to our product candidates. 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. If we are sued for patent infringement, we would need to demonstrate that our product candidates or platform technology either do not infringe the patent claims of a relevant patent or that the patent claims are invalid or unenforceable, and we may not be able to do this. Proving invalidity may be difficult. For example, in the United States, proving invalidity in court requires a showing of clear and convincing evidence to overcome the presumption of validity enjoyed by issued patents. We may not have sufficient resources to bring these actions to a successful conclusion. If we are unable to successfully settle future claims on terms acceptable to us, we may be required to engage or continue costly, unpredictable, and time-consuming litigation and may be prevented from or experience substantial delays in marketing our product candidates.

Our involvement in litigation, and in any interferences, post-grant proceedings, opposition proceedings, or other intellectual property proceedings inside and outside of the United States may divert management from focusing on business operations, and even if we are successful in these proceedings, we may incur substantial costs and the time and attention of our management and scientific personnel could be diverted in pursuing these proceedings, which could have a material adverse effect on our business and operations. In addition, 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 this type of litigation.

Any current and potential intellectual property litigation also could force us to do one or more of the following:

- stop marketing, selling, incorporating, manufacturing, or using our product candidates or any products, if approved, in the United States and/or other jurisdictions that use the subject intellectual property;
- obtain from a third party asserting its intellectual property rights, a license to sell or use the relevant technology, including the obligation to pay royalties, which license may not be available on reasonable terms, or at all, or may be non-exclusive thereby giving our competitors access to the same technologies licensed to us;
- redesign those products or processes that use any allegedly infringing or misappropriated technology, which may result in significant cost or delay to us, or which redesign could be impossible or technically infeasible; or
- pay damages, including the possibility of treble damages and attorneys' fees in a patent case if a court finds us to have willfully infringed certain intellectual property rights.

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

We own and are pursuing rights to the intellectual property, including patent applications relating to our immunotherapy platform technology and our product candidates. In the future, we may be required to license technologies relating to our therapeutic research programs from additional third parties to further develop or commercialize our platform technology and product candidates. The fusion components of our product candidates may have also been the subject of research by companies that could have filed patent applications on their specific construct and therapeutic methods. There can be no assurance any such patents will not be asserted against us or that we will not need to seek licenses from such third parties. We may not be able to secure such licenses on acceptable terms, if at all, and any such litigation would be costly and time-consuming.

Should we be required to obtain licenses to any third-party technology, including any such patents required to manufacture, use, or sell our product candidates or any products, if approved, the growth of our business will likely depend in part on our ability to acquire, in-license, maintain, or use these proprietary rights. The inability to obtain any third-party license required to develop or commercialize any of our product candidates could cause us to abandon any related efforts, which could seriously harm our business and operations.

In addition, our product candidates may require specific formulations to work effectively and efficiently and the rights to these formulations may be held by others. We may be unable to acquire or in-license any compositions, methods of use, processes, or other third-party intellectual property rights from third parties that we identify as necessary for our product candidates. The licensing

and acquisition of third-party intellectual property rights is a competitive area, and a number of more established companies are also pursuing strategies to license or acquire third-party intellectual property rights that we may consider attractive. These established companies may have a competitive advantage over us due to their size, cash 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. Even if we are able to obtain a license, it may be non-exclusive, thereby giving our competitors access to the same technologies licensed to us. If we are unable to successfully obtain a license to third-party intellectual property rights necessary for the development of a product candidate or program, we may have to abandon development of that product candidate or program and our business and financial condition could suffer.

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 by potential collaborators, partners, or customers in our markets of interest. 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. If other entities use trademarks similar to ours in different jurisdictions, or have senior rights to ours, it could interfere with our use of our current trademarks throughout the world.

During trademark registration proceedings, we may receive rejections. Although we would be given an opportunity to respond to those rejections, we may be unable to overcome such rejections. In addition, in both the USPTO and comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and to seek to cancel registered trademarks. Opposition or cancellation proceedings may be filed against our trademarks, which may not survive such proceedings. If we are unable to establish name recognition based on our trademarks and trade names, we may not be able to compete effectively and our business may be adversely affected.

We may license our trademarks and trade names to third parties, such as distributors. Though these license agreements may provide guidelines for how our trademarks and trade names may be used, a breach of these agreements or misuse of our trademarks and tradenames by our licensees may jeopardize our rights in or diminish the goodwill associated with our trademarks and trade names.

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 U.S. non-provisional or PCT filing date. 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, we may be open to competition from competitive medications, including biosimilar medications. In addition, although upon issuance in the United States a patent's life can be increased based on certain delays caused by the USPTO, this increase can be reduced or eliminated based on certain delays caused by the patent applicant during patent prosecution. If we do not have sufficient patent life to protect our product candidates and any products, if approved, our business and results of operations will be adversely affected. 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. As a result, our patent portfolio may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours.

If we do not obtain protection under the Hatch-Waxman Amendments and similar non-U.S. legislation for extending the term of patents covering each of our product candidates, our business may be materially harmed.

Depending upon the timing, duration, and conditions of 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. A patent term extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval, and only claims covering such approved drug product, a method for using it or a method for manufacturing it may be extended.

However, we may not receive an extension if we 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. 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 that product 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, possibly materially.

We expect there may be only limited geographical protection with respect to certain patents and may not be able to protect our intellectual property rights throughout the world.

Patents are of national or regional effect. While we will endeavor to try to protect our technology, products, and product candidates with intellectual property rights such as patents throughout the world, as appropriate, the process of obtaining patents is time-consuming, expensive, and sometimes unpredictable in other countries. We may not be able to file, prosecute, maintain, enforce, or license all necessary or desirable patent rights at a commercially reasonable cost or in a timely manner. In addition, we may not pursue or obtain patent protection in all markets. As such, 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.

International applications under the Patent Cooperation Treaty ("PCT"), are usually filed within 12 months after the priority filing. Based on the PCT filing, national and regional patent applications may be filed in additional jurisdictions where we believe our product candidates may be marketed. We have not, and will not, file for patent protection in all national and regional jurisdictions where such protection may be available. Filing, prosecuting, and defending patents on all of our research programs and product candidates in all countries throughout the world would be prohibitively expensive, and, therefore, the scope and strength of our intellectual property rights will vary from jurisdiction to jurisdiction. In addition, we may decide to abandon national and regional patent applications before grant. Finally, the grant proceeding of each national/regional patent is an independent proceeding which may lead to situations in which applications might in some jurisdictions be refused by the relevant patent offices, while granted by others. Further, the standards applied by the USPTO and foreign patent offices in granting patents are not always applied uniformly or predictably. It is common that depending on the country, the scope of patent protection may vary for the same product candidate and/or technology. As such, we do not know the degree of future protection that we will have on our technology and product candidates in different jurisdictions.

Competitors may use our or our collaboration partners' technologies in jurisdictions where we have not obtained patent protection to develop their own products and, further, may export otherwise infringing products to territories where we or our collaboration partners have patent protection, but enforcement is not as strong as that in the United States. These products may compete with our product candidates, and our or our collaboration partners' patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

The laws of some jurisdictions, particularly certain developing countries, do not protect intellectual property rights, particularly those relating to pharmaceuticals or biologics, to the same extent as laws in the United States, and many companies have encountered significant difficulties in protecting and defending such rights in such jurisdictions. 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. If we encounter difficulties in protecting, or are otherwise precluded from effectively protecting, the intellectual property rights important for our business in such jurisdictions, the value of these rights may be diminished, and we may face additional competition from others in those jurisdictions.

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. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain significant commercial advantage from the intellectual property that we develop or license.

Some countries, including China and India, have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In addition, some countries limit the enforceability of patents against government agencies or government contractors. In these countries, the patent owner may have limited remedies, which could materially diminish the value of such patent. If we are forced to grant a license to third parties with respect to any patents relevant to our business, our competitive position may be impaired and our business and results of operations may be adversely affected.

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

We generally enter into confidentiality and intellectual property assignment agreements with our employees, consultants, and contractors. These agreements generally provide that inventions conceived by the party in the course of rendering services to us will be our exclusive property. However, those agreements may not be honored and may not effectively assign intellectual property rights to us. Moreover, there may be some circumstances, where we are unable to negotiate for such ownership rights. Disputes regarding ownership or inventorship of intellectual property can also arise in other contexts, such as collaborations and sponsored research. If we are subject to a dispute challenging our rights in or to patents or other intellectual property, such a dispute could be expensive and time consuming. If we were unsuccessful, we could lose valuable rights in intellectual property that we regard as our own. In addition, interferences, post-grant proceedings, opposition proceedings, derivation proceedings, or other intellectual property proceedings provoked by third parties or brought by us or declared by the USPTO may be necessary to determine the priority of inventions with respect to our patents or patent applications.

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

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

The degree of future protection afforded by our intellectual property rights is uncertain because intellectual property rights have limitations, and may not adequately protect our business, or permit us to maintain our competitive advantage. Moreover, if a third party has intellectual property rights that cover the practice of our technology, we may not be able to fully exercise or extract value from our intellectual property rights. The following examples are illustrative:

- others may be able to make product candidates similar to our product candidates but that are not covered by the claims of the patents that we own or have exclusively licensed;
- the patents of third parties may have an adverse effect on our business;
- we or any future strategic partners might not have been the first to conceive or reduce to practice the inventions covered by the issued patent or pending patent application that we own or have exclusively licensed;
- we or any future strategic partners might not have been the first to file patent applications covering certain of our inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technology without infringing, misappropriating, or otherwise violating our intellectual property rights;
- it is possible that our pending patent applications will not lead to issued patents;
- issued patents that we own or have exclusively licensed may not provide us with any competitive advantage, or may be held invalid or unenforceable, as a result of legal challenges by our competitors;
- we cannot predict the degree and range of protection any issued patents will afford us against competitors, whether or not others will obtain patents claiming aspects similar to those covered by our patents and patent applications, or whether we will need to initiate litigation or administrative proceedings which may be costly whether we win or lose;
- 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;
- third parties performing manufacturing or testing for us using our product candidates or technologies could use the intellectual property of others without obtaining a proper license; and

- we may not develop additional technologies that are patentable.

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

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

Changes in patent laws or patent jurisprudence 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 involve both technological complexity and legal complexity. 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. Therefore, obtaining and enforcing biopharmaceutical patents is costly, time-consuming, and inherently uncertain.

In September 2011, the America Invents Act (the "AIA"), was enacted in the United States, resulting in significant changes to the U.S. patent system. An important change introduced by the AIA was a transition to a "first-to-file" system for deciding which party should be granted a patent when two or more patent applications are filed by different parties claiming the same invention, which went into effect on March 16, 2013. Therefore, a third party that now files a patent application in the USPTO before we do could be awarded a patent covering an invention of ours even if we created the invention before it was created by the third party. While we are cognizant of the time from invention to filing of a patent application, circumstances could prevent us from promptly filing patent applications for our inventions.

Among some of the other changes introduced by the AIA were changes that limit where a patentee may file a patent infringement suit and providing opportunities for third parties to challenge any issued patent in the USPTO. This applies to all of our U.S. patents. Because of a lower evidentiary standard in USPTO proceedings compared to the evidentiary standard in U.S. federal courts necessary to invalidate a patent claim, a third party could potentially provide evidence in a USPTO proceeding sufficient for the USPTO to hold a claim invalid even though the same evidence would be insufficient to invalidate the claim if first presented in a district court action. Accordingly, a third party may attempt to use the USPTO procedures to invalidate our patent claims that would not have been invalidated if first challenged by the third party as a defendant in a district court action. The AIA and its continued implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications, and the patent applications of our collaborators, and the enforcement or defense of our issued patents.

Depending on decisions by the U.S. Congress, the federal courts, and the USPTO, the laws and regulations governing patents could change in unpredictable ways that could 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 U.S. Supreme Court held that certain claims to DNA molecules are not patentable. While we do not believe that any of the patents owned by us will be found invalid based on this decision, we cannot predict how future decisions by the courts, the U.S. Congress or the USPTO may impact the value of our patents. Similarly, there is complexity and uncertainty related to European patent laws. For example, European patent laws are stringent in the type of amendments that are allowed during prosecution, and the complexity and uncertainty of European patent laws have also increased in recent years. These limitations and requirements could adversely affect our ability to obtain new patents in the future that may be important for our business.

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

In addition to seeking patents for some of our technology and product candidates, we may rely on trade secrets and/or confidential know-how to protect our technology, especially where patent protection is believed to be of limited value, to maintain our competitive position with respect to our research programs and product candidates. Elements of our product candidates, including

processes for their preparation and manufacture, may involve proprietary know-how, information, or technology that is not covered by patents, and thus for these aspects we may consider trade secrets and know-how to be our primary intellectual property. Any disclosure, either intentional or unintentional, by our employees or by other third parties of our trade secrets or proprietary information could enable competitors to duplicate or surpass our technological achievements, thus adversely eroding our competitive position in our market.

Trade secrets and/or confidential know-how can be difficult to protect or maintain as confidential. To protect this type of information against disclosure or appropriation by competitors, we generally require our employees, consultants, contractors, collaborators, advisors, and other third parties to enter into confidentiality agreements with us. Despite these efforts, any of these parties may unintentionally or willfully breach the agreements and disclose our confidential information, and confidentiality agreements may not provide an adequate remedy in the event of unauthorized disclosure of confidential information. Monitoring unauthorized uses and disclosures is difficult, and we do not know whether the steps we have taken to protect our internally-developed technology will be effective. Enforcing a claim that a third party obtained illegally and is using trade secrets and/or confidential know-how is also expensive, time-consuming, and unpredictable.

The enforceability of confidentiality agreements may vary from jurisdiction to jurisdiction. The laws of some foreign countries do not protect proprietary rights to the same extent or in the same manner as the laws of the United States. As a result, we may encounter significant problems in protecting and defending our intellectual property both in the United States and abroad. Furthermore, if a competitor lawfully obtained or independently developed any of our trade secrets, we would have no right to prevent such competitor from using that technology or information to compete with us, which could harm our competitive position. Additionally, if the steps taken to maintain our trade secrets are deemed inadequate, we may have insufficient recourse against third parties for misappropriating the trade secret. In addition, some courts inside and outside the United States are less willing or are unwilling to protect trade secrets or other proprietary information.

Trade secrets can over time be disseminated within the biopharmaceutical industry through independent development, the publication of journal articles, and the movement of personnel skilled in the art from company to company or academic to industry scientific positions. Though our agreements with third parties typically restrict the ability of our employees, consultants, contractors, collaborators, advisors, and other third parties to publish data potentially relating to our trade secrets, our agreements may contain certain limited publication rights. Because from time to time we expect to rely on third parties in the development, manufacture, and distribution of our product candidates and provision of our services, we must, at times, share trade secrets with them. Despite employing the contractual and other security precautions described above, the need to share trade secrets increases the risk that such trade secrets become known by our competitors, are inadvertently incorporated into the technology of others, or are disclosed or used in violation of these agreements. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor or other third party, we would have no right to prevent them from using that technology or information to compete with us. If any of our trade secrets were to be disclosed to or independently developed by a competitor or other third party, our competitive position would be harmed.

In addition, our competitors may independently develop substantially equivalent trade secrets, proprietary information, or know-how and may even apply for patent protection in respect of the same. If successful in obtaining such patent protection, our competitors could limit our use of our trade secrets and/or confidential know-how. Under certain circumstances and to make it more likely that we have our freedom to operate, we may also decide to publish some know-how to make it difficult for others to obtain patent rights covering such know-how, at the risk of potentially exposing our trade secrets to our competitors.

We may be subject to third-party claims asserting that our employees, consultants, contractors, collaborators, or advisors have misappropriated or wrongfully used or disseminated their intellectual property, or claiming ownership of what we regard as our own intellectual property.

Many of our employees, including our senior management, were previously employed at universities or at other biopharmaceutical companies, including our competitors or potential competitors. Some of these employees executed proprietary rights, non-disclosure, and non-competition agreements in connection with such previous employment. Similarly, we work with consultants, contractors, collaborators, advisors, or other third parties who have worked with, and do currently work with, other companies, including our competitors or potential competitors, and have executed proprietary rights, non-disclosure, and non-competition agreements in connection with such other companies. Although we try to ensure that our employees, consultants, contractors, collaborators, advisors, or other third parties do not use or disclose the proprietary information or know-how of others in their work for us, we may be subject to claims that we or these employees or individuals that we work with have used or disclosed confidential information or intellectual property of others, including trade secrets or other proprietary information, or that we caused an individual to breach the terms of his or her non-competition or non-solicitation agreement with a current or former employer or competitor.

Litigation may be necessary to defend against these claims and, even if we are successful, could result in substantial costs and could be a distraction to management, our employees, and our routine business. If we fail in prosecuting or defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel or sustain damages. Such intellectual property rights could be awarded to a third party, and we could be required to obtain a license from such third party to develop or commercialize our technology or product candidates. Such a license may not be available on commercially reasonable terms or at all. Moreover, any such litigation or the threat thereof may adversely affect our reputation and our ability to form strategic alliances or sublicense our rights to collaborators, engage with scientific advisors or hire employees or consultants, each of which would have an adverse effect on our business, results of operations, and financial condition.

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 noncompliance with these requirements.

Periodic maintenance and annuity fees on any issued patent are due to be paid to the USPTO and foreign governmental 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 failure to respond to official actions within prescribed time limits, non-payment of fees, and failure to properly legalize and submit formal documents within prescribed time limits. If we fail to maintain the patents and patent applications covering our product candidates or if we otherwise allow our patents or patent applications to be abandoned or lapse, our competitors might be able to enter the market, which would have an adverse effect on our business.

Our information technology systems, or those used by other contractors or consultants, may fail or suffer security breaches, which could adversely affect our business.

We collect and maintain information in digital form that is necessary to conduct our business, and we are dependent on our information technology systems and those of third parties to operate our business. In the ordinary course of our business, we collect, store, and transmit large amounts of confidential information, including intellectual property, proprietary business information, and personal information, and data to comply with cGMP and data integrity requirements. It is critical that we do so in a secure manner to maintain data security and data integrity of such information. We have established physical, electronic, and organizational measures to safeguard and secure our systems to prevent a data compromise. We have also outsourced elements of our information technology infrastructure, and as a result a number of third-party vendors may or could have access to our confidential information. Despite the implementation of security measures, our information technology systems and data and those of our contractors and consultants are vulnerable to compromise or damage from computer hacking, malicious software, fraudulent activity, employee misconduct, human error, telecommunication and electrical failures, natural disasters, or other cybersecurity attacks or accidents. Future acquisitions could expose us to additional cybersecurity risks and vulnerabilities from any newly acquired information technology infrastructure. Cybersecurity attacks are constantly increasing in sophistication and are made by groups and individuals with a wide range of motives (including industrial espionage) and expertise, including by organized criminal groups, “hacktivists,” nation states, and others. Our systems may be subject to attacks and could be targeted by foreign actors for purposes of economic espionage. Due to the nature of some of such attacks, there is a risk that an attack may remain undetected for a period of time. While we continue to make investments to improve the protection of data and information technology, there can be no assurance that our efforts will prevent service interruptions or security breaches.

Any cybersecurity incident could adversely affect our business, by leading to, for example, the loss of trade secrets or other intellectual property, demands for ransom or other forms of blackmail, or the unauthorized disclosure of personal or other sensitive information of our employees, clinical trial patients, customers, and others. Although to our knowledge we have not experienced any material cybersecurity incident to date, if such an event were to occur, it could seriously harm our development programs and our business operations. We could be subject to regulatory actions taken by governmental authorities, litigation under laws that protect the privacy of personal information, or other forms of legal proceedings, which could result in significant liabilities or penalties. Further, a cybersecurity incident may disrupt our business or damage our reputation, which could have a material adverse effect on our business, prospects, operating results, share price, stockholder value, and financial condition. We could also incur substantial remediation costs, including the costs of investigating the incident, repairing or replacing damaged systems, restoring normal business operations, implementing increased cybersecurity protections, and paying increased insurance premiums.

Risks Related to Ownership of Our Common Stock

Our stock price may be volatile or may decline regardless of our operating performance, resulting in substantial losses for investors.

The market price of our common stock may be highly volatile and may fluctuate substantially as a result of a variety of factors, some of which are related in complex ways. The market price of our common stock may fluctuate significantly in response to numerous factors, many of which are beyond our control, including the factors described in this "Risk Factors" section and elsewhere in this Annual Report on Form 10-K.

In addition, the stock market in general, and the Nasdaq Stock Market, or Nasdaq, and biopharmaceutical companies in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of these companies. Additionally, the trading prices for pharmaceutical, biopharmaceutical and biotechnology companies have been highly volatile as a result of the COVID-19 pandemic. Also, broad market and industry factors may negatively affect the market price of our common stock, regardless of our actual operating performance.

We could be subject to securities class action litigation.

In the past, securities class action litigation has often been instituted against companies following periods of volatility in the market price of a company's securities. This type of litigation, if instituted, could result in substantial costs and a diversion of management's attention and resources, which would harm our business, operating results, or financial condition. Additionally, the dramatic increase in the cost of directors' and officers' liability insurance may cause us to opt for lower overall policy limits or to forgo insurance that we may otherwise rely on to cover significant defense costs, settlements, and damages awarded to plaintiffs.

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

As of December 31, 2021, our executive officers, directors, holders of 5% or more of our capital stock and their respective affiliates beneficially owned approximately 50% of our outstanding voting stock (excluding any stock options exercisable within 60 days of such date held by such persons). Therefore, these stockholders have the ability to influence us through this ownership position. These stockholders may be able to determine all matters requiring stockholder approval. For example, these stockholders may be able to control elections of directors, amendments of our organizational documents, or approval of any merger, sale of assets, or other major corporate transaction. This may prevent or discourage unsolicited acquisition proposals or offers for our common stock that you may feel are in your best interest as one of our stockholders.

Future sales of our common stock in the public market could cause our common stock price to fall.

Sales of a substantial number of shares of our common stock in the public market, or the perception that these sales might occur, could depress the market price of our common stock and could impair our ability to raise capital through the sale of additional equity securities.

In addition, in the future, we may issue additional shares of common stock, or other equity or debt securities convertible into common stock, in connection with a financing, acquisition, employee arrangement, or otherwise. Any such issuance could result in substantial dilution to our existing stockholders and could cause the price of our common stock to decline.

If we engage in future acquisitions or strategic partnerships, this may increase our capital requirements, dilute our stockholders, cause us to incur debt or assume contingent liabilities, and subject us to other risks.

We may evaluate various acquisitions and strategic partnerships, including licensing or acquiring complementary products, intellectual property rights, technologies, or businesses. Any potential acquisition or strategic partnership may entail numerous risks, including:

- increased operating expenses and cash requirements;
- the assumption of additional indebtedness or contingent liabilities;
- assimilation of operations, intellectual property and products of an acquired company, including difficulties associated with integrating new personnel;

- our inability to achieve desired efficiencies, synergies or other anticipated benefits from such acquisitions or strategic partnerships;
- the diversion of our management's attention from our existing product programs and initiatives in pursuing such a strategic merger or acquisition;
- retention of key employees, the loss of key personnel, and uncertainties in our ability to maintain key business relationships;
- risks and uncertainties associated with the other party to such a transaction, including the prospects of that party and their existing products or product candidates and regulatory approvals; and
- our inability to generate revenue from acquired technology and/or products sufficient to meet our objectives in undertaking the acquisition or even to offset the associated acquisition and maintenance costs.

In addition, if we undertake acquisitions, we may issue dilutive securities, assume or incur debt obligations, incur large one-time expenses and acquire intangible assets that could result in significant future amortization expense. Moreover, we may not be able to locate suitable acquisition opportunities and this inability could impair our ability to grow or obtain access to technology or products that may be important to the development of our business.

If securities or industry analysts either do not publish research about us or publish inaccurate or unfavorable research about us, our business or our market, or if they change their recommendations regarding our common stock adversely, the trading price or trading volume of our common stock could decline.

The trading market for our common stock depends in part upon the research and reports that securities or industry analysts may publish about us, our business, our market, or our competitors. If one or more of these analysts initiate research with an unfavorable rating or downgrade our common stock, provide a more favorable recommendation about our competitors or publish inaccurate or unfavorable research about our business, our common stock price would likely decline. If any analyst who may cover us were to cease coverage of us or fail to regularly publish reports on us, we could lose visibility in the financial markets, which in turn could cause the trading price or trading volume of our common stock to decline.

We are an emerging growth company, and any decision on our part to comply only with certain reduced reporting and disclosure requirements applicable to emerging growth companies could 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, or the JOBS Act, and, for as long as we continue to be an emerging growth company, we may choose to take advantage of exemptions from various reporting requirements applicable to other public companies but not to emerging growth companies, including:

- not being required to have our independent registered public accounting firm audit our internal control over financial reporting under Section 404 of the Sarbanes-Oxley Act;
- reduced disclosure obligations regarding executive compensation in our periodic reports and annual reports on Form 10-K; and
- exemptions from the requirements of holding non-binding advisory votes on executive compensation and stockholder approval of any golden parachute payments not previously approved.

We will remain an emerging growth company until the earlier of:

- the last day of the fiscal year in which we have more than $1.07 billion in annual revenue;
- the date we qualify as a "large accelerated filer," with at least $700 million of equity securities held by non-affiliates;
- the date on which we have issued, in any three-year period, more than $1.0 billion in non-convertible debt securities; or
- December 31, 2026.

We cannot predict if investors will find our common stock less attractive if we choose to rely on any of the exemptions afforded to emerging growth companies. If some investors find our common stock less attractive because we rely on any of these exemptions, there may be a less active trading market for our common stock and the market price of our common stock may be more volatile.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards until such time as those standards apply to private companies. We elected to use this extended transition period for complying with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date that we (i) are no longer an emerging growth company or (ii) affirmatively and irrevocably opt out of the extended transition period provided in the JOBS Act. As a result, these audited financial statements may not be comparable to companies that comply with the new or revised accounting pronouncements as of public company effective dates.

If we fail to maintain proper and effective internal controls over financial reporting our ability to produce accurate and timely financial statements could be impaired.

Pursuant to Section 404 of the Sarbanes-Oxley Act, our management will be required to report upon the effectiveness of our internal control over financial reporting beginning with the annual report for our fiscal year ending December 31, 2022. When we lose our status as an "emerging growth company" and a "smaller reporting company," and become an "accelerated filer" or a "large accelerated filer," our independent registered public accounting firm will be required to attest to the effectiveness of our internal control over financial reporting. The rules governing the standards that must be met for management to assess our internal control over financial reporting are complex and require significant documentation, testing and possible remediation. To comply with the requirements of being a reporting company under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), we have implemented and will continue to implement additional financial and management controls, reporting systems and procedures and we have hired and intend to continue to hire additional accounting and finance staff.

We cannot assure you that there will not be material weaknesses or significant deficiencies in our internal control over financial reporting in the future. Any failure to maintain internal control over financial reporting could severely inhibit our ability to accurately report our financial condition, results of operations, or cash flows. If we are unable to conclude that our internal control over financial reporting is effective, or if our independent registered public accounting firm determines we have a material weakness or significant deficiency in our internal control over financial reporting, investors may lose confidence in the accuracy and completeness of our financial reports, the market price of our common stock could decline, and we could be subject to sanctions or investigations by Nasdaq, the SEC, or other regulatory authorities. Failure to remedy any material weakness in our internal control over financial reporting, or to implement or maintain other effective control systems required of public companies, could also restrict our future access to the capital markets.

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

We are subject to the periodic reporting requirements of the Exchange Act. We have designed our disclosure controls and procedures to reasonably assure that information we must disclose in reports we file or submit under the Exchange Act is accumulated and communicated to management, and recorded, processed, summarized, and reported within the time periods specified in the rules and forms of the SEC. We believe that any disclosure controls and procedures or internal controls and procedures, no matter how well-conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. These inherent limitations include the realities that judgments in decision-making can be faulty, and that breakdowns can occur because of simple error or mistake. For example, our directors or executive officers could inadvertently fail to disclose a new relationship or arrangement causing us to fail to make a required related party transaction disclosure. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people or by an unauthorized override of the controls. Accordingly, because of the inherent limitations in our control system, misstatements due to error or fraud may occur and not be detected.

We do not currently intend to pay dividends on our common stock and, consequently, our stockholders' ability to achieve a return on their investment will depend on appreciation of the value of our common stock.

We have never declared or paid cash dividends on our common stock. We currently intend to retain all available funds and any future earnings to support operations and to finance the growth and development of our business. We do not intend to declare or pay any cash dividends on our capital stock in the foreseeable future. As a result, any investment return on our common stock will depend upon increases in the value for our common stock, which is not certain.

Provisions in our amended and restated certificate of incorporation and our amended and restated bylaws and Delaware law might discourage, delay or prevent a change in control of our company or changes in our management and, therefore, depress the market price of our common stock.

Our amended and restated certificate of incorporation and our amended and restated bylaws contain provisions that could depress the market price of our common stock by acting to discourage, delay, or prevent a change in control of our company or changes in our management that the stockholders of our company may deem advantageous. These provisions, among other things:

- establish a staggered Board divided into three classes serving staggered three-year terms, such that not all members of the Board will be elected at one time;
- authorize our Board to issue new series of redeemable preferred stock without stockholder approval and create, subject to applicable law, a series of redeemable preferred stock with preferential rights to dividends or our assets upon liquidation, or with superior voting rights to our existing common stock;
- eliminate the ability of our stockholders to call special meetings of stockholders;
- eliminate the ability of our stockholders to fill vacancies on our Board;
- establish advance notice requirements for nominations for election to our Board or for proposing matters that can be acted upon by stockholders at our annual stockholder meetings;
- permit our Board to establish the number of directors;
- provide that our Board is expressly authorized to make, alter or repeal our amended bylaws;
- provide that stockholders can remove directors only for cause and only upon the approval of not less than 66 2/3 of all outstanding shares of our voting stock;
- require the approval of not less than 66 2/3 of all outstanding shares of our voting stock to amend our bylaws and specific provisions of our certificate of incorporation; and
- limit the jurisdictions in which certain stockholder litigation may be brought.

As a Delaware corporation, we are subject to the anti-takeover provisions of Section 203 of the Delaware General Corporation Law, which prohibits a Delaware corporation from engaging in a business combination specified in the statute with an interested stockholder (as defined in the statute) for a period of three years after the date of the transaction in which the person first becomes an interested stockholder, unless the business combination is approved in advance by a majority of the independent directors or by the holders of at least two-thirds of the outstanding disinterested shares. The application of Section 203 of the Delaware General Corporation Law could also have the effect of delaying or preventing a change of control of our company.

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware will be the exclusive forum 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, unless we consent in writing to the selection of an alternative forum, the sole and exclusive forum, to the fullest extent permitted by law, for (1) any derivative action or proceeding brought on our behalf, (2) any action asserting a breach of a fiduciary duty owed by any director, officer or other employee to us or our stockholders, (3) any action asserting a claim against us or any director, officer, or other employee arising pursuant to the Delaware General Corporation Law, (4) any action to interpret, apply, enforce, or determine the validity of our amended and restated certificate of incorporation or amended and restated bylaws, or (5) any other action asserting a claim that is governed by the internal affairs doctrine, shall be the Court of Chancery of the State of Delaware (or another state court or the federal court located within the State of Delaware if the Court of Chancery does not have or declines to accept jurisdiction), in all cases subject to the court's having jurisdiction over indispensable parties named as defendants. In addition, our amended and restated certificate of incorporation provides that the federal district courts of the United States is the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act of 1933, as amended (the "Securities Act") but that the forum selection provision will not apply to claims brought to enforce a duty or liability created by the Exchange Act. Although we believe these provisions benefit us by

providing increased consistency in the application of Delaware law for the specified types of actions and proceedings, the provisions may have the effect of discouraging lawsuits against us or our directors and officers. These provisions may limit an investor's ability to bring a claim in a judicial forum that it finds favorable for disputes with our company, including by increasing the cost of such lawsuits, which may discourage such claims. Alternatively, if a court were to find the choice of forum provision contained in our amended and restated certificate of incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions, which could harm our business, financial condition, and operating results. For example, under the Securities Act, federal courts have concurrent jurisdiction over all suits brought to enforce any duty or liability created by the Securities Act, and investors cannot waive compliance with the federal securities laws and the rules and regulations thereunder. Any person or entity purchasing or otherwise acquiring any interest in our shares of capital stock shall be deemed to have notice of and consented to this exclusive forum provision, but will not be deemed to have waived our compliance with the federal securities laws and the rules and regulations thereunder.

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

As of December 31, 2020, and 2021, we had available federal net operating loss ("NOL") carryforwards of $14.8 million and $26.1 million, respectively. We also had available state NOLs carryforwards of approximately $15.2 million and $26.8 million, as of December 31, 2020 and 2021, respectively. As of December 31, 2021, we also had federal tax credits of $218,015, which may be used to offset future tax liabilities. The federal and state NOLs will carryforward indefinitely and be available to offset up to 100% of taxable income for taxable years before 2021 and 80% of taxable years staring after 2020.

Use of our NOL carryforwards and tax credit carryforwards depends on many factors, including having current or future taxable income, which cannot be assured. Our U.S. NOL and tax credit carryforwards could expire unused and be unavailable to offset future taxable income or income tax liabilities because of their limited duration or because of restrictions under U.S. tax law. In addition, for taxable years beginning after December 31, 2020, the deductibility of federal NOLs generated in taxable years beginning after December 31, 2017 is limited to 80% of our taxable income in such year (after taking into account utilization of NOLs generated in taxable years beginning before January 1, 2018), where taxable income is determined without regard to such NOL deduction itself. In addition, under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended (the "Code"), and certain corresponding provisions of state law, a corporation that undergoes an "ownership change" is subject to limitations on its ability to utilize its pre-change NOL and tax credit carryforwards to offset future taxable income or taxes. For these purposes, an ownership change generally occurs where the aggregate stock ownership of one or more stockholders (or groups of stockholders), each of whom owns at least 5% of a corporation's stock, increases by more than 50 percentage points over its lowest ownership percentage within a specified testing period. We believe we may have experienced ownership changes in the past, and we believe it is likely that we will experience an additional ownership change in the future as a result of this offering or subsequent shifts in our stock ownership, some of which are outside our control. If finalized, Treasury Regulations currently proposed under Section 382 of the Code may further limit our ability to utilize our pre-change NOL and tax credit carryforwards if we undergo an additional ownership changes in the future.

If we earn taxable income in the future, we expect that our ability to use existing NOL and tax credit carryforwards to offset such taxable income will be materially limited as a result of such ownership changes.

The application of such limitations may cause U.S. federal income taxes (and possibly state income taxes) to be paid by us earlier than they otherwise would be paid if such limitations were not in effect and could cause such NOLs and tax credit carryforwards to expire unused, in each case reducing or eliminating the benefit of such NOLs and tax credit carryforwards.

To the extent we are not able to offset our future taxable income with our NOLs or offset future taxes with our tax credit carryforwards, this would adversely affect our operating results and cash flows. These same risks can arise in the context of state income and franchise tax given many states conform to federal law and rely on federal authority for determining state NOLs.

Changes in tax laws or in their implementation or interpretation may adversely affect our business and financial condition.

Recent changes in tax law may adversely affect our business or financial condition. On December 22, 2017, the U.S. government enacted the Tax Cuts and Jobs Act ("TCJA"), which significantly reformed the Code. The TCJA, among other things, contains significant changes to corporate taxation, including reducing the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, limiting the tax deduction for net interest expense to 30% of adjusted taxable income (except for certain small businesses), limiting the deduction for net operating losses, or NOLs, arising in taxable years beginning after December 31, 2017 to 80% of current year taxable income and elimination of NOL carrybacks for losses arising in taxable years ending after December 31, 2017 (though any such NOLs may be carried forward indefinitely), imposing a one-time taxation of offshore earnings at reduced rates regardless of whether they are repatriated, eliminating U.S. tax on foreign earnings (subject to certain important exceptions), allowing

immediate deductions for certain new investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits.

As part of Congress' response to the COVID-19 pandemic, the Families First Coronavirus Response Act ("FFCR Act"), was enacted on March 18, 2020, and the Coronavirus Aid, Relief, and Economic Security Act ("CARES Act"), was enacted on March 27, 2020. Both contain numerous tax provisions. The CARES Act did not have any material effect to the Company.

We urge prospective investors in our common stock to consult with their legal and tax advisors with respect to any recently enacted tax legislation, or proposed changes in law, and the potential tax consequences of investing in or holding our common stock.

Item 1B Unresolved Staff Comments.

None.

Item 2 Properties.

Our corporate headquarters are located in Miramar, Florida. We currently occupy approximately 12,250 square feet of space under a lease that expired on February 28, 2022. Effective March 1, 2022, we entered into a new lease for the same location with a term that will expire on February 28, 2024. We use these facilities for research and development laboratories and facilities for manufacturing research-grade materials, as well as offices for all the Company's employees, including clinical development, research, development, quality control, quality assurance, regulatory affairs, and administration.

We are actively seeking an appropriate new location in the Miramar area that has approximately 40,000 – 60,000 square feet of space for our employee offices, laboratories, and manufacturing facilities. We continue to plan to move to our new location by the end of 2023.

Item 3 Legal Proceedings.

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

Item 4 Mine Safety Disclosures.

Not applicable.

PART II

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

Market Information and Holders of our Common Stock

Our common stock is traded on The Nasdaq Global Select Market under the symbol "HCWB". As of March 22, 2022, 35,779,489 shares of the Company's common stock were issued and outstanding and were owned by approximately 3,900 holders of record. The actual number of stockholders is greater than this number of record holders and includes stockholders who are beneficial owners but whose shares are held in street name by brokers and other nominees.

Dividend Policy

We have never declared or paid any cash dividends on our common stock or any other securities. We anticipate that we will retain all available funds and any future earnings, if any, for use in the operation of our business and do not anticipate paying cash dividends in the foreseeable future. In addition, future debt instruments may materially restrict our ability to pay dividends on our common stock. Payment of future cash dividends, if any, will be at the discretion of the board of directors after taking into account various factors, including our financial condition, operating results, current and anticipated cash needs, the requirements of current or then-existing debt instruments and other factors the board of directors deems relevant.

Recent Sales of Unregistered Securities

From January 1, 2021 through July 21, 2021 (the date of the filing of our registration statement on Form S-8), we issued and sold to our employees, consultants and other service providers an aggregate of 162,189 unregistered shares of common stock upon the exercise of stock options under our 2019 Equity Incentive Plan, as amended, at a weighted average exercise price of $0.14. The securities issued in these transactions were exempt from the registration requirements of the Securities Act in reliance upon Rule 701 promulgated under the Securities Act. The foregoing transactions did not involve any underwriters, underwriting discounts or commissions, or any public offering.

Use of Proceeds from Initial Public Offering of Company's Stock

On July 19, 2021, our registration statement on Form S-1 (File No. 333-256510) related to our IPO was declared effective by the SEC. On July 22, 2021, we completed the IPO pursuant to which we issued and sold 7,000,000 shares of common stock at $8.00 per share and received gross proceeds of $56.0 million, which resulted in net proceeds to us of $49.2 million, after deducting underwriting discounts and commissions and offering expenses paid by us. None of the expenses associated with the IPO were paid to directors, officers, persons owning ten percent or more of any class of equity securities or to their affiliates. EF Hutton Division of Benchmark Investments, LLC acted as sole book-running manager and Revere Securities LLC acted as co-manager for the offering.

There has been no material change in the planned use of proceeds from our IPO from that described in the final prospectus dated July 19, 2021 and filed with the SEC.

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 financial statements and related notes thereto included elsewhere in this Annual Report on Form 10-K. This discussion contains forward-looking statements that involve risk and uncertainties, such as statements of our plans, objectives, expectations, and intentions, that are based on the beliefs of our management. Our actual results could differ materially from those discussed in these forward-looking statements. Factors that could cause or contribute to such differences include, but are not limited to, those discussed in the "Risk Factors" section of this Annual Report on Form 10-K.

Overview

We are a biopharmaceutical company focused on discovering and developing novel immunotherapies to lengthen health span by disrupting the link between chronic, low-grade inflammation and age-related diseases. We believe age-related, chronic, low-grade inflammation, or "inflammaging," is a significant contributing factor to several diseases and conditions, such as cancer, cardiovascular disease, diabetes, neurodegenerative diseases, and autoimmune diseases. The induction and retention of low-grade inflammation in an aging human body is mainly the result of the accumulation of non-proliferative senescent cells and persistent activation of protein complexes, known as inflammasomes, in innate immune cells. These two elements share common mechanisms in promoting secretion of proinflammatory proteins and in many cases interact to drive inflammaging. Our novel approach is to treat both of these elements. We believe our approach has the potential to fundamentally change the treatment of age-related diseases.

Our gateway indication for clinical development is oncology. Advances in immuno-stimulatory and anti-immunosuppressive therapeutics have revolutionized cancer treatment, and our internally-developed, lead product candidate, HCW9218, is designed with both of these functionalities. We believe the bifunctionality of HCW9218 will allow it to be effective against solid tumor cancers because it simultaneously provides immunostimulation of natural killer ("NK") cells and effector T cells to enhance the cytotoxicity of immune cells against tumor targets, while reducing immunosuppression associated with solid tumors by capturing and neutralizing TGF-β. The FDA has permitted two clinical trials in difficult-to-treat cancer indications to proceed. These include a Company-sponsored trial to evaluate HCW9218 in advanced pancreatic cancer, and an Investigator-sponsored trial by Masonic Cancer Center at University of Minnesota to evaluate HCW9218 in other solid tumors. We expect both trials to initiate in the first half of 2022.

Our internally-developed, lead product candidate, HCW9302, an IL-2-based fusion molecule that expands T_{reg} cells *in vivo* and *ex vivo* as an injectable or cell-based strategy, is designed to reduce inflammation through deactivation of inflammasomes. Preclinical studies have demonstrated the ability of HCW9302 to reduce inflammation, allowing for the potential to treat a wide variety of autoimmune and age-related diseases. We expect to complete IND-enabling activities for an autoimmune indication by the end of 2022. Upon completion of IND-enabling activities, we intend to submit an IND for a Phase 1b clinical trial to evaluate HCW9302 in alopecia areata.

Since commencing operations in 2018, we have devoted substantially all of our efforts and financial resources to building our research and development capabilities, and establishing our corporate infrastructure. To date, we have not generated any product revenue and we have never been profitable. We have incurred significant operating losses since the commencement of our operations. As of December 31, 2021, we had an accumulated deficit of $30.6 million. Our cumulative net losses for the years ended December 31, 2020 and 2021 were $15.1 million and $27.9 million, respectively. Our net losses for years ended December 31, 2020 and 2021 were $5.8 million and $12.9 million, respectively. We do not expect to generate product revenue unless and until we obtain marketing approval for and commercialize a drug candidate, and we cannot assure you that we will ever generate significant revenue or profits from product sales.

To date, we have financed our operations primarily with proceeds of $29.4 million from the sale and issuance of redeemable preferred stock, $49.2 million in net proceeds from our IPO, and to a lesser extent, the proceeds of upfront payments from an out-license agreement. As of December 31, 2021, we had cash and cash equivalents of $11.7 million, short-term investments in U.S. government-backed securities of $25.0 million, and long-term investments in U.S. government-backed securities of $9.9 million.

We expect to continue to incur significant expenses and operating losses for the foreseeable future, as we continue our clinical development activities, particularly if and as we:

- Advance the development of our lead product candidate, HCW9218, and clinical trials for oncology, and if approved by the FDA, commercialization;
- Advance preclinical development of other indications for HCW9218, including fibrotic indications, especially those resulting in NAFLD and liver cancer;

- Advance the preclinical development of our second lead product candidate, HCW9302, for autoimmune diseases and pro-inflammatory diseases, such as coronary artery disease;
- Establish our own domestic manufacturing capability;
- Maintain, expand, and protect our intellectual property portfolio;
- Scale up our clinical and regulatory capabilities; and
- Expand operational and management information systems as well as investor relations, legal, accounting, and audit services required to operate as a public company.

As a result of these anticipated expenditures, we will need substantial additional financing to support our continuing operations and pursuit of our clinical development strategy. Until such time as we can generate significant revenues from sales of an approved drug or drugs, if ever, we expect to finance our operations through a combination of equity offerings or other financings, collaborations, strategic alliances, co-development deals, and out-licensing arrangements. We may be unable to raise additional funds or enter into such other agreements when needed on favorable terms or at all. If we fail to raise capital or enter into such agreements as, and when, needed, we may need to significantly delay, scale back, or discontinue the development and commercialization of one or more of our product candidates which may have a negative impact on our financial condition.

We believe that our existing cash and cash equivalents, will be sufficient to fund our operating expenses through the end of 2023. We have based this estimate on assumptions that may prove to be wrong, we could utilize our available capital resources sooner than we expect. See the section entitled "Liquidity and Capital Resources." Our future viability beyond 2023 is dependent on our ability to raise additional capital to finance our operations and fund capital expenditure requirements. Because of the numerous risks and uncertainties associated with our programs, we are unable to estimate the amounts of increased capital outlays and operating expenses associated with completing the preclinical and clinical development of our product candidates.

Recent Developments

The Company achieved several milestones in the past year:

- **Initial Public Offering.** On July 19, 2021, the Company's S-1 registration statement for an Initial Public Offering ("IPO") was declared effective. On July 22, 2021, the Company closed its IPO resulting in net proceeds of approximately $49.2 million, after deducting underwriting discounts and commissions and estimated offering expenses paid by the Company.
- **FDA clearance for Company-sponsored Phase 1b clinical trial in cancer.** On October 28, 2021, the Company announced that we were cleared by the FDA to proceed to evaluate our lead drug candidate, HCW9218, in a first-in-human Phase 1b clinical trial in patients with advanced pancreatic cancer. We expect to initiate this multi-center trial in the first half of 2022.
- **FDA clearance for Investigator-sponsored Phase 1 clinical trial in cancer.** On January 24, 2022, the Company announced that the Masonic Cancer Center, University of Minnesota was cleared by the FDA to proceed to evaluate our lead drug candidate, HCW9218, in a Phase 1 clinical trial in patients with advanced solid tumors with progressive disease after prior chemotherapies. We expect to initiate this single-center trial in the first half of 2022.
- **Three publications in peer-reviewed journals.** We are successfully executing our strategy to publish pivotal scientific papers to establish our leadership in oncology and other age-related diseases in the scientific and clinical communities. Thus far, three papers have been published:
    - An article in *Cancer Immunology Research* describing our platform: Becker-Hapak MK, et al. A Fusion Protein Complex Combines IL-12, IL-15, and IL-18 Signaling to Induce Memory-like NK Cells for Cancer Immunotherapy. September 9, 2021.
    - An article in *Molecular Therapy* on the characterization of our lead molecules, HCW9218: Liu B et al., Bifunctional TGF-ß Trap/IL-15 Protein Complex Elicits Potent NK Cell and $CD8^+$ T Cell Immunity Against Solid Tumors. October 6, 2021.

- An article in *Molecular Therapy* which discusses HCW9218 and its ability to augment anti-tumor activity and reduce side effects of chemotherapy regimens: Chaturvedi, P et al., Immunotherapeutic HCW9218 Augments Anti-tumor Activity of Chemotherapy via NK Cell Mediated Reduction of Therapy Induced Senescent Cells, January 17, 2022.

Trends and Uncertainties – COVID-19 Pandemic

There created significant uncertainty around the breadth and duration of business disruptions related to COVID-19, as well as its impact on the U.S. and international economies and, as such, we are unable to determine if it will have a material impact on our operations. The COVID-19 pandemic continues to impact U.S. and international markets and supply chains through the spread of COVID-19 variants.

The COVID-19 pandemic continues to present a substantial public health and economic challenge around the world. The global COVID-19 pandemic continues to evolve, and we will continue to monitor the COVID-19 situation closely. The extent of the impact of the COVID-19 pandemic on our business, operations and development timelines and plans remains uncertain, and will depend on certain developments, including the duration and spread of the pandemic and its impact on our development activities, third-party manufacturers, and other third parties with whom we do business, as well as its impact on regulatory authorities and our key scientific and management personnel. See "Risk Factors-- Public health crises such as pandemics or similar outbreaks could materially and adversely affect our preclinical and clinical trials, business, financial condition, and results of operations."

For additional information on the various risks posed by the COVID-19 pandemic, please read section titled “Risk Factors” set forth in Part I, Item 1A of this Annual Report on Form 10-K and in our other filings with the Securities and Exchange Commission (the “SEC”).

Components of Results of Operation

Revenues

To date, we have not generated any revenue from product sales and do not expect to generate revenue from product sales for the foreseeable future. Until that occurs, our sole source of revenue will be derived from out-licenses, collaborative agreements, and co-development deals.

On June 18, 2021, we entered into a master services agreement with Wugen related to a development supply agreement, under which the Company will sell cGMP and non-cGMP grade licensed molecules to Wugen for clinical development. As of December 31, 2021, we had not finalized any statements of work for orders placed under the master services agreement. Thus, as of December 31, 2021, a contract does not exist between Wugen and the Company on which to base revenue recognition for the sale of material to Wugen. Revenues will be deferred until such time as a contact exists. In future periods, we intend to enter into an agreement with Wugen for commercial supply of licensed molecules when commercialization commences. In addition, under the terms of the Wugen License, we may be eligible to receive additional cash payments that will be recognized as revenue, including development and commercialization milestones and single-digit royalties based on annual net sales of licensed products.

Operating Expenses

Our operating expenses are reported as research and development expenses and general and administrative expenses.

Research and Development

Our research and development expenses consist primarily of costs incurred for the development of our product candidates, which include:

- Employee-related expenses, including salaries, benefits, and stock-based compensation expense.
- Expenses related to manufacturing and materials, consisting primarily of expenses incurred in connection with third-party contract manufacturing organizations (“CMO”), that produce cGMP materials for clinical trials on our behalf.
- Expenses associated with preclinical activities, including research and development and other IND-enabling activities.
- Expenses incurred in connection with clinical trials.

- Other expenses, such as facilities-related expenses, direct depreciation costs for capitalized laboratory equipment, and an allocation for overhead.

We expense research and development costs as they are incurred. Costs for contract manufacturing are recognized 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 agreement, and the pattern of payments for goods and services will change depending on the material. Nonrefundable advance payments for goods or services to be received in the future for use in research and development activities are recorded as prepaid expenses and recognized as expenses as the related goods are delivered or the services are performed.

We expect research and development expenses to increase substantially for the foreseeable future as we continue the development of our product candidates. We cannot reasonably determine the nature, timing, and costs of the efforts that will be necessary to complete the development of, and obtain regulatory approval for, any of our product candidates. Product candidates in later stages of development generally have higher development costs than those in earlier stages. We expect our research and development expenses will increase substantially for the foreseeable future as we continue to invest in research and development activities related to developing our lead product candidates, advance into later stages of development, begin to conduct larger clinical trials, expand our product pipeline, continue to maintain, expand, protect, and enforce our intellectual property portfolio, and establish our own manufacturing capabilities. In particular, we expect our research and development expenses will increase substantially as we progress to Phase 2 and Phase 2/3 clinical trials for our lead product candidates, primarily due to the increased size and duration of later-stage clinical trials.

The duration, costs, and timing of the clinical development of our product candidates are highly uncertain and will depend on a variety of factors, including, but not limited to:

- Number and scope of preclinical and IND-enabling studies;
- Successful and timely patient enrollment in, and completion of, clinical trials;
- Per subject trial costs;
- Number of trials required for regulatory approval;
- Number of sites included in the trials;
- Number of subjects needed for each trial;
- Cost and timing of manufacturing of cGMP materials for clinical trials;
- Receipt of regulatory approvals from applicable regulatory authorities;
- Establishing commercial manufacturing capabilities; and
- Costs to maintain, defend, and enforce our intellectual property rights.

A change in the outcome of any of these variables with respect to the development of any of our product candidates could significantly change the costs and timing associated with the development of that product candidate.

General and Administrative Expenses

General and administrative expenses consist primarily of employee-related expenses, including salaries, related benefits, and stock-based compensation expense, for employees in the executive, legal, finance and accounting, human resources, and other administrative functions. General and administrative expenses also include third-party costs such as insurance costs, fees for professional services, such as legal, auditing and tax services, facilities administrative costs, and other expenses.

We expect that our general and administrative expenses will increase in the foreseeable future as the size of our business grows to support additional research and development activities. We anticipate increased expenses relating to our operations as a public company, including increased costs for the hiring of additional personnel, and for payment to outside consultants, including lawyers and accountants, to comply with additional regulations, corporate governance, internal control and similar requirements applicable to public companies, as well as increased costs for insurance.

Interest and Other Income, Net

Interest and other income, net consists of interest earned on our cash, cash equivalents, unrealized gains and losses related to our investments in U.S. government-backed securities, and other income related to non-operating activities, offset by miscellaneous non-operating expenses.

Results of Operations

The following table summarizes our results of operations for the years ended December 31, 2020 and 2021:

	Years Ended December 31,			
	2020	2021	$ Change	% Change
Revenues	$ 4,099,750	$ —	$ (4,099,750)	*
Operating Expenses:				
Research and development	7,255,227	8,173,624	918,397	11%
General and administrative	2,669,048	5,194,210	2,525,162	49%
Total operating expenses	9,924,275	13,367,834	3,443,559	26%
Loss from operations	(5,824,525)	(13,367,834)	(7,543,309)	56%
Interest and other income, net	22,324	505,366	483,042	*
Net loss	$ (5,802,201)	$ (12,862,468)	$ (7,060,267)	55%

* - not meaningful

Revenue

In the year ended December 31, 2020, the Company recognized $4.1 million of revenue, as a result of entering into the Wugen License. No revenues were recognized in the year ended December 31, 2021.

On December 24, 2020, we entered into the Wugen License. We assessed the Wugen License and determined this was a transaction with a customer and should be accounted for under Topic 606. The three performance obligations that had been satisfied as of the effective date of the Wugen License were: (1) exclusive worldwide license, (2) vials of HCW9201, and (3) R&D know-how.

This is the first time we have entered into an out-license arrangement and the first time the Company has established prices for its goods and services. Accordingly, the standalone selling price of the various performance obligations is uncertain, and we determined that an observable standalone selling price was not available for the identified performance obligations under the Wugen License. Where a standalone selling price is not directly observable, then we estimate the standalone selling price considering marketing conditions, entity-specific factors, and information about the customer that is reasonably available. The process for determining a standalone selling price involves significant judgment and includes consideration of multiple factors, including assumptions related to the market opportunity and the time needed to commercialize a product candidate pursuant to the relevant license, estimated direct expenses, and other costs.

The estimated transaction price for performance obligations that were satisfied as of December 31, 2020 was $4.1 million. First, we determined a standalone selling price of $2.5 million for the vials of HCW9201 and the R&D know-how. The prices were determined based on costs for developing the know-how and costs incurred in producing the vials. The standalone selling price for the license was then determined using the residual approach and was priced at $1.6 million.

As of December 31, 2020, we recorded $2.5 million in Accounts receivable, net for the nonrefundable payments related to the sale of non-financial assets to Wugen that were due after the reporting period. The Company records amounts as accounts receivable when the right to consideration is deemed unconditional.

On June 18, 2021, the Company entered into a master services agreement with Wugen related to supply of licensed molecules for use in research and clinical development. As of December 31, 2021, the Company has not finalized any statements of work, which will specify the performance obligations required to be completed by the Company for supplies ordered by Wugen. Thus, a contract did not exist as of December 31, 2021. Revenues will be deferred until a contract exists. The standalone selling price for materials purchased during the year ended December 31, 2021 was determined using industry-standard "cost plus" terms which is the pricing set forth in the Wugen License. Deferred revenue represents amounts billed, or yet to be billed to the Company's customer, where payment has been received for which the related revenues have not been recognized because one or more of the revenue recognition criteria have not been met.

Because a contract did not exist as of December 31, 2021, we deferred revenue recognition. As of December 31, 2021, we recognized $1.8 million of deferred revenue, included within Accrued liabilities and other current liabilities on the accompanying balance sheet. The Company's policy is to recognize deferred revenue only to the extent product release occurred after meeting specification required, product is shipped, and cash payment is received.

Research and Development Expenses

The following table summarizes our research and development expenses for the years ended December 31, 2020 and 2021:

	Year Ended December 31,			
	2020	2021	$ Change	% Change
Salaries, benefits and related expenses	$ 2,726,046	$ 2,825,303	$ 99,257	4%
Manufacturing and materials	2,560,350	2,483,687	(76,663)	-3%
Preclinical expenses	1,188,018	2,007,264	819,246	69%
Clinical trials	234,498	249,204	14,706	6%
Other expenses	546,315	608,166	61,851	11%
Total research and development expenses	**$ 7,255,227**	**$ 8,173,624**	**$ 918,397**	**13%**

Research and development expenses increased by $918,397, or 13%, from $7.3 million for the year ended December 31, 2020 to $8.2 million for the year ended December 31, 2021. The increase was primarily attributable to an increase in preclinical expenses and salaries, benefits and related expenses.

Salaries, benefits and related expenses increased $99,257, or 4%, from $2.7 million for the year ended December 31, 2020 to $2.8 million for the year ended December 31, 2021. The increase is primarily attributable to an increase in salaries, performance bonuses, and benefits of $313,745 and an increase in payroll taxes of $25,624, offset by a reimbursement of $240,000 for certain expenses incurred as required under the terms of the Wugen License.

Manufacturing and materials expenses decreased $76,663, or 3%, from $2.6 million for the year ended December 31, 2020 to $2.5 million for the year ended December 31, 2021. During the year ended December 31, 2020, various testing and quality control procedures were conducted on the materials manufactured in 2019 and 2020 to ensure materials met all expected quality requirements. Beginning in May 2020, we launched manufacturing for three additional molecules as well as larger cGMP production runs of the internally-developed affinity ligand used in our manufacturing process. During the year ended December 31, 2021, the Company completed necessary procedures to release clinical materials for HCW9218. Additionally, the Company conducted several manufacturing activities for HCW9302, including initiating the master cell bank characterization, effecting a technology transfer to our contract manufacturer, performing a 200-liter cGMP production run, as well as other testing procedures.

Expenses associated with preclinical activities increased by $819,246, or 69%, from $1.2 million for the year ended December 31, 2020 to $2.0 million for the year ended December 31, 2021. The increase is due primarily to an increase in expenses for the toxicology studies for HCW9218 required to prepare for submission of our IND to evaluate HCW9218 in a pancreatic cancer trial, and toxicology studies for HCW9302, which is a multi-dose nonhuman primate toxicology study that began in the second half of 2021 and is expected to be completed in the second half of 2022. Upon completion of IND-enabling activities, we intend to submit an IND for a Phase 1b clinical trial to evaluate HCW9302 in alopecia areata.

Expenses associated with clinical trials including professional fees related to regulatory filings, increased by $14,706, or 6%, from $234,498 for the year ended December 31, 2020 to $249,204 for the year ended December 31, 2021. The Company expects to initiate two clinical trials for cancer indications in the first half of 2022. One of these trials is a Phase 1b, Company-sponsored study to evaluate HCW9218 in advanced pancreatic cancer. The other is a Phase 1 clinical trial sponsored by the Masonic Cancer Center at University of Minnesota to evaluate HCW9218 in solid tumors, such as breast, ovarian, prostate, and colorectal cancers. As we

advance our product candidates through clinical development, we expect our clinical trial expenses to increase significantly, as we conduct larger, later-stage clinical trials and expand the number of indications we advance in clinical development.

Other expenses consist primarily of direct depreciation costs for laboratory equipment, an allocation for rent expense, repairs and maintenance, as well as general office furniture and supplies. The increase from the year ended December 31, 2020 to the year ended December 31, 2021 is primarily attributable to an increase in repairs and maintenance, office equipment, and rent expense, offset by a decrease in depreciation expense.

General and Administrative Expenses

The following table summarizes our general and administrative expense for the years ended December 31, 2020 and 2021:

	Year Ended December 31,			
	2020	2021	$ Change	% Change
Salaries, benefits and related expenses	$ 1,492,382	$ 2,341,807	$ 849,425	57%
Professional services	447,093	1,263,270	816,177	183%
Facilities and office expenses	243,241	308,741	65,500	27%
Depreciation	233,039	218,466	(14,573)	-6%
Rent expense	100,972	100,457	(515)	-1%
Other expenses	152,321	961,469	809,148	531%
Total general and administrative expenses	**$ 2,669,048**	**$ 5,194,210**	**$ 2,525,162**	**95%**

General and administrative expenses increased by $2.5 million, or 95%, from $2.7 million for the year ended December 31, 2020 to $5.2 million for the year ended December 31, 2021. The increase is attributable primarily to an increase in salaries, benefits and related expenses, professional services fees, and other expenses.

Salaries, benefits and related expenses increased $849,425, or 57%, from $1.5 million for the year ended December 31, 2020 to $2.3 million for the year ended December 31, 2021. The increase is attributable primarily to an increase of $367,750 for performance-based bonuses paid upon the successful completion of the Wugen License and the IPO and an increase of $323,453 in stock-based compensation expense. Professional services increased primarily due to legal services required for patent filings and advisories fees paid for investor relations services. Other expenses increase is primarily due to an increase in insurance premiums.

We expect to incur increasing general and administrative expenses as a result of operating as a public company, including expenses for SEC reporting, investor relations, additional insurance requirements, and other administrative expenses. We expect to increase our administrative function to support the growth in our business and public company reporting requirements.

Interest and Other Income, Net

For the years ended December 31, 2020 and 2021, other income (expense), net increased by $483,042 primarily due to the forgiveness of the SBA Paycheck Protection Loan and accrued interest.

Liquidity and Capital Resources

Sources of Liquidity

Since inception, we have funded our operations primarily from the issuance of redeemable preferred stock and our IPO. From our inception in 2018 to July 19, 2021, the effective date of our IPO, we raised net proceeds of approximately $85.4 million, including $49.2 million of net proceeds from the IPO.

Based on our existing business plan, we believe that our existing cash, cash equivalents and investments will be sufficient to fund our anticipated operating expenses through the end of 2023.

We have based our projections of operation expenses and capital expenditure requirements on assumptions that may prove to be incorrect, and we may use all of our available capital sooner than we expect. Because of the numerous risks and uncertainties associated with the clinical development and commercialization of immunotherapeutics, we are unable to estimate the exact amount of capital requirements to pursue these activities. Our funding requirements will depend on many factors, including, but not limited to:

- Timing, progress, costs, and results of our ongoing preclinical studies and clinical trials of our immunotherapeutic products;
- Impact of COVID-19 on the timing and progress of our clinical trials and our ability to identify and enroll patients;
- Costs, timing, and outcome of regulatory review of our product candidates;
- Number of trials required for regulatory approval;
- Whether we enter into any collaboration or co-development agreements and the terms of such agreements;
- Effect of competing technology and market developments;
- Cost of maintaining, expanding, and enforcing our intellectual property rights; and
- Costs and timing of future commercialization activities, including product manufacturing, marketing, sales, and distribution, for any of our product candidates for which we receive regulatory approval.

A change in the outcome of any of these or other factors with respect to the clinical development and commercialization of our product candidates could significantly change the costs and timing associated with the development of that product candidate. Further, our operating plan may change, and we may need additional funds to meet operational needs and capital requirements for clinical trials and other research and development expenditures.

If we raise additional funds by issuing equity securities, our stockholders will experience dilution. Any future debt financing into which we enter may impose upon us additional covenants that restrict our operations, including limitations on our ability to incur liens or additional debt, pay dividends, repurchase our common stock, make certain investments and engage in certain merger, consolidation or asset sale transactions. Any debt financing or additional equity that we raise may contain terms that are not favorable to us or our stockholders. If we are unable to raise additional funds when needed, we may be required to delay, reduce, or terminate some or all of our development programs and clinical trials. We may also be required to sell or license to others rights to our drug candidates in certain territories or indications that we would prefer to develop and commercialize ourselves.

Summary of Statements of Cash Flows

The following table summarizes our cash flows for the years ended December 31, 2020 and 2021:

	Years Ended December 31,	
	2020	2021
Cash used in operating activities	$ (10,431,326)	$ (11,041,749)
Cash used in investing activities	(186,682)	(34,952,883)
Cash provided by financing activities	11,718,008	49,269,475
Net increase in cash and cash equivalents	**$ 1,100,000**	**$ 3,274,843**

Operating Activities

Net cash used in operating activities was $10.4 million for the year ended December 31, 2020 and $11.0 million for the year ended December 31, 2021.

Cash used in operating activities for the year ended December 31, 2020 consisted primarily of net loss for the period of $5.8 million and an increase in Accounts receivable of $2.5 million pursuant to the Wugen License, partially offset by $595,911 of depreciation and amortization.

Cash used in operating activities for the year ended December 31, 2021 consisted primarily of net loss for the period of $12.9 million, a gain on extinguishment of debt of $567,311, and an increase in Prepaid expenses and other assets of $2.8 million, primarily offset by an decrease of $2.4 million in Accounts receivable, an increase of $1.9 million in Accounts payable and other liabilities, and $595,765 of depreciation and amortization.

Investing Activities

For the year ended December 31, 2020, the cash used in investing activities reflects the purchase of laboratory equipment and general office equipment.

For the year ended December 31, 2021, cash used in investing activities reflects the purchase of U.S. government-backed securities with the proceeds of our IPO and the purchase of laboratory equipment and general office equipment. As of December 31, 2021, we held $34.9 million in U.S. government-backed securities.

Financing Activities

For the year ended December 31, 2020, cash provided by financing activities was $11.7 million, consisting of an increase of $11.1 million from proceeds from the issuance of Series C redeemable preferred stock and an increase of $563,590 from proceeds from an SBA Paycheck Protection Loan.

For the year ended December 31, 2021, cash provided by financing activities was $49.3 million, consisting primarily of net proceeds of $49.2 million from our IPO.

Contractual Obligations and Commitments

As of December 31, 2021, we had $36,000 of obligations for the two months remaining in the lease terms for a non-cancellable operating lease agreement and a short-term sublease agreement related to our facilities in Miramar, Florida. On February 25, 2022, HCW Biologics was assigned all rights, title, and interest in the primary lease which underlies the sublease. Effective March 1, 2022, we entered into a lease extension for our current location for a period of two years. Total contractual obligations under the lease extension are $339,300, all of which are due by February 29, 2024.

The Company has commitments with a third-party manufacturing organization to supply us with clinical grade materials. As of December 31, 2021, we are under contract for obligations of $2.5 million that we expect to pay during the two years ending December 31, 2023.

In the normal course of business, we enter into contracts for non-clinical studies, preclinical testing, and other services and products. These contracts generally provide for termination following a certain period after notice and therefore we believe that our non-cancellable obligations under these agreements are not material.

Critical Accounting Policies, Significant Judgements and Use of Estimates

The financial statements are prepared in conformity with accounting principles generally accepted in the United States ("U.S. GAAP"), which requires the use of estimates, judgments and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses in the periods presented. Our estimates are based on our historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgements about the carrying value of assets and liabilities that are not readily apparent from other sources. We believe the accounting estimates employed are appropriate and the resulting balances are reasonable; however, due to the inherent uncertainties in developing estimates, actual results could differ from the original estimates, requiring adjustments to these balances in future periods. Refer to Note 1 to our financial statements for our significant accounting policies related to our critical accounting estimates.

We believe that the accounting policies discussed below are critical to understanding our historical and future performance, as these policies relate to the more significant areas involving management's judgements and estimates.

Revenue Recognition

For the year ended December 31, 2020, we adopted provisions of the Financial Accounting Standards Board ("FASB") Accounting Standards Codification ("ASC") 606, Revenue from Contracts with Customers ("Topic 606"). Under Topic 606, we recognize revenue when our customer obtains control of promised goods or services, in an amount that reflects the consideration which we expect to receive in exchange for those goods or services. To determine the appropriate amount of revenue to be recognized for arrangements determined to be within the scope of Topic 606, we perform the following five steps: (i) identification of the contract(s) with the customer, (ii) identification of the promised goods or services in the contract and determination of whether the promised goods or services are performance obligations, (iii) measurement of the transaction price, (iv) allocation of the transaction price to the performance obligations, and (v) recognition of revenue when (or as) we satisfy each performance obligation. We only apply the five-step model to contracts when it is probable that we will collect the consideration we are entitled to in exchange for the goods or services we transfer to our customer. Refer to Note 1 to our financial statements for our significant accounting policies related to revenue recognition.

Fair Value Measurements

Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. FASB ASC Topic 820, Fair Value Measurements and Disclosures, establishes a fair value hierarchy for those instruments measured at fair value that distinguishes between fair value measurements based on market data (observable inputs), and those based on our own assumptions (unobservable inputs). This hierarchy maximizes the use of observable inputs and minimizes the use of unobservable inputs. The three levels of inputs used to measure fair value are as follows:

- Level 1: Observable inputs such as quoted prices in active markets;
- Level 2: Inputs, other than the quoted prices in active markets, that are observable either directly or indirectly; and
- Level 3: Unobservable inputs in which there is little or no market data, which require a reporting entity to develop its own assumptions.

Fair Value

Under the Wugen License, we received shares of common stock of Wugen on the effective date of the Wugen License. We estimated that the fair value of the stock was $1.6 million. As the common stock of Wugen is not currently publicly traded, the fair value was determined based on inputs other than a public market price. We relied primarily on the most recent third-party financing completed by Wugen. In addition, we considered the results of a third-party valuation assessment. Since our ownership interest in Wugen is less than 20% and we do not have significant influence over the operations of Wugen, we account for these securities as a cost method investment. We will carry this investment at cost less impairment, adjusted for observable price changes in orderly transactions for an identical or similar investment of the same investee. We assess the investment each reporting period to determine if an impairment has occurred. In the event that a public market becomes available for the common stock of Wugen in the future and the shares become freely tradeable, we will recognize changes in fair value according to the market price in other income in the statements of operations.

Stock-based Compensation

As described in Note 1 and Note 10 to our audited financial statements which appear elsewhere in this Annual Report on Form 10-K, we maintain a stock-based compensation plan as a long-term incentive for employees, non-employees, and directors. The plan allows for grants of incentive stock options, non-qualified stock options, and other forms of equity awards. We have granted options with service-based and performance-based vesting conditions.

We measure our stock-based awards granted to employees and directors based on the estimated fair value of the option on the date of grant (grant date fair value) and recognize compensation expense over the vesting period. Compensation expense is recorded as either research and development or general and administrative expenses in the statements of operations based on the function to which the related services are provided. Forfeitures are accounted for as they occur. We estimate grant date fair value using the Black-Scholes option-pricing model.

For stock option grants with service-based vesting, stock-based compensation expense represents the portion of the grant date fair value of employee stock option grants recognized over the requisite service period of the awards on a straight-line basis, net of estimated forfeitures. For options that vest upon the achievement of performance milestones, the Company estimates fair value at the date of grant and compensation expense is recognized using the accelerated attribution method when it is determined that the performance criteria is probable of being met.

In determining the fair value of the stock-based awards, we use the Black-Scholes option-pricing model and assumptions discussed below. Each of these inputs is subjective and its determination generally requires significant judgment. These assumptions include, but are not limited to:

- *Fair Value of Common Stock*—Prior to our initial public offering, the estimated fair value of our common stock was determined by our board of directors as of the date of each option grant, with input from management, considering our most recently available third-party valuation of our common stock as well as our 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 to the date of the grant. Since the completion of our initial public offering on July 19, 2021, the fair value of each share of common stock underlying stock option grants is based the quoted market price on the primary stock exchange on which our common stock is traded on the day the stock award or option is granted.
- *Expected term*—The expected term of stock options is determined using the "simplified" method, whereby the expected life equals the arithmetic average of the vesting term and the original contractual term of the option due to the Company's lack of sufficient historical data.
- *Expected volatility*—Since there is no trading history for our common stock, the expected volatility was estimated based on the historical equity volatility for comparable publicly traded biotechnology companies. The comparable companies were chosen based on their similar size, stage in the life cycle or area of specialty.
- *Risk-free interest rate*—The risk-free interest rate is based on the U.S. Treasury Bond in effect at the time of grant for periods corresponding with the expected term of the exit event.
- *Dividend yield*—The expected dividend yield is 0% because the Company has not historically paid, and does not expect, for the foreseeable future, to pay a dividend on its common stock.

Determination of the Fair Value of Our Common Stock

Until July 19, 2021 when our IPO was effective, there was no public market for our common stock historically. Prior to this offering, our board of directors considered various objective and subjective factors to determine the fair value of our common stock as of each grant date, which may be as a date later than the most recent third-party valuation date, including:

- results of third-party valuations performed in accordance with the guidance outlined in the American Institute of Certified Public Accountants' Accounting Practice Aid entitled, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation;*
- the prices at which we sold shares of redeemable preferred stock and the superior rights and preferences of the redeemable preferred stock relative to our common stock at the time of each grant;
- the progress of our research and development programs, including the status of preclinical and planned clinical trials for our product candidates;
- our stage of development and commercialization and our business strategy;
- external market conditions affecting the biotechnology industry, and trends within the biotechnology industry;
- our financial position, including cash on hand, and our historical and forecasted performance and operating results;
- the lack of an active public market for our common stock and our redeemable preferred stock;
- the likelihood of achieving a liquidity event, such as an IPO, or a sale of our company considering prevailing market conditions; and
- the analysis of IPOs and the market performance of similar companies in the biopharmaceutical industry.

For financial reporting purposes, it is our policy to perform a contemporaneous valuation when a material number of stock awards or options are granted. As a private company, we relied primarily on the evidence of third-party financings to support valuation of common stock. The assumptions underlying these valuations represent management's best estimates, which involve inherent uncertainties and the application of management judgment. As a result, if factors or expected outcomes change, and we use significantly different assumptions or estimates, our stock-based compensation expense could be materially different.

Now that we have completed our IPO, our board of directors determines the fair value of each share of underlying common stock based on its closing price as reported on the date of grant according to the quoted market price on the primary stock exchange on which our common stock is traded.

Income Taxes

We recognize deferred income taxes for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax basis and operating loss and tax credit carryforwards. In evaluating our valuation allowance, we consider all available positive and negative evidence, including scheduled reversals of deferred tax liabilities, projected future taxable income, tax planning strategies, and recent financial performance. Due to our lack of earnings history and uncertainties surrounding our ability to generate future taxable income, the net deferred tax assets have been fully offset by a valuation allowance.

As of December 31, 2020 and 2021, we had available federal net operating loss ("NOL") carryforwards of $14.8 million and $26.1 million, respectively. We also had available state NOLs carryforwards of approximately $15.2 million and $26.8 million, as of December 31, 2020 and 2021, respectively. The federal and state NOLs will carryforward indefinitely. Federal NOLs are available to offset up to 100% of taxable income for tax years before 2021, and state NOLs are available to offset 80% of taxable income for tax years starting after 2020.

Under Sections 382 and 383 of the Code, substantial changes in our ownership may limit the amount of NOL and research and development credit carryforwards that could be used annually in the future to offset taxable income. The tax benefits related to future utilization of federal and state NOL carryforwards, credit carryforwards, and other deferred tax assets may be limited or lost if cumulative changes in ownership exceeds 50% within any three-year period. We have not completed a Section 382/383 analysis under the Code regarding the limitation of NOL and credit carryforwards. If a change in ownership were to have occurred, the annual limitation may result in the expiration of NOL carryforwards and credits before utilization.

We record unrecognized tax benefits as liabilities or reduce the underlying tax attribute, as applicable, and adjust them when our judgment changes as a result of the evaluation of new information not previously available. Because of the complexity of some of these uncertainties, the ultimate resolution may result in a payment that is materially different from our current estimate of the unrecognized tax benefit liabilities. These differences will be reflected as increases or decreases to income tax expense in the period in which new information is available.

Recent Accounting Pronouncements

See Note 1 to our audited annual financial statements appearing elsewhere in this Annual Report on Form 10-K for more information about recent accounting pronouncements.

Emerging Growth Company and Smaller Reporting Status

As an emerging growth company, or EGC, under the JOBS Act, we may delay the adoption of certain accounting standards until such time as those standards apply to private companies. Other exemptions and reduced reporting requirements under the JOBS Act for EGCs include presentation of only two years of audited financial statements in a registration statement for an initial public offering, or IPO, an exemption from the requirement to provide an auditor's report on internal controls over financial reporting pursuant to Section 404(b) of the Sarbanes-Oxley Act of 2002, an exemption from any requirement that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation, and less extensive disclosure about our executive compensation arrangements.

We may remain classified as an EGC until the end of the fiscal year until December 31, 2026, although if the market value of our common stock that is held by non-affiliates exceeds $700 million as of any June 30 before that time or if we have annual gross revenues of $1.07 billion or more in any fiscal year, we would cease to be an emerging growth company as of December 31 of the applicable year. We also would cease to be an EGC if we issue more than $1 billion of non-convertible debt over a three-year period.

We are also a "smaller reporting company," as defined in Rule 12b-2 under the Exchange Act. Similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations, such as an ability to provide simplified executive compensation information and only two years of audited financial statements in an annual report on Form 10-K, with correspondingly reduced "Management's Discussion and Analysis of Financial Condition and Results of Operations" disclosure.

Item 7A Quantitative and Qualitative Disclosures About Market Risk.

We are a smaller reporting company, as defined by Rule 12b-2 under the Exchange Act and are not required to provide the information under this item.

Item 8 Financial Statements and Supplementary Data.

HCW Biologics Inc.
Index to Financial Statements

Years ended December 31, 2020 and 2021

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Shareholders
HCW Biologics Inc.

Opinion on the financial statements

We have audited the accompanying balance sheets of HCW Biologics Inc. (the "Company") as of December 31, 2021 and 2020, and the related statements of operations, changes in redeemable preferred stock and stockholders' (deficit) equity, and cash flows for the years then ended, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2021, in conformity with accounting principles generally accepted in the United States of America.

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/ GRANT THORNTON LLP

We have served as the Company's auditor since 2019.

Miami, FL
March 29, 2022

HCW Biologics Inc.
Balance Sheets

	December 31,	
	2020	2021
ASSETS		
Current assets:		
Cash and cash equivalents	$ 8,455,834	$ 11,730,677
Short-term investments	—	24,983,520
Accounts receivable, net	2,500,000	133,000
Prepaid expenses	538,306	2,196,557
Other current assets	654,528	1,436,617
Total current assets	12,148,668	40,480,371
Investments	1,599,750	11,522,050
Property and equipment, net	1,615,426	1,119,090
Other assets	34,242	393,318
Total assets	$ 15,398,086	$ 53,514,829
LIABILITIES, REDEEMABLE PREFERRED STOCK AND STOCKHOLDERS' (DEFICIT) EQUITY		
Liabilities		
Current liabilities:		
Accounts payable	$ 155,343	$ 223,664
Accrued liabilities and other current liabilities	845,741	2,097,925
Total current liabilities	1,001,084	2,321,589
Commitments and contingencies (Note 14)		
Redeemable preferred stock:		
Series A, $0.0001 par value; 14,738,948 shares authorized and 6,316,691 shares issued at December 31, 2020; nil shares authorized or issued at December 31, 2021	6,140,792	—
Series B, $0.0001 par value; 28,029,449 shares authorized and 12,012,617 shares issued at December 31, 2020; nil shares authorized or issued at December 31, 2021	13,680,306	—
Series C, $0.0001 par value; 18,181,818 shares authorized and 5,439,112 shares issued at December 31, 2020; nil shares authorized or issued at December 31, 2021	11,294,301	—
Total redeemable preferred stock	31,115,399	—
Stockholders' (deficit) equity:		
Common stock:		
Class B convertible, $0.0001 par value; 10,000,000 shares authorized and 4,285,714 shares issued at December 31, 2020; nil shares authorized or issued at December 31, 2021	429	—
Common, $0.0001 par value; 74,950,215 shares authorized and 507,680 shares issued at December 31, 2020; 250,000,000 shares authorized and 35,768,264 shares issued at December 31, 2021	51	3,577
Additional paid-in capital	—	81,827,006
Accumulated deficit	(16,718,877)	(30,637,343)
Total stockholders' (deficit) equity	(16,718,397)	51,193,240
Total liabilities, redeemable preferred stock and stockholders' (deficit) equity	$ 15,398,086	$ 53,514,829

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

HCW Biologics Inc.
Statements of Operations

	Years Ended December 31,	
	2020	2021
Revenues:		
Revenues	$ 4,099,750	$ —
Total revenues	4,099,750	—
Operating expenses:		
Research and development	7,255,227	8,173,624
General and administrative	2,669,048	5,194,210
Total operating expenses	9,924,275	13,367,834
Loss from operations	(5,824,525)	(13,367,834)
Interest and other income, net	22,324	505,366
Net loss	$ (5,802,201)	$ (12,862,468)
Less: cumulative preferred dividends earned in the period, net of forfeitures	(1,271,675)	—
Net loss available for distribution to common stockholders	$ (7,073,876)	$ (12,862,468)
Net loss per share, basic and diluted	$ (1.49)	$ (0.69)
Weighted average shares outstanding, basic and diluted	4,739,285	18,770,935

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

HCW Biologics Inc.
Statements of Changes in Redeemable Preferred Stock and Stockholders' (Deficit) Equity

	Redeemable Preferred Stock						Stockholders' Deficit				
	Series A		Series B		Series C		Common Stock		Additional Paid-In	Accumulated	Total Stockholders'
	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount	Capital	Deficit	(Deficit) Equity
Balance, December 31, 2019	6,316,691	$ 5,792,302	12,012,617	$ 12,883,859	—	$ —	4,717,542	$ 472	$ —	$ (9,676,766)	$ (9,676,294)
Issuance of Class A Common Stock upon exercise of stock options	—	—	—	—	—	—	75,851	8	9,895	—	9,903
Issuance of Series C Redeemable Preferred Stock, net of issuance costs	—	—	—	—	5,439,112	11,144,520	—	—	—	—	—
Stock-based compensation	—	—	—	—	—	—	—	—	21,871	—	21,871
6% cumulative dividends on redeemable preferred stock	—	348,490	—	776,804	—	146,381	—	—	(31,766)	(1,239,910)	(1,271,676)
Accretion of issuance costs	—	—	—	19,643	—	3,400	—	—	—	—	—
Net loss	—	—	—	—	—	—	—	—	—	(5,802,201)	(5,802,201)
Balance, December 31, 2020	**6,316,691**	**$ 6,140,792**	**12,012,617**	**$ 13,680,306**	**5,439,112**	**$ 11,294,301**	**4,793,393**	**$ 480**	**$ —**	**$ (16,718,877)**	**$ (16,718,397)**
Issuance of Class A Common Stock upon exercise of stock options	—	—	—	—	—	—	206,455	20	29,517	—	29,537
6% cumulative dividends on redeemable preferred stock	—	193,050	—	430,319	—	336,651	—	—	(33,053)	(926,966)	(960,019)
Accretion of issuance costs	—	—	—	7,858	—	20,398	—	—	—	—	—
Issuance of common stock upon initial public offering, net of issuance cost	—	—	—	—	—	—	7,000,000	700	49,239,247	—	49,239,947
Conversion of Series A Redeemable Preferred Stock, with forfeited cumulative dividends	(6,316,691)	(6,333,842)	—	—	—	—	6,316,691	632	6,353,474	(20,265)	6,333,841
Conversion of Series B Redeemable Preferred Stock, with forfeited cumulative dividends	—	—	(12,012,617)	(14,118,483)	—	—	12,012,613	1,201	14,170,312	(53,030)	14,118,483
Conversion of Series C Redeemable Preferred Stock, with forfeited cumulative dividends	—	—	—	—	(5,439,112)	(11,651,350)	5,439,112	544	11,706,534	(55,737)	11,651,341
Stock-based compensation	—	—	—	—	—	—	—	—	360,975	—	360,975
Net loss	—	—	—	—	—	—	—	—	—	(12,862,468)	(12,862,468)
Balance, December 31, 2021	**—**	**$ —**	**—**	**$ —**	**—**	**$ —**	**35,768,264**	**$ 3,577**	**$ 81,827,006**	**$ (30,637,343)**	**$ 51,193,240**

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

HCW Biologics Inc.
Statements of Cash Flows

	Years Ended December 31,	
	2020	**2021**
Cash flows from operating activities:		
Net loss	$ (5,802,201)	$ (12,862,468)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	572,868	543,598
Stock-based compensation	21,875	360,975
Gain on extinguishment of debt	—	(567,311)
Unrealized gain (loss) on investments, net	—	65,832
Accretion of issuance costs	23,043	28,256
Changes in operating assets and liabilities:		
Accounts receivable	(2,500,000)	2,367,000
Prepaid expenses and other assets	(2,118,264)	(2,799,415)
Accounts payable and other liabilities	(628,647)	1,887,816
Net cash used in operating activities	(10,431,326)	(10,975,717)
Cash flows from investing activities:		
Purchases of property and equipment	(186,682)	(47,263)
Purchases of short-term investments	—	(24,987,277)
Purchases of long-term investments	—	(9,984,375)
Net cash used in investing activities	(186,682)	(35,018,915)
Cash flows from financing activities:		
Proceeds from PPP loan	563,590	—
Proceeds from the sale of Series C Preferred Stock	11,144,520	—
Proceeds from initial public offering	—	56,000,000
Issuance costs of initial public offering	—	(6,760,053)
Proceeds from issuance of common stock	9,898	29,528
Net cash provided by financing activities	11,718,008	49,269,475
Net changes in cash and cash equivalents	1,100,000	3,274,843
Cash and cash equivalents at the beginning of the period	7,355,834	8,455,834
Cash and cash equivalents at the end of the period	$ 8,455,834	$ 11,730,677
Non-cash operating, investing and financing activities:		
In-kind payment for license fee	$ 1,599,750	$ —
Cumulative dividends earned, accrued and forfeited in the reporting period	$ 1,271,676	$ —
Forfeiture of cumulative dividends, upon conversion of Preferred Stock	$ —	$ 2,822,081
PPP loan forgiveness	$ —	$ 567,311

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

1. Organization and Summary of Significant Accounting Policies

Organization

HCW Biologics Inc. (the "Company") is a biopharmaceutical company focused on discovering and developing novel immunotherapies to lengthen health span by disrupting the link between chronic, low-grade inflammation and age-related diseases. The Company believes age-related low-grade chronic inflammation, or "inflammaging," is a significant contributing factor to several chronic diseases and conditions, such as cancer, cardiovascular disease, diabetes, neurodegenerative diseases, and autoimmune diseases. The Company is located in Miramar, Florida and was incorporated in the state of Delaware in April 2018.

Reverse Stock Split

In June 2021, the Company's board of directors and stockholders approved an amendment to the Company's certificate of incorporation to effect a 3-for-7 reverse stock split for all issued and outstanding common stock, redeemable preferred stock, and stock options, that was effective on June 25, 2021 (the "Reverse Stock Split"). The number of authorized shares and the par values of the common stock and redeemable preferred stock were not adjusted as a result of the Reverse Stock Split. The accompanying financial statements and notes to the financial statements give retroactive effect to the Reverse Stock Split for all periods presented.

Liquidity

On December 24, 2020, the Company entered into the Exclusive Worldwide License Agreement with Wugen Inc. ("Wugen License"). As a result of this transaction, as of December 31, 2020 and 2021, the Company holds a minority interest in Wugen Inc. ("Wugen") carried at $1.6 million, the fair value on the effective date of the Wugen License. The underlying shares of common stock are not currently traded on any public market and thus have limited marketability. These shares were subject to an anti-dilution provision based on the terms of a subsequent financing. During the year ended December 31, 2021, the Company received additional shares in Wugen under the terms of the anti-dilution provision for no additional consideration. The Company deemed the additional shares to be a similar instrument to those shares already held. During the year ended December 31, 2021, the Company received cash payments of $2.5 million for amounts due under the terms of the Wugen License.

As of December 31, 2021, the Company had not generated any revenue from sales of its immunotherapeutic products. In the course of its development activities, the Company has sustained operating losses and expects to continue to incur operating losses for the foreseeable future. Since inception, substantially all the Company's activities have consisted of research, development, establishing large-scale cGMP production for clinical trials, and raising capital.

On July 19, 2021, the Company's registration statement on Form S-1 for its initial public offering ("IPO") was declared effective by the Securities and Exchange Commission (the "SEC"). On July 22, 2021, the Company closed its IPO with the sale of 7,000,000 shares of common stock, at a public offering price of $8.00 per share, resulting in net proceeds of approximately $49.2 million, after deducting underwriting discounts and commissions and estimated offering expenses paid by the Company. The IPO met the provisions for mandatory conversion of all shares of redeemable preferred stock according to the designations for these securities. As a result of the conversion, the Company issued 23,768,416 shares of common stock to the former holders of redeemable preferred stock. In addition, as a result of conditions for mandatory conversion, the Company was relieved of its obligation to pay $2.8 million in cumulative dividends that were accrued and unpaid on the conversion date.

As of December 31, 2021, the Company had cash and cash equivalents of $11.7 million, short-term investments of $25.0 million held in U.S. government-backed securities, and long-term investments of $9.9 million held in U.S. government-backed securities. Since inception to December 31, 2021, the Company incurred cumulative net losses of $27.9 million. Management expects to incur additional losses in the future to conduct product research and development and recognizes the need to raise additional capital to fully implement its business plan. The Company intends to raise capital through the issuance of additional equity financing, sale of investment, and/or third-party collaboration funding. However, if such financing is not available at adequate levels, the Company will need to reevaluate its operating plan and may be required to delay the development of some of its products. The Company expects its cash and cash equivalents and current and long-term investments in government-backed securities as of December 31, 2021 will be sufficient to fund operating expenses and capital expenditure requirements for a period of at least one year from the issuance date of the financial statements.

Summary of Significant Accounting Policies

Basis of Presentation

The accompanying financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America ("U.S. GAAP").

Segment Reporting

The Company has one operating segment. The Company's chief operating decision maker, its Chief Executive Officer, reviews financial information on an aggregate basis for allocating capital and evaluating performance.

Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts in the financial statements and accompanying notes. Management must apply significant judgment in this process. The Company evaluates its estimates and assumptions on an ongoing basis using historical experience and other factors and adjusts those estimates and assumptions when facts and circumstances dictate. Actual results could differ from estimates.

Cash and Cash Equivalents

Cash and cash equivalents consist of demand deposits at financial institutions, money market funds, and highly liquid investments with original maturities of three months or less.

Fair Value Measurements

Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Financial Accounting Standards Board ("FASB") Accounting Standards Codification ("ASC") 820, *Fair Value Measurement* ("Topic 820"), establishes a fair value hierarchy for those instruments measured at fair value that distinguishes between fair value measurements based on market data (observable inputs) and those based on the Company's own assumptions (unobservable inputs). This hierarchy maximizes the use of observable inputs and minimizes the use of unobservable inputs. The three levels of inputs used to measure fair value are as follows:

Level 1: Observable inputs such as quoted prices in active markets;

Level 2: Inputs, other than the quoted prices in active markets, that are observable either directly or indirectly; and

Level 3: Unobservable inputs in which there is little or no market data, which require a reporting entity to develop its own assumptions.

Fair value measurements are classified based on the lowest level of input that is significant to the measurement. The Company's assessment of the significance of a particular input to the fair value measurement requires judgment, which may affect the valuation of the assets and liabilities and their placement within the fair value hierarchy levels. The determination of the fair values, as disclosed in Note 3, takes into account the market for the Company's financial assets and liabilities, the associated credit risk, and other factors as required. The Company considers active markets as those in which transactions for the assets or liabilities occur in sufficient frequency and volume to provide pricing information on an ongoing basis.

Concentration of Credit Risk and Other Risks and Uncertainties

Financial instruments that potentially subject the Company to concentrations of credit risk primarily consist of cash, cash equivalents, accounts receivable, and investments. The Company's cash and cash equivalents are deposited in accounts with financial institutions that management believes are of high credit quality. Such deposits may, at times, exceed federally insured limits. The Company has not experienced any losses on its deposits of cash and cash equivalents.

Currently all of the Company's revenues are derived from the Wugen License. For the year ended December 31, 2020, the Company recognized revenues of $4.1 million, $1.6 million of which was consideration received in the form of shares of Wugen common stock. These shares have limited marketability, and there was no public market on which to trade these shares as of December 31, 2021. As of December 31, 2021, the Company received cash payments of $1.8 million for the sale of research and clinical-grade material, which are currently recognized as deferred revenue on the accompanying balance sheet since the criteria for revenue recognition have not been met.

The Company is highly dependent on a third-party manufacturer to supply drug products for its research and development activities of its programs, including clinical and non-clinical studies. These programs could be adversely affected by a significant interruption in the supply of such drug products. The Company has no off-balance sheet concentrations of credit risk, such as foreign currency exchange contracts, option contracts or other hedging arrangements.

Property and Equipment, Net

Property and equipment is stated at cost less accumulated depreciation. Depreciation expense is calculated using the straight-line method over the estimated useful lives of the assets, which range from 3 to 7 years. Leasehold improvements are amortized on a straight-line method over the shorter of the useful life of the leasehold improvement or the term of the lease. Upon retirement or sale of the assets, the cost and related accumulated depreciation and amortization are removed from the accompanying balance sheets and the resulting gain or loss is recorded to the statements of operations. Repairs and maintenance are expensed as incurred.

Impairment of Long-Lived Assets

Long-lived assets are reviewed for indications of possible impairment whenever events or changes in circumstances indicate that the carrying value of an asset may not be recoverable. Recoverability is measured by comparison of the carrying amounts to the future undiscounted cash flows attributable to these assets. An impairment loss is recognized to the extent an asset group is not recoverable, and the carrying amount exceeds the projected discounted future cash flows arising from these assets. Impairment losses, if any, are recognized in earnings. There were no impairment losses for any of the periods presented.

Redeemable Preferred Stock

The Company applied the relevant accounting standards to distinguish liabilities from equity when we assessed the classification and measurement of preferred stock. Preferred Stock subject to mandatory redemptions was considered a liability and measured at fair value. Conditionally redeemable preferred stock issued by the Company was considered mezzanine or temporary equity and presented outside of the equity section of the accompanying balance sheet as of December 31, 2020.

Cumulative Dividends on Preferred Stock

The Company’s Preferred Stock earned a 6% cumulative dividend that compounded annually, whether or not declared by the Board of Directors. The Company considered cumulative dividends a legal obligation that should be recognized and accrued until such time as the dividends were declared and paid or liquidation occurred.

If Preferred Stock was classified as other than equity, this obligation was presented within Redeemable preferred stock. If Preferred Stock was included within equity, this obligation was treated as a long-term liability and presented within other liabilities in the accompanying balance sheet. As of December 31, 2020, all of the Company’s Preferred Stock was classified as other than equity, or mezzanine equity. Holders of Preferred Stock earned cumulative dividends beginning on June 7, 2019, with the original issuance of Series B Preferred Stock. During the year ended December 31, 2020, Series A Preferred Stock earned $348,490 in cumulative dividends; Series B Preferred Stock earned $776,804 in cumulative dividends; and Series C Preferred Stock earned $146,381 in cumulative dividends. Upon the IPO, all of the Company’s preferred stock converted to common stock. At that time, Series A Preferred Stock forfeited $753,307 of cumulative dividends; Series B Preferred Stock forfeited $1,550,403 of cumulative dividends; and Series C Preferred Stock forfeited $518,371 of cumulative dividends. No dividends were declared as of the conversion date.

Collaborative Arrangements

When the Company enters into collaboration arrangements, it assesses whether the arrangements fall within the scope of FASB issued ASC 808, *Collaborative Arrangements,* based on whether the arrangements involve joint operating activities and whether both parties have active participation in the arrangement and are exposed to significant risks and rewards. If the payments from the collaboration partner to the Company represent consideration from a customer, such as license fees and contract research and development activities, the Company accounts for those payments within the scope of FASB issued ASC 606, *Revenue from Contracts with Customers* ("Topic 606"). However, if the Company concludes that the payments are not from a customer, for certain activities and associated payments, such as for certain collaborative research, development, manufacturing, and commercial activities, these payments are presented as a reduction of research and development expense or general and administrative expense, based on where the Company presents the underlying expense.

Revenue Recognition

The Company recognizes revenue when its customer or collaborator obtains control of promised goods or services, in an amount that reflects the consideration which the Company expects to receive in exchange for those goods or services.

To determine revenue recognition for arrangements that are within the scope of Topic 606, it performs the following five steps:

i. identify the contract(s) with a customer;

ii. identify the performance obligations in the contract;

iii. determine the transaction price;

iv. allocate the transaction price to the performance obligations within the contract; and

v. recognize revenue when (or as) the entity satisfies a performance obligation.

At contract inception, once the contract is determined to be within the scope of Topic 606 and it is probable of collection, the Company assesses the goods or services promised within the contract to determine whether each promised good or service is a performance obligation. The promised goods or services in the Company's arrangements may consist of a license, or options to license, the Company's intellectual property and research, development, and manufacturing services. The Company may provide options to additional items in such arrangements, which are accounted for as separate contracts when the customer elects to exercise such options, unless the option provides a material right to the customer. Performance obligations are promises in a contract to transfer a distinct good or service to the customer that (i) the customer can benefit from on its own or together with other readily available resources, and (ii) is separately identifiable from other promises in the contract. Goods or services that are not individually distinct performance obligations are combined with other promised goods or services until such combined group of promises meet the requirements of a performance obligation.

The Company determines the transaction price based on the amount of consideration the Company expects to receive for transferring the promised goods or services in the contract. Consideration may be fixed, variable, or a combination of both. At contract inception for arrangements that include variable consideration, the Company estimates the probability and extent of consideration it expects to receive under the contract utilizing either the most likely amount method or expected amount method, whichever best estimates the amount expected to be received. The Company then considers any constraints on the variable consideration and includes in the transaction price variable consideration to the extent it is deemed probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is subsequently resolved.

The Company then allocates the transaction price to each performance obligation based on the relative standalone selling price and recognizes as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) control is transferred to the customer and the performance obligation is satisfied. For performance obligations which consist of licenses and other promises, the Company utilizes judgment to assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, the appropriate method of measuring progress. The Company evaluates the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition.

The Company records amounts as accounts receivable when the right to consideration is deemed unconditional. When consideration is received, or such consideration is unconditionally due, from a customer prior to transferring goods or services to the customer under the terms of a contract, a contract liability is recorded as deferred revenue.

Deferred Revenue

Deferred revenue represents amounts billed, or in certain cases, yet to be billed to the Company's customer for which the related revenues have not been recognized because one or more of the revenue recognition criteria have not been met. The current portion of deferred revenue represents the amount to be recognized within one year from the balance sheet date based on the estimated performance period of the underlying performance obligations. As December 31, 2021, current deferred revenue includes amounts of $1.8 million allocated to the development supply agreement performance obligation under the Wugen License that is included within Accrued liabilities and other current liabilities.

Investments

The Company holds a minority interest in Wugen. The underlying shares of common stock are not traded on any public market and thus have limited marketability. The Company does not have significant influence over the operating and financial policies of Wugen. As a result, the Company has accounted for this investment using the measurement alternative whereby the investment is recorded at cost less impairment, adjusted for observable price changes in orderly transactions for an identical or similar investment of the same investee. No impairment was recognized during the years ended December 31, 2020 and 2021.

The Company invests net proceeds of its IPO in bills and notes issued by the U.S. Treasury which are classified as trading securities. As of December 31, 2021, the Company holds, $25.0 million in U.S. Treasury bills included in Short-term investments and $9.9 million in U.S. Treasury notes included in Investments in the accompanying balance sheet.

Research and Development Expenses

Research and development costs are expensed as incurred and include salaries, benefits, and other operating costs such as outside services, supplies and allocated overhead expenses. The Company may perform research and development for its own proprietary drug candidates and technology development or for certain third parties under collaborative arrangements. For its proprietary drug candidates and its internal technology development programs, the Company invests its own funds without reimbursement from a third party. Where the Company performs research and development activities under a clinical joint development collaboration, it records the partner's share of collaboration expenses as a reduction to research and development expense when reimbursement amounts are due under the agreement.

The Company records an accrued expense for the estimated costs of its contract manufacturing activities performed by third parties. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows to vendors. Payments under the contracts include upfront payments and milestone payments, which depend on factors such as the achievement of the completion of certain stages of the manufacturing process. For purposes of recognizing expense, the Company assesses whether the production process is sufficiently defined to be considered the delivery of a good, as evidenced by predictive or contractually required yields in the production process, or the delivery of a service, where processes and yields are developing and less certain. If the Company considers the process to be the delivery of a good, the Company recognizes the expense when the drug product is delivered, or otherwise bears risk of loss. If the Company considers the process to be the delivery of a service, the expense is recognized based on its best estimates of the contract manufacturer's progress towards completion of the stages in the contracts. The Company recognizes and amortizes upfront payments and accrues for liabilities based on the specific terms of each arrangement. Arrangements may provide upfront payments for certain stages of the arrangement and milestone payments for the completion of certain stages, and, accordingly, may result in advance payments for services that have not been completed or goods not delivered and liabilities for stages where the contract manufacturer is entitled to a milestone payment.

Advance payments for goods or services that will be used or rendered for future research and development activities are capitalized as prepaid expenses and recognized as expense as the related goods are delivered or the related services are performed. The Company bases its estimates on the best information available at the time. However, additional information may become available to the Company which may allow it to make a more accurate estimate in future periods. In this event, the Company may be required to record adjustments to research and development expenses in future periods when the actual level of activity becomes more certain. Such increases or decreases in cost are generally considered to be changes in estimates and will be reflected in research and development expenses in the period identified.

Patent Costs

Costs related to filing and pursuing patent applications are recorded as general and administrative expenses in the accompanying statements of operations, and expensed as incurred since recoverability of such expenditures is uncertain.

Stock-based Compensation

The Company measures its stock-based awards granted to employees and directors based on the estimated fair value of the option on the date of grant (grant date fair value) and recognizes compensation expense over the vesting period. Compensation expense is recorded as either research and development or general and administrative expenses in the accompanying statements of operations based on the function to which the related services are provided. Forfeitures are accounted for as they occur. The Company has granted options with service-based and performance-based vesting conditions.

The Company uses the Black-Scholes option pricing model for the respective grant to determine the grant date fair value. The Black-Scholes option pricing model requires the input of highly subjective assumptions. These variables include, but are not limited to, its stock price volatility over the term of the awards and actual and projected employee stock option exercise behaviors. Management will continue to assess the assumptions and methodologies used to calculate the estimated grant date fair value of stock-based compensation. Circumstances may change and additional data may become available over time, which could result in changes to these assumptions and methodologies and materially impact the Company's grant date fair value determination.

For stock option grants with service-based vesting, stock-based compensation expense represents the portion of the grant date fair value of employee stock option grants recognized over the requisite service period of the awards on a straight-line basis, net of estimated forfeitures. For options that vest upon the achievement of performance milestones, the Company estimates fair value at the date of grant and compensation expense is recognized using the accelerated attribution method when it is determined that the performance criteria is probable of being met.

Deferred Offering Costs

The Company defers offering costs consisting of legal, accounting and other fees and costs directly attributable to its IPO. The deferred offering costs will be offset against the proceeds received upon the completion of the IPO. Deferred offering costs will be recorded under other non-current assets on the accompanying balance sheets. In the event the IPO is terminated, all of the deferred offering costs will be expensed within the Company's statements of operations. As of December 31, 2020, there were no deferred offering costs recorded on the accompanying balance sheets. As of December 31, 2021, deferred offering costs related to underwriting discounts and commissions and offering expenses of $6.8 million were offset against IPO proceeds upon the consummation of the IPO.

Income Taxes

The Company accounts for income taxes using an asset and liability approach in accordance with applicable guidance prescribed by FASB issued ASC 740, *Income Taxes* ("Topic 740"). Topic 740 requires that the deferred tax consequences of temporary differences between the amounts recorded in the financial statements and the amounts included in the federal and state income tax returns to be recognized in the balance sheet.

The Company makes judgments regarding the realizability of its deferred tax assets. The balance sheet carrying value of its deferred tax assets is based on whether the Company believes it is more likely than not that the Company will generate sufficient future taxable income to realize these deferred tax assets after consideration of all available evidence. The Company regularly reviews its deferred tax assets for recoverability considering historical profitability, projected future taxable income, the expected timing of the reversals of existing temporary differences and tax planning strategies. In assessing the need for a valuation allowance, the Company considers both positive and negative evidence related to the likelihood of realization of the deferred tax assets. The weight given to the positive and negative evidence is commensurate with the extent to which the evidence may be objectively verified. As such, it is generally difficult for positive evidence regarding projected future taxable income exclusive of reversing taxable temporary differences to outweigh objective negative evidence of recent financial reporting losses. Generally, cumulative loss in recent years is a significant piece of negative evidence that is difficult to overcome in determining that a valuation allowance is not needed.

The Company's tax positions may be subject to income tax audits. The Company recognizes the tax benefit of an uncertain tax position only if it is more likely than not that the position is sustainable upon examination by the taxing authority, based on the technical merits. The tax benefit recognized is measured as the largest amount of benefit which is more likely than not to be realized upon settlement with the taxing authority. The Company recognizes interest accrued and penalties related to unrecognized tax benefits in its tax provision. The Company evaluates uncertain tax positions on a regular basis. The evaluations are based on a number of factors, including changes in facts and circumstances, changes in tax law, correspondence with tax authorities during the course of the audit, and effective settlement of audit issues. The provision for income taxes includes the effects of any accruals that the Company believes are appropriate, as well as the related net interest and penalties.

Tax Credit Receivable

The Company is eligible for research and development credits for its research and development activities, in accordance with Internal Revenue Code ("I.R.C.") § 41(c). The credits are generally available to offset income tax liabilities. The Company has applied approximately $250,000 of research and development credits to offset its federal payroll tax expenses for both years ended December 31, 2020 and 2021, due to its small business status. As of December 31, 2020 and 2021, the current portion of outstanding payroll tax receivables is recorded in Other current assets in the accompanying balance sheets and the noncurrent portion is recorded in Other noncurrent assets.

Net Loss Per Share

Basic net loss per share is calculated by dividing the net loss attributable to common stockholders by the weighted-average number of common shares outstanding for the period, without consideration of potential dilutive securities. Diluted net loss per share is computed by dividing the net loss attributable to common stockholders by the sum of the weighted average number of common shares plus the potential dilutive effects of potential dilutive securities outstanding during the period. Potential dilutive securities are excluded from diluted earnings or loss per share if the effect of such inclusion is anti-dilutive. The Company's potentially dilutive securities, which include convertible redeemable preferred stock and outstanding stock options under the 2019 Equity Incentive Plan ("2019 Plan") and the 2021 Equity Incentive Plan ("2021 Plan"), have been excluded from the computation of diluted net loss per share as they would be anti-dilutive to the net loss per share. For all periods presented, there is no difference in the number of shares used to calculate basic and diluted shares outstanding due to the Company's net loss position.

Recently Issued Accounting Pronouncements

In June 2016, FASB issued Accounting Standards Update ("ASU") No. 2016-13, *Financial Instruments—Credit Losses: Measurement of Credit Losses on Financial Instruments*, as clarified in subsequent amendments to the initial guidance (collectively, "Topic 326"). Topic 326 requires measurement and recognition of expected credit losses for financial assets held at the reporting date based on historical experience, current conditions, and reasonable and supportable forecast. The Company adopted Topic 326 using a modified retrospective approach which requires a cumulative effect adjustment as of the beginning of the reporting period in which the guidance is adopted. Topic 326 is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2019, with early adoption permitted. The Company adopted Topic 326 effective January 1, 2020. The adoption did not have a material impact on our financial statements.

In February 2016, the FASB issued ASU No. 2016-02, Leases ("Topic 842"), which requires an entity to recognize assets and liabilities arising from a lease for both financing and operating leases. The ASU will also require new qualitative and quantitative disclosures to help investors and other financial statement users better understand the amount, timing, and uncertainty of cash flows arising from leases. Topic 842 is effective for the Company in the fiscal years beginning after December 15, 2021, with early adoption permitted. The Company will adopt Topic 842 for the fiscal year ended December 31, 2022. The Company plans to use a practical expedient provided by FASB, and it will not recast comparative periods to reflect the impact of the new lease standard. Effective March 1, 2022, the Company entered into a non-cancelable operating lease for its current location with a two-year term. This is the only lease in scope of Topic 842. The Company expects accounting for the new lease under Topic 842 will materially affect the reported amount of total assets and total liabilities within the balance sheet, but it does not expect a material impact to the statement of operations.

2. Property and Equipment, Net

Property and equipment, net consists of the following:

	At December 31,	
	2020	2021
Laboratory equipment	$ 1,924,596	$ 1,949,318
Office equipment	152,003	175,245
Furniture and fixtures	292,866	292,165
Leasehold improvements	349,976	349,976
	$ 2,719,441	$ 2,766,704
Less: Accumulated depreciation and amortization	(1,104,015)	(1,647,614)
Property and equipment, net	$ 1,615,426	$ 1,119,090

Depreciation and amortization expense for the year ended December 31, 2020 was $572,867 of which $362,892 is included in research and development expenses. Depreciation and amortization expense for the year ended December 31, 2021 was $543,598, of which $353,388 is included in research and development expenses.

3. Fair Value of Financial Instruments

The carrying amount of the Company's financial instruments, including cash and cash equivalents, accounts receivable, prepaid expenses and other current assets, U.S. government backed securities with maturity dates up to one year, accounts payable and accrued liabilities, approximate fair value due to their short-term maturities.

Money market funds included in cash and cash equivalents and U.S. government backed securities are measured at fair value based on quoted prices in active markets, which are considered Level 1 inputs. No transfers between levels occurred during the periods presented. The following table presents the Company's assets which were measured at fair value at December 31, 2020 and 2021:

	At December 31, 2020			
	Level 1	Level 2	Level 3	Total
Assets:				
Money market funds	$ 6,752,266	$ —	$ —	$ 6,752,266
Investment in Wugen	—	—	1,599,750	—
Total	$ 6,752,266	$ —	$ 1,599,750	$ 6,752,266

	At December 31, 2021			
	Level 1	Level 2	Level 3	Total
Assets:				
Money market funds	$ 9,506,499	$ —	$ —	$ 9,506,499
Treasury bills	24,983,520	—	—	24,983,520
Treasury notes	9,922,300	—	—	9,922,300
Total	$ 44,412,319	$ —	$ —	$ 44,412,319

4. Investments

As of December 31, 2020, Investments consisted of a balance of $1.6 million. In December 2020, the Company entered into the Wugen License for limited rights to develop, manufacture and commercialize cellular therapy products based on two of the Company's fusion protein molecules. As part of the consideration received for the Wugen License, the Company received shares of Wugen common stock, which were recognized at $1.6 million, the fair value of the securities as of December 24, 2020, the effective date for the Wugen License. Initial recognition was at fair value based on level 3 inputs, since there was no public market on which to trade these shares at the time they were received. The fair value was determined based primarily on the pricing and terms of a third-party financing completed by Wugen in 2020. So long as there continues to be no public market for these securities, the Company will classify this asset as a cost method investment, recorded at cost less impairment adjusted for observable market changes.

As of December 31, 2021, Investments had a balance of $11.5 million in the accompanying balance sheet, consisting of $1.6 million for the investment in Wugen, which the Company continues to carry at cost since no public market exists for these securities, and no impairment adjusted was necessary. In addition, Investments include $9.9 million in U.S. Treasury notes as of December 31, 2021. These securities are classified as trading securities.

5. Related Party Transactions

As of December 31, 2020, related parties held capital stock in the Company. The Company's Founder and Chief Executive Officer, Hing C. Wong, PhD., held all Class B Common Stock and Series A Preferred Stock issued by the Company. In addition, Dr. Wong purchased shares of Series B Preferred Stock and Series C Preferred Stock on the same terms and conditions for third-party investors. All shares of Preferred Shares held by Dr. Wong earned cumulative dividends.

During the year ended December 31, 2021, all shares purchased by Dr. Wong prior to the IPO were converted to common stock, and the Company was relieved of its obligation to pay cumulative dividends on Preferred Shares that were accrued and unpaid as of the conversion date. Dr. Wong purchased additional shares of the Company's common stock in the IPO and in the open market post IPO, in compliance with SEC regulations and the Company's insider trading policies.

6. Accrued Liabilities and Other Current Liabilities

In May 2020, the Company received an SBA Paycheck Protection Loan ("PPP loan") in the principal amount of $563,590. As of December 31, 2020, the Company had $845,741 of Accrued liabilities and other current liabilities, primarily consisting of the PPP loan of $567,311, including principal and accrued but unpaid interest, and accrued liabilities of $273,907.

As of December 31, 2021, the Company had a balance of $2.1 million in Accrued liabilities and other current liabilities, consisting of $1.8 million related to deferred revenue, $48,750 related to manufacturing materials, $51,000 related to legal fees, and $50,000 for other expenses. On January 8, 2021, the Company received full loan forgiveness of $567,311 for obligations related to the PPP loan. The Company accounted for the PPP loan as debt, and the loan forgiveness was accounted for as a debt extinguishment. The amount of loan and interest forgiven is recognized as a gain upon debt extinguishment and is reported within Interest and other income, net in the accompanying statement of operations for the year ended December 31, 2021.

7. License Agreement

On December 24, 2020, the Company entered into the Wugen License transferring rights to Wugen to develop, manufacture, and commercialize certain cellular therapy products based on two of the Company's fusion protein molecules. The term of the agreement will expire on a product-by-product and country-by-country basis, upon the later of (i) ten (10) years from the first commercial sale of the product or (ii) the expiration of the last-to-expire valid patent claim of such product.

The Company retained regulatory T cell-based cellular therapy, injectable rights, and manufacturing rights, not granted to Wugen under the terms of the Wugen License. The Company and Wugen will enter into two supply agreements under industry-standard terms, under which the Company will provide cGMP and non-cGMP grade materials, including a development supply agreement and a commercial supply agreement.

According to the terms of the agreement, Wugen will fund all future clinical development and commercialization activities for cellular therapy treatments for any indications utilizing the licensed fusion protein molecules covered by the Wugen License. In January 2021, two Phase 2 clinical trials related to treatment for relapsed / refractory acute myeloid leukemia based on one of the licensed molecules were initiated by the School of Medicine at Washington University in St. Louis and supported by Wugen.

The Company concluded that Wugen is a customer and the Wugen License is a functional license under the provisions of Topic 606. The Company identified the following performance obligations at the inception of the agreement:

- Provide Wugen with exclusive worldwide license rights for certain fusion proteins.
- Sell vials of HCW9201 clinical grade product available immediately.
- Transfer R&D know-how.
- Supply of cGMP and non-cGMP grade materials for development.

- Supply of cGMP grade materials for commercialization.

For the year ended December 31, 2020 the Company recognized $4.1 million for performance obligations satisfied in the period. This is the first time the Company has entered into an out-license arrangement and the first time the Company has established prices for its goods and services. Accordingly, the standalone selling price of the various performance obligations is uncertain, and the Company determined that an observable standalone selling price is not available for the identified performance obligations under the Wugen License. Where a standalone selling price is not directly observable, then the Company estimates the standalone selling price considering marketing conditions, entity-specific factors, and information about the customer that is reasonably available. The process for determining a standalone selling price involves significant judgment and includes consideration of multiple factors, including assumptions related to the market opportunity and the time needed to commercialize a product candidate pursuant to the relevant license, estimated direct expenses and other costs.

The Company first determined the standalone selling price of $2.5 million for the vials of HCW9201 and the R&D know-how. The price was determined based on the cost of developing the know-how and the costs incurred in producing the vials. The standalone selling price for the license was determined using the residual approach and was priced at $1.6 million.

As of December 31, 2020, the Company and Wugen had not finalized the development supply agreement. Therefore, there was no contract for purchase of materials during Wugen's development phase. The Company will defer recognition of revenues and costs for supply of materials during development until a contract is in place. The commercial supply agreement will be entered into in the future, pursuant to the terms of the Wugen License.

For the year ended December 31, 2021, the Company entered into a master services agreement with Wugen related to the development supply agreement to provide cGMP and non-cGMP grade licensed material based on industry-standard terms. However, as of December 31, 2021, the Company and Wugen have not finalized any statements of work under the master services agreement, thus no contract exists. Until such time that the Company enters statements of work for Wugen orders related to licensed material for clinical development, the Company will defer recognition of revenues.

The Wugen License includes milestone payments and royalties. The Company uses judgment to determine whether milestones or other variable consideration should be included in the transaction price. For revenue-based royalties, including milestone payments based on the level of sales, the Company will include royalties in the transaction price at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty is allocated has been satisfied (or partially satisfied). As part of management’s evaluation of the transaction price, the Company considers numerous factors, including whether the achievement of the milestones is outside of our control, contingent upon the efforts of others or subject to scientific risks of success. If the Company concludes it is probable that a significant revenue reversal would not occur, the associated milestone payment is included in the transaction price. Milestone payments that are not within our control, such as regulatory approvals, are generally not considered probable until those milestones are achieved. The Company reevaluates the transaction price, including estimated variable consideration included in the transaction price and all constrained amounts, in each reporting period and as uncertain events are resolved or other changes in circumstances occur.

8. Redeemable Preferred Stock

In a series of closings which took place in 2020, the Company completed the private placement of Series C Preferred Stock. The terms of the redeemable preferred stock provided for an adjustment to the conversion price upon the occurrence of certain transactions or events, such as stock splits, split-up, certain dividends, or distributions. Cumulative dividends accrued whether or not declared by the Board of Directors. Giving effect to the Reverse Stock Split, a total of 5,439,112 shares of Series C Preferred Stock were issued at $2.05 per share, for $11.2 million, net of offering costs. The Company’s Series C Preferred Stock was convertible into shares of Class A common stock and earned cumulative dividends at a rate of 6% per annum and compound annually until converted or redeemed.

On July 22, 2021, the Company closed on its IPO, and the requirements for mandatory conversion were met. All outstanding shares of Series A, Series B, and Series C Preferred Stock converted into an equal number of shares of common stock. As a result, the rights, preferences, and terms ascribed to these shares are no longer applicable. Cumulative dividends of $2.8 million accrued as of the conversion date were forfeited and such forfeiture was recognized through Additional paid-in capital.

At December 31, 2021, the Company has 10,000,000 shares of preferred stock authorized and no shares issued.

9. Net Loss Per Share

The following table summarizes the computation of the basic and diluted net loss per share:

	Years Ended December 31,	
	2020	2021
Numerator:		
Net loss	$ (5,802,201)	$ (12,862,468)
Less: cumulative preferred dividends earned in the period, net of forfeitures	(1,271,675)	—
Net loss available for distribution to common stock holders	$ (7,073,876)	$ (12,862,468)
Denominator:		
Weighted-average common shares outstanding	4,739,285	18,770,935
Net loss per share, basic and diluted	$ (1.49)	$ (0.69)

The following table summarizes the outstanding potentially dilutive securities that have been excluded in the calculation of diluted net loss per share because their inclusion would be anti-dilutive:

	As of December 31,	
	2020	2021
Redeemable Preferred Stock	23,768,416	—
Common stock options	742,114	1,770,739
Potentially diluted securities	24,510,530	1,770,739

10. Stock-based Compensation

On June 21, 2021, the 2021 Plan was adopted by the Company's board of directors and approved by the Company's stockholders. As of the adoption date, the 2019 Plan was terminated. No terms were changed for grants previously awarded under the 2019 Plan, and the Company concluded a modification did not occur. Under the 2019 Plan, the Company primarily granted employees incentive stock options, which had a maximum term of ten years from the date of the grant. Generally, the incentive stock options granted under the 2019 Plan have a four year, service-based vesting period. All of the options granted under the 2019 Plan had an exercise price equal to the fair value of a share of common stock on the date of the grant, according to Company policy.

The 2021 Plan permits the grant of incentive stock options, nonstatutory stock options, stock appreciation rights, restricted stock, restricted stock units, and stock bonus awards. The 2021 Plan initially reserved 3,444,343 shares of Common Stock, including the transfer of remaining shares reserved under the 2019 Plan. In addition, the number of shares reserved for issuance under the 2021 Plan will increase automatically on the first day of each fiscal year beginning with the 2022 fiscal year.

Under the 2021 Plan, the term of each stock option must be stated in the stock award agreement. In the case of an incentive stock option, the term will be ten years from the date of grant, or such shorter term as may be provided in the stock award agreement. Moreover, in the case of an incentive stock option granted to a participant who owns stock representing more than 10% of the total combined voting power of all classes of our stock or the stock of any of our affiliates, the term of the incentive stock option will be five years from the date of grant or such shorter term as may be provided in the stock award agreement. Under the 2021 Plan, the Company continues to have a policy to grant options with an exercise price equal to the fair value of a share of common stock, as determined by the closing price on NASDAQ on the grant date.

The following summarizes the Company's stock option activity for the year ended December 31, 2021:

	Shares Issuable under Options	Weighted Average Exercise Price	Weighted Average Remaining Contract Term	Aggregate Intrinsic Value
Outstanding at December 31, 2019	586,662	0.13	9.6 years	$ 5,500
Granted	263,976	0.20		
Exercised	(75,851)	0.13		
Forfeited or cancelled	(32,740)	0.12		
Outstanding at December 31, 2020	742,047	0.16	9.1 years	$ 39,078
Exercisable at December 31, 2020	88,531	0.15	9.0 years	$ 5,413
Outstanding at December 31, 2020	742,047	0.16	9.1 years	$ 39,078
Granted	1,249,287	4.16		
Exercised	(206,455)	0.13		
Forfeited or cancelled	(14,140)	0.19		
Outstanding at December 31, 2021	1,770,739	2.96	9.0 years	$ 1,124,215
Exercisable at December 31, 2021	41,084	0.17	7.9 years	$ 87,522

The aggregate intrinsic value is calculated based on the difference between the exercise price of the underlying stock options and the fair value of the Company's common stock for stock options as of the reporting date. The intrinsic value of stock options exercised during the years ended December 31, 2020 and 2021 was $6,032 and $447,115, respectively. The weighted-average fair value of options granted during the years ended December 31, 2020 and 2021 was $0.20 and $4.16 per share, respectively.

For stock option grants with service-based vesting, stock-based compensation expense represents the portion of the grant date fair value of employee stock option grants recognized over the requisite service period of the awards on a straight-line basis, net of estimated forfeitures. For options that vest upon the achievement of performance milestones, the Company estimates fair value at the date of grant and compensation expense is recognized using the accelerated attribution method when it is determined that the performance criteria is probable of being met.

In determining the grant date fair value of the stock-based awards, the Company uses the Black-Scholes option-pricing model and assumptions discussed below. Each of these inputs is subjective and its determination generally requires significant judgment.

Fair Value of Common Stock—Prior to our initial public offering, the estimated fair value of our common stock was determined by our board of directors as of the date of each option grant, with input from management, considering our most recently available third-party valuation of our common stock as well as our 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 to the date of the grant. Since the completion of our initial public offering on July 19, 2021, the fair value of each share of common stock underlying stock option grants is based the quoted market price on the primary stock exchange on which our common stock is traded on the day the stock award or option is granted.

Expected term—The expected term of stock options is determined using the "simplified" method, whereby the expected life equals the arithmetic average of the vesting term and the original contractual term of the option due to the Company's lack of sufficient historical data.

Expected volatility—We have limited information on the income volatility of our stock as shares of our common stock were not actively traded on any public markets prior to July 19, 2021. The expected volatility was derived from the historical stock volatilities of comparable peer public companies within our industry.

Risk-free interest rate—The risk-free interest rate is based on the U.S. Treasury Bond in effect at the time of grant for periods corresponding with the expected term.

Dividend yield—The expected dividend yield is 0% because the Company has not historically paid, and does not expect, for the foreseeable future, to pay a dividend on its common stock.

For the years ended December 31, 2020 and 2021, the fair value of employee and director stock option awards was estimated at the date of grant using a Black-Scholes option-pricing model with the following assumptions:

	Years Ended December 31,	
	2020	2021
Expected term (years)	6.25	6.24
Expected volatility	87.30%	83.18%
Risk-free interest rate	0.50%	1.02%
Dividend yield	—	—
Fair value underlying common stock	$0.18	$2.95

For the year ended December 31, 2020, for options with service-based vesting conditions, the Company recognized $9,590 of employee stock-based compensation expense in research and development expenses and $12,285 of employee stock-based compensation in general and administrative expenses in the accompanying statements of operations. For the year ended December 31, 2021, for options with service-based vesting conditions, the Company recognized $25,239 of employee stock-based compensation expense in research and development expenses and $335,736 of employee stock-based compensation in general and administrative expenses in the accompanying statements of operations.

As of December 31, 2020, the Company had an aggregate of $103,045 of unrecognized employee stock-based compensation cost for options with service-based vesting, which is expected to be recognized over a weighted average vesting period of 5.12 years.

As of December 31, 2020 and 2021, there was no unrecognized employee stock-based compensation cost for options with performance-based vesting conditions, as no performance-based options were unvested. For the years ended December 31, 2020 and 2021, the Company recognized an aggregate of $6,750 and nil of employee stock-based compensation cost, respectively, for options with performance-based vesting conditions which vested immediately upon achieving the performance target, respectively.

11. Employee Benefit Plan

The Company offers a defined contribution savings plan (the “Benefit Plan”) under Section 401 of the Internal Revenue Code for all eligible employees. The Benefit Plan allows for discretionary contributions which are limited to the maximum allowable for federal tax purposes. The total expense related to the discretionary payments made by the Company to the Benefit Plan for the years ended December 31, 2020 and 2021 was $146,400 and $173,400, respectively.

12. Collaborative Arrangements

In March 2020, the Company entered into two collaborative arrangements relating to IND-enabling activities which continued in 2021. Pursuant to these agreements, the Company supplied materials for the studies and reimbursed the collaboration partner costs in connection with the projects. In turn, the partner will provide written reports and a body of scientific data for the results of the projects.

13. Income Taxes

The Company did not have a provision for income taxes (current or deferred tax expense) for tax years ended December 31, 2020 and 2021.

The following table summarizes the differences between the statutory federal income tax rate and the Company's effective income tax rate (percent data):

Rate Reconciliation	**2020**		**2021**	
Net Loss Before Taxes	$ (5,802,201)		$ (12,862,468)	
Benefit at statutory rate	(1,218,462)	21.00%	(2,701,118)	21.00%
State tax benefit net of federal benefit	(264,152)	4.55%	(590,728)	4.59%
Permanent book/tax differences	10,161	(0.18%)	(85,678)	0.67%
Other adjustments	(34,591)	0.60%	2,093	(0.02%)
R&D credit carryforward	(46,608)	0.80%	(85,000)	0.66%
Change in valuation allowance	1,555,740	(26.81%)	3,460,431	(26.90%)
Other	(2,088)	0.04%	—	0.00%
Income tax expense/(benefit)	$ —	0.00%	$ —	0.00%

The tax effects of temporary differences that give rise to significant portions of the deferred tax assets and deferred tax liabilities at December 31, 2020 and 2021 are presented below:

	2020	2021
Deferred tax assets:		
Federal net operating loss carryforward	$ 3,102,649	$ 5,479,664
State net operating loss carryforward	658,595	1,164,970
Accrued expenses	24,585	12,356
Stock-based compensation	2,821	84,612
Deferred rent	2,089	307
R&D credit	133,015	218,015
Unrealized gain/loss	—	16,708
Deferred revenue	—	397,464
Net deferred tax assets	3,923,754	7,374,096
Deferred tax liabilities:		
Depreciable assets	(10,054)	35
Net deferred tax liabilities	(10,054)	35
Less: valuation allowance	(3,913,700)	(7,374,131)
Net deferred tax asset (after valuation allowance)	$ —	$ —

A valuation allowance is recorded to reduce the deferred tax asset if, based on the weight of the evidence, it is more likely than not that some portion or all of the deferred tax asset will not be realized. As of December 31, 2021, after consideration of all the evidence, both positive and negative, management has determined that a valuation allowance of $7.4 million is necessary to reduce the deferred tax asset to the amount that will more likely than not be realized. During the year ended December 31, 2021, the valuation allowance increased by $3.5 million.

On March 27, 2020, the Coronavirus Aid, Relief and Economic Security (“CARES”) Act was enacted and signed into law. Certain provisions of the CARES Act could impact the 2019 income tax provision computations of the Company and will be reflected in the period of enactment (tax year 2020). The CARES Act, among other things, contains modifications on the limitation of business interest expense under Section 163(j), allow for net operating loss ("NOL") carryovers and carrybacks to offset 100% of taxable income for taxable years before 2021, and includes a technical correction to the TCJA with respect to Qualified Improvement Property ("QIP") where such property has a 15-year recovery period for purposes of the general depreciation system of Section 168(a). The Company is currently evaluating the impact of the CARES Act, and aside from the 15-year QIP technical correction, it believes that none of other modifications or tax law changes will result in any material benefit or apply.

As of December 31, 2020 and 2021, the Company had available federal NOL carryforwards of $14.8 million and $26.1 million. The Company also has available state NOLs carryforwards of approximately $15.2 million and $26.8 million, as of December 31, 2020 and 2021, respectively. The federal and state NOLs will carry forward indefinitely and be available to offset up to 100% of taxable income for taxable years before 2021 and 80% of taxable years staring after 2020. In addition, the Company had federal research and development credits carryforwards of $133,015 and $218,015, as of December 31, 2020 and 2021, respectively, to reduce future federal income taxes, if any. These carryforwards expire from 2038 through 2041 and are subject to review and possible adjustment.

Under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, (the Code), substantial changes in the Company’s ownership may limit the amount of net operating loss and research and development credit carryforwards that could be used annually in the future to offset taxable income. A formal Section 382 study has not been completed to determine if an ownership change has occurred and if its net operating losses are subject to an annual limitation. Such annual limitations could affect the utilization of NOL and tax credit carryforwards in the future.

14. Commitments and Contingencies

Leases

The Company leases its operating facilities in Miramar, Florida under non-cancelable operating lease agreements and a short-term sublease agreement for additional office space. Rent expense is recognized for leases with increasing annual rents on a straight-line basis over the term of the lease. The amount of rent expense in excess of cash payments is classified as deferred rent. Lease incentives received are deferred and amortized over the term of the lease.

The future minimum payments for the lease and sublease agreements at December 31, 2021 are as follows:

2022 (remaining 2 months)	$ 36,000

For the year ended December 31, 2020 and 2021, rental expense, including common area maintenance costs, recognized by the Company was $183,943 and $208,348, of which $82,971 and $100,457, respectively, are included in Research and development, in the accompanying statements of operations.

Contractual Commitments

During the year ended December 31, 2021, the Company entered into several agreements with a third-party global contract development and manufacturer of biologics for the manufacture of the Company's proprietary molecules for use in clinical trials. At December 31, 2020, the future minimum payments under such agreements were $3.9 million. At December 31, 2021, future payment obligations under such agreements were $2.5 million of which approximately $181,600 was paid in January 2022.

Legal

Management has no knowledge of any pending or unasserted claims against the Company.

Other

In March 2020, the World Health Organization declared the outbreak of a novel coronavirus (COVID-19) as a pandemic, which continues to spread throughout the United States and the world. The spread of COVID-19 has caused significant volatility in the U.S. and international markets. There is significant uncertainty around the breadth and duration of business disruptions related to COVID-19, as well as its impact on the U.S. and international economies and, as such, the Company is unable to determine if it will have a material impact to its operations.

15. Subsequent Events

Subsequent events have been evaluated through the date the financial statements were issued. As of such date, there were no material subsequent events identified that required recognition or disclosure other than as disclosed below or in the footnotes herein.

Effective March 1, 2022, the Company entered into a non-cancelable operating lease agreement for its current location with a two-year term and future minimum payments of $339,300.

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 disclosure controls and procedures are designed to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act, is recorded, communicated to our management to allow timely decisions regarding required disclosure, summarized and reported within the time periods specified in the SEC's rules and forms.

Under the supervision and with the participation of our management, including the Chief Executive Officer and Chief Financial Officer, we have evaluated the effectiveness of our disclosure controls and procedures as required under Rules 13a-15(e) and 15d-15(e) under the Exchange Act as of December 31, 2021. Based on that evaluation, the Chief Executive Officer and Chief Financial Officer have concluded that these disclosure controls and procedures are effective as of December 31, 2021.

Management's Report on Internal Control over Financial Reporting

This Annual Report on Form 10-K does not include a report of management’s assessment regarding internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) or an attestation report of our registered public accounting firm due to a transition period established by the rules of the SEC for newly public companies. Additionally, for as long as we remain an “emerging growth company” as defined in Section 2(a) of the Securities Act, as modified by the JOBS Act, we intend to take advantage of the exemption permitting us not to comply with the requirement that our independent registered public accounting firm provide an attestation on the effectiveness of our internal control over financial reporting.

Attestation Report of the Independent Registered Public Accounting Firm

This Annual Report on Form 10-K does not include an attestation repot of our independent registered public accounting firm (PCAOB ID Number 248) due to an exemption provided by the JOBS Act for "emerging growth companies."

Changes in Internal Control over Financial Reporting

There have been no changes in our internal control over financial reporting during the quarter ended December 31, 2021 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B Other Information.

None.

Item 9C Disclosure Regarding Foreign Jurisdictions That Prevent Inspections.

Not applicable.

PART III

Item 10 Directors, Executive Officers and Corporate Governance.

The information required by this item is included under the captions "Board of Directors and Corporate Governance," "Proposal One: Election of Directors," "Executive Officers" and "Delinquent Section 16(a) Reports" included in our definitive Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the year ended December 31, 2021, and is incorporated herein by reference.

Item 11 Executive Compensation.

The information required by this item is included under the captions “Board of Directors and Corporate Governance” and "Executive Compensation" in our definitive Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the year ended December 31, 2021, 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 is included under the captions "Equity Compensation Plan Information" and “Security Ownership of Certain Beneficial Owners and Management” in our definitive Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the year ended December 31, 2021, and is incorporated herein by reference.

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

The information required by this item is included under the captions "Board of Directors and Corporate Governance" and “Certain Relationships and Related Party Transactions” in our definitive Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the year ended December 31, 2021, and is incorporated herein by reference.

Item 14 Principal Accounting Fees and Services.

The information required by this item is included under the caption “Proposal Two: Ratification of Appointment of Independent Registered Public Accounting Firm” in our definitive Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the year ended December 31, 2021, and is incorporated herein by reference.

PART IV

Item 15 Exhibits, Financial Statement Schedules.

(a)(1) Financial Statements

The information concerning HCW Biologics' audited financial statements and the Report of Independent Registered Public Accounting Firm required by this Item 15(a)(1) is incorporated by reference herein to the section of this Annual Report on Form 10-K in Part II, Item 8, titled "Financial Statements and Supplementary Data."

(a)(2) Financial Statement Schedules

All financial statement schedules have been omitted as the information is not required under the related instructions or is not applicable or because the information required is already included in the condensed financial statements or the notes to those condensed financial statements.

(a)(3) Exhibits

We have filed, or incorporated into this Annual Report on Form 10-K by reference, the exhibits listed on the accompanying Exhibit Index immediately preceding the signature page of this Annual Report on Form 10-K.

Exhibit Index

Exhibit No.	Exhibit title	Incorporated by reference				Filed or furnished herewith
		Form	File No.	Exhibit No.	Filing date	
3.1	Amended and Restated Certificate of Incorporation	8-K	001-40591	3.1	07/26/2021	
3.2	Amended and Restated Bylaws	8-K	001-40591	3.2	07/26/2021	
4.1	Specimen Stock Certificate	S-1/A	333-256510	4.1	07/09/2021	
4.2	Description of Securities					X
10.1	Form of Indemnification Agreement between HCW Biologics Inc. and each of its officers and directors.	S-1/A	333-256510	10.1	07/09/2021	
10.2+	2019 Equity Incentive Plan, as amended, and forms of agreement thereunder.	S-1	333-256510	10.2	07/09/2021	
10.3+	First Amendment to 2019 Equity Incentive Plan.	S-1	333-256510	10.3	07/09/2021	
10.4+	2021 Equity Incentive Plan and forms of agreement thereunder	S-1	333-256510	10.4	07/09/2021	
10.5+	Employment Agreement, dated July 6, 2021, between Peter Rhode and the Registrant.	S-1	333-256510	10.6	07/09/2021	
10.6+	Employment Agreement, dated October 9, 2019, between Rebecca Byam and the Registrant.	S-1	333-256510	10.7	07/09/2021	
10.7+	Non-Employee Director Compensation Policy.	S-1	333-256510	10.8	07/09/2021	
10.8+	Employment Agreement, dated June 18, 2021, between Dr. Hing C. Wong and the Registrant.	S-1	333-256510	10.13	07/09/2021	
10.9+	Executive Incentive Bonus Plan.	S-1	333-256510	10.11	07/09/2021	
10.10†	Exclusive License Agreement, dated December 24, 2020, between the Registrant and Wugen, Inc.	S-1	333-256510	10.10	07/09/2021	
10.11†	Master Services Agreement, dated March 14, 2019, between the Registrant and EirGenix, Inc.	S-1	333-256510	10.12	07/09/2021	
23.1	Consent of Independent Registered Public Accounting Firm					X
24.1	Power of Attorney (incorporated by reference to the signature page of this Annual Report on Form 10-K)					X
31.1	Certification of Chief Executive Officer pursuant to Rules 13a-14(a) and Rule 15d-14(a) of the Exchange Act					X
31.2	Certification of Chief Financial Officer pursuant to Rules 13a-14(a) and Rule 15d-14(a) of the Exchange Act					X
32.1*	Certification of Chief Executive Officer pursuant to Rule 13a-14(b) of the Exchange Act and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002					X
32.2*	Certification of Chief Executive Officer pursuant to Rule 13a-14(b) of the Exchange Act and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002					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 (embedded within the Inline XBRL document)					X

* Furnished and not filed.
+ Indicates a management contract or compensatory plan or arrangement.
† The schedules to this Exhibit have been omitted in accordance with Regulation S-K Item 601(b)(2). The Registrant agrees to furnish supplementally a copy of any omitted schedule to the Securities and Exchange Commission upon its request.

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**.**

HCW Biologics Inc.

Date: March 29, 2022

By: /s/ Hing C. Wong, Ph.D.
Hing C. Wong, Ph.D.
Founder and Chief Executive Officer

POWER OF ATTORNEY

Each person whose signature appears below constitutes and appoints Hing C. Wong and Rebecca Byam, , and each of them, as his or her true and lawful attorney-in-fact and agent, with full power of substitution and resubstitution, for him or her and in his or her name, place and stead, in any and all capacities, to sign any and all amendments to this Annual Report on Form 10-K, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he or she might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or any of them, or their or his substitutes, may lawfully do or cause to be done by virtue thereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, this Report has been signed below by the following persons on behalf of the Registrant in the capacities and on the dates indicated.

Name	Title	Date
/s/ Hing C. Wong, Ph.D. **Hing C. Wong, Ph.D.**	Founder, Chief Executive Officer (Principal Executive Officer)	March 29, 2022
/s/ Rebecca Byam **Rebecca Byam**	Chief Financial Officer (Principal Financial and Accounting Officer)	March 29, 2022
/s/ Scott T. Garrett **Scott T. Garrett**	Chairperson of the Board of Directors	March 29, 2022
/s/ Lisa M. Giles **Lisa M. Giles**	Director	March 29, 2022
/s/ Rick S. Greene **Rick S. Greene**	Director	March 29, 2022
/s/ Gary M. Winer **Gary M. Winer**	Director	March 29, 2022

Exhibit 4.2

DESCRIPTION OF THE REGISTRANT'S SECURITIES REGISTERED PURSUANT TO SECTION 12 OF THE SECURITIES EXCHANGE ACT OF 1934

The following description summarizes the most important terms of our securities registered pursuant to Section 12 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), certain securities convertible into such registered securities, and some of the provisions of our restated certificate of incorporation, restated bylaws, and relevant provisions of Delaware General Corporate Law (the "DGCL"). The descriptions herein are qualified in their entirety by our restated certificate of incorporation and restated bylaws, each of which have been previously filed with the Securities and Exchange Commission and are incorporated by reference as an exhibit to the Annual Report on Form 10-K of which this Exhibit 4.2 is a part, as well as the relevant provisions of Delaware General Corporate Law.

General

Our authorized capital stock consists of 250,000,000 shares of common stock, par value $0.0001 per share, and 10,000,000 shares of redeemable preferred stock, par value $0.0001 per share.

Common Stock

Voting Rights

Each holder of common stock is entitled to one vote for each share on all matters submitted to a vote of the stockholders, including the election of directors. Our certificate of incorporation and bylaws to be in effect upon the completion of this offering do not provide for cumulative voting rights. Because of this, the holders of a plurality of the shares of common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they should so choose. With respect to matters other than the election of directors, at any meeting of the stockholders at which a quorum is present or represented, the affirmative vote of a majority of the voting power of the shares present in person or represented by proxy at such meeting and entitled to vote on the subject matter shall be the act of the stockholders, except as otherwise required by law. The holders of a majority of the stock issued and outstanding and entitled to vote, present in person or represented by proxy, shall constitute a quorum for the transaction of business at all meetings of the stockholders.

Dividends

Subject to preferences that may be applicable to any then outstanding redeemable preferred stock, holders of common stock are entitled to receive dividends, if any, as may be declared from time to time by the board of directors out of legally available funds.

Liquidation

In the event of our liquidation, dissolution or winding up, holders of common stock will be entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of our debts and other liabilities and the satisfaction of any liquidation preference granted to the holders of any then outstanding shares of redeemable preferred stock.

Rights and Preferences

Holders of common stock have no preemptive, conversion, subscription or other rights, and there are no redemption or sinking fund provisions applicable to the common stock. The rights, preferences and privileges of the holders of common stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of redeemable preferred stock that we may designate in the future.

Fully Paid and Nonassessable

All of our outstanding shares of common stock are, and the shares of common stock to be issued pursuant to this offering, when paid for, will be fully paid and nonassessable.

Preferred Stock

Our board of directors has the authority, without further action by the stockholders, to issue up to 10,000,000 shares of redeemable preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences, and privileges could include dividend rights, conversion rights, voting rights, redemption rights, liquidation preferences, sinking fund terms and the number of shares constituting any series or the designation of such series, any or all of which may be greater than the rights of common stock. The issuance of redeemable preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon liquidation. In addition, the issuance of redeemable preferred stock could have the effect of delaying, deferring or preventing change in our control or other corporate action. We have no present plan to issue any shares of redeemable preferred stock.

Anti-Takeover Effects of Delaware Law and Our Amended and Restated Certificate of Incorporation and Amended and Restated Bylaws

Certain provisions of our restated certificate of incorporation, restated bylaws and Delaware law, which are summarized below, are expected to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed, in part, to encourage persons seeking to acquire control of us to negotiate first with our board of directors. We believe that the benefits of increased protection of our potential ability to negotiate more favorable terms with an unfriendly or unsolicited acquirer outweigh the disadvantages of discouraging a proposal to acquire us.

Undesignated Preferred Stock

As discussed above, our board of directors has the ability to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change control of us. These and other provisions may have the effect of deterring hostile takeovers or delaying changes in control or management of our company.

Limits on Ability of Stockholders to Act by Written Consent or Call a Special Meeting

Our amended and restated certificate of incorporation provides that our stockholders may not act by written consent, which may lengthen the amount of time required to take stockholder actions. As a result, a holder controlling a majority of our capital stock would not be able to amend our bylaws or remove directors without holding a meeting of our stockholders called in accordance with our bylaws.

In addition, our amended and restated bylaws provides that special meetings of the stockholders may be called only by the chairperson of the board, the Chief Executive Officer or our board of directors. Stockholders may not call a special meeting, which may delay the ability of our stockholders to force consideration of a proposal or for holders controlling a majority of our capital stock to take any action, including the removal of directors.

Requirements for Advance Notification of Stockholder Nominations and Proposals

Our amended and restated bylaws establishes advance notice procedures with respect to stockholder proposals and the nomination of candidates for election as directors, other than nominations made by or at the direction of our board of directors or a committee of our board of directors. These provisions may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed. These provisions may also discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer's own slate of directors or otherwise attempting to obtain control of our company.

Board Classification

Our board of directors is divided into three classes, one class of which is elected each year by our stockholders. The directors in each class will serve three-year terms. A third party may be discouraged from making a tender offer or otherwise attempting to obtain control of us as it is more difficult and time-consuming for stockholders to replace a majority of the directors on a classified board.

No Cumulative Voting

Our amended and restated certificate of incorporation and amended and restated bylaws do not permit cumulative voting in the election of directors. Cumulative voting allows a stockholder to vote a portion or all of its shares for one or more candidates for seats on the board of directors. Without cumulative voting, a minority stockholder may not be able to gain as many seats on our board of directors as the stockholder would be able to gain if cumulative voting were permitted. The absence of cumulative voting makes it more difficult for a minority stockholder to gain a seat on our board of directors to influence our board's decision regarding a takeover.

Amendment of Charter and Bylaws Provisions

The amendment of the above provisions of our amended and restated certificate of incorporation will require approval by holders of at least two-thirds of our outstanding capital stock entitled to vote generally in the election of directors. The amendment of our bylaws will require approval by the holders of at least two-thirds of our outstanding capital stock entitled to vote generally in the election of directors.

Choice of Forum

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware will be the exclusive forum for the following types of actions or proceedings under Delaware statutory or common law: (1) any derivative action or proceeding brought on our behalf; (2) any action asserting a claim of breach of a fiduciary duty or other wrongdoing by any of our directors, officers, or employees to us or our stockholders; (3) any action asserting a claim against us or our stockholders arising pursuant to any provision of the General Corporation Law of the State of Delaware or our certificate of incorporation or bylaws; (4) any action to interpret, apply, enforce, or determine the validity of our certificate of incorporation or bylaws; (5) any action as to which the Delaware General Corporation Law confers jurisdiction to the Court of Chancery of the State of Delaware; or (6) any action asserting a claim governed by the internal affairs doctrine. The provisions would not apply to suits brought to

enforce a duty or liability created by the Securities Act of 1933, as amended (the "Securities Act"), the Exchange Act, or any other claim for which the U.S. federal courts have exclusive jurisdiction. 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 provides that the federal district courts of the United States of America will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act.

While the Delaware courts have determined that such choice of forum provisions are facially valid, a stockholder may nevertheless seek to bring a claim in a venue other than those designated in the exclusive forum provisions. In such instance, we would expect to vigorously assert the validity and enforceability of the exclusive forum provisions of our amended and restated certificate of incorporation. This may require significant additional costs associated with resolving such action in other jurisdictions and there can be no assurance that the provisions will be enforced by a court in those other jurisdictions.

Delaware Anti-Takeover Statute

We are subject to the provisions of Section 203 of the DGCL regulating corporate takeovers. In general, Section 203 prohibits a publicly held Delaware corporation from engaging, under certain circumstances, in a business combination with an interested stockholder for a period of three years following the date the person became an interested stockholder unless:

- prior to the date of the transaction, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;

- upon completion of the transaction that resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, calculated as provided under Section 203; or

- at or subsequent to the date of the transaction, the business combination is approved by our board of directors and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Generally, a business combination includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. An interested stockholder is a person who, together with affiliates and associates, owns or, within three years prior to the determination of interested stockholder status, did own 15% or more of a corporation's outstanding voting stock. We expect the existence of this provision to have an anti-takeover effect with respect to transactions our board of directors does not approve in advance. We anticipate that Section 203 may also discourage attempts that might result in a premium over the market price for the shares of common stock held by stockholders.

The provisions of Delaware law and the provisions of our amended and restated certificate of incorporation and amended and restated bylaws could have the effect of discouraging others from attempting hostile takeovers and, as a consequence, they might also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions might also have the effect of preventing

changes in our management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders might otherwise deem to be in their best interests.

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company LLC. The transfer agent and registrar's address is 6201 15th Avenue, Brooklyn, NY 11219, and its telephone number is (718) 921-8124.

Listing

Our common stock is listed on the Nasdaq Global Market under the trading symbol "HCWB".

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We have issued our report dated March 29, 2022 with respect to the financial statements included in the Annual Report of HCW Biologics Inc. on Form 10-K for the year ended December 31, 2021. We consent to the incorporation by reference of said report in the Registration Statement of HCW Biologics Inc. on Form S-8 (File No. 333-258067).

/s/ GRANT THORNTON LLP

Miami, Florida
March 29, 2022

Exhibit 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

I, Hing C. Wong, certify that:

1. I have reviewed this Annual Report on Form 10-K of HCW Biologics 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)) 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) 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

   (c) 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 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.

/s/ Hing C. Wong

Hing C. Wong
Founder and Chief Executive Officer

Date: March 29, 2022

Exhibit 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

I, Rebecca Byam, certify that:

1. I have reviewed this Annual Report on Form 10-K of HCW Biologics 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)) 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) 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

   (c) 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 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.

/s/ Rebecca Byam

Rebecca Byam
Chief Financial Officer

Date: March 29, 2022

Exhibit 32.1

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

Pursuant to 18 U.S.C. Section 1350, I, Hing C. Wong, hereby certify that, to the best of my knowledge, HCW Biologics Inc.'s Annual Report on Form 10-K for the period ended December 31, 2021 (the "Report"), as filed with the Securities and Exchange Commission on the date hereof, fully complies with the requirements of Section 13(a) or Section 15(d) of the Securities Exchange Act of 1934, as amended, and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of HCW Biologics Inc.

Date: March 29, 2022

By: /s/ Hing C. Wong
Hing C. Wong
Founder and Chief Executive Officer

Exhibit 32.2

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

Pursuant to 18 U.S.C. Section 1350, I, Rebecca Byam, hereby certify that, to the best of my knowledge, HCW Biologics Inc.'s Annual Report on Form 10-K for the period ended December 31, 2021 (the "Report"), as filed with the Securities and Exchange Commission on the date hereof, fully complies with the requirements of Section 13(a) or Section 15(d) of the Securities Exchange Act of 1934, as amended, and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of HCW Biologics Inc.

Date: March 29, 2022

By: /s/ Rebecca Byam
Rebecca Byam
Chief Financial Officer