UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K/A
(Amendment No.1)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2021

☐ **TRANSITION REPORT PURSUANT TO SECTIONS 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from to

Commission file number 001-32188

ORAGENICS, INC.
(Exact name of registrant as specified in its charter)

Florida	**59-3410522**
(State or Other Jurisdiction of Incorporation or Organization)	**(IRS Employer Identification No.)**
4902 Eisenhower Blvd., Suite 125 Tampa, FL	
(Address of Principal Executive Offices)	**33634 (Zip Code)**

813-286-7900
(Registrant's Telephone Number, Including Area Code)

SECURITIES REGISTERED PURSUANT TO SECTION 12(b) OF THE ACT:

Title of each class	Trading Symbol	Name of each exchange on which registered
Common Stock $0.001 par value per share	**OGEN**	**NYSE AMERICAN**

SECURITIES REGISTERED PURSUANT TO SECTION 12(g) OF THE ACT:
None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐No ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange 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 Exchange Act Rule 12b-2). Yes☐ No ☒

The aggregate market value of the voting and non-voting common equity stock held by non-affiliates of the registrant, was approximately $80,959,901 computed based upon a last sales price of $0.71 as reported by the NYSE American as of June 30, 2021.

As of March 8, 2022, there were 116,394,806 shares of the registrant's Common stock outstanding.

EXPLANATORY NOTE

We are filing this Amendment No. 1 to our Annual Report on Form 10-K for the fiscal year ending December 31, 2021 filed with the Securities and Exchange Commission (the "SEC") on March 24, 2022 (the "Original Filing") for the sole purpose of including amended Exhibits 32.1 and 32.2 which contain the Section 906 Certifications of our Principal Executive Officer and Principal Financial Officer due to such Exhibits in the Original Filing containing a typographical error in the date of the applicable fiscal year.

Pursuant to Rule 12b-15 under the Securities Exchange Act of 1934, as amended, this Form 10-K/A also contains new certifications pursuant to Section 302 of the Sarbanes-Oxley Act of 2002. Because there have been no changes to the financial statements in the Original Filing and this Form 10-K/A does not contain or amend any disclosure with respect to Items 307 and 308 of Regulation S-K, paragraphs 3, 4, and 5 of such certifications have been omitted.

Except as described above, this Form 10-K/A does not modify, amend or update in any way any of the financial information or any other information contained in the Original Filing. This Form 10-K/A does not reflect events that may have occurred subsequent to the filing date of the Original Filing and information not affected by this Form 10-K/A remains unchanged and reflects the disclosures made at the time the Original Filing was filed.

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FORWARD LOOKING STATEMENTS AND CERTAIN CONSIDERATIONS

This report, along with other documents that are publicly disseminated by us, contains or might contain forward-looking statements within the meaning of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). All statements included in this report and in any subsequent filings made by us with the Securities and Exchange Commission (the "SEC") other than statements of historical fact, that address activities, events or developments that we or our management expect, believe or anticipate will or may occur in the future are forward-looking statements. These statements represent our reasonable judgment on the future based on various factors and using numerous assumptions and are subject to known and unknown risks, uncertainties and other factors that could cause our actual results and financial position to differ materially. We claim the protection of the safe harbor for forward-looking statements provided in the Private Securities Litigation Reform Act of 1995, Section 27A of the Securities Act and Section 21E of the Exchange Act. Examples of forward-looking statements include: (i) projections of revenue, earnings, capital structure and other financial items, (ii) statements of our plans and objectives, (iii) statements of expected future economic performance, and (iv) assumptions underlying statements regarding us or our business. Forward-looking statements can be identified by, among other things, the use of forward-looking language, such as "believes," "expects," "estimates," "may," "will," "should," "could," "seeks," "plans," "intends," "anticipates" or "scheduled to" or the negatives of those terms, or other variations of those terms or comparable language, or by discussions of strategy or other intentions.

Forward-looking statements are subject to known and unknown risks, uncertainties and other factors that could cause the actual results to differ materially from those contemplated by the statements. The forward-looking information is based on various factors and was derived using numerous assumptions. Important factors that could cause our actual results to be materially different from the forward-looking statements include the following risks and other factors discussed under the Item 1A "Risk Factors" in this Annual Report on Form 10-K. These factors include:

- We have incurred significant operating losses since our inception and cannot assure you that we will generate revenues or achieve profitability;
- We will need to raise additional capital to fully implement our business strategy and we may not be able to do so;
- Our financial capacity and performance, including our ability to obtain funding, non-dilutive or otherwise, necessary to do the research, development, manufacture and commercialization of any one or all of our product candidates;
- The timing, progress and results of clinical trials of our product candidates, including statements regarding the timing of initiation and completion of pre-clinical studies or clinical trials or related preparatory work, the period during which the results of the trials will become available and our research and development programs;
- The timing of any submission of filings for regulatory approval of our product candidates and our ability to obtain and maintain regulatory approvals for our product candidates for any indication;
- Our expectations regarding the potential benefits, activity, effectiveness and safety of our product candidates including as to distribution and storage;
- Our expectations regarding the size of the patient populations, market acceptance and opportunity for and clinical utility of our product candidates, if approved for commercial use;
- Our manufacturing capabilities and strategy, including the scalability and commercial viability of our manufacturing methods and processes, and those of our contractual partners;
- Our expectations regarding the scope of any approved indications for our product candidates;
- Our ability to successfully commercialize our product candidates;
- The potential benefits of, and our ability to maintain, our relationships and collaborations with the NIAID, the NIH, the NRC and other potential collaboration or strategic relationships;
- Our ability to use our lantibiotic platform to develop future product candidates;

- Our estimates of our expenses, ongoing losses, future revenue, capital requirements and our needs for or ability to obtain additional funding, including any application for future grants or funding;
- Our ability to identify, recruit and retain key personnel and consultants;
- Our ability to obtain, retain, protect and enforce our intellectual property position for our product candidates, and the scope of such protection;
- Our ability to advance the development of our new NT-CoV2-1 vaccine product candidate under the timelines and in accord with the milestones projected;
- Our inability to achieve success in our identification of lantibiotic homologs or the manufacture and nonclinical testing of our lantibiotic product candidates;
- Our need to comply with extensive and costly regulation by worldwide health authorities, who must approve our product candidates prior to substantial research and development and could restrict or delay the future commercialization of certain of our product candidates;
- Our ability to successfully complete pre-clinical and clinical development of, and obtain regulatory approval of our product candidates and commercialize any approved products on our expected timeframes or at all;
- The safety, efficacy and benefits of our product candidates;
- The content and timing of submissions to and decisions made by the FDA, other regulatory agencies and nongovernmental bodies and actors, such as investigational review boards;
- The effects of government regulation and regulatory developments, and our ability and the ability of the third parties with whom we engage to comply with applicable regulatory requirements;
- The capacities and performance of our suppliers and manufacturers and other third parties over whom we have limited control;
- Our ability to maintain our listing on the NYSE American;
- The impact of the COVID-19 pandemic on our financial condition and business operations and our ability to continue research and development for existing product candidates on previously-projected timelines or in accord with ordinary practices, as well as the broader governmental, global health and macro- and microeconomic responses to and consequences of the pandemic;
- We may be adversely impacted by any significant broad-based financial crises and its impact on consumers, retailers and equity and debt markets as well as our inability to obtain required additional funding to conduct our business;
- As a public company, we must implement additional and expensive finance and accounting systems, procedures and controls as we grow our business and organization to satisfy reporting requirements, which add to our costs and require additional management time and resources;
- Our competitive position and the development of and projections relating to our competitors or our industry; and
- The impact of laws and regulations, including those that may not yet exist.

We caution investors that actual results or business conditions may differ materially from those projected or suggested in forward-looking statements as a result of various factors including, but not limited to, those described above and in the Risk Factors section of this report. We cannot assure you that we have identified all the factors that create uncertainties. Moreover, new risks emerge from time to time and it is not possible for our management to predict all risks, nor can we assess the impact of all risks on our business or the extent to which any risk, or combination of risks, may cause actual results to differ from those contained in any forward-looking statements. Readers should not place undue reliance on forward-looking statements. Except as required by applicable law, we undertake no obligation to publicly release the result of any revision of these forward-looking statements to reflect events or circumstances after the date they are made or to reflect the occurrence of unanticipated events.

PART I

ITEM 1. BUSINESS.

This description contains certain forward-looking statements that involve risks and uncertainties. Our actual results could differ materially from the results discussed in the forward-looking statements as a result of certain of the risks set forth herein. We assume no obligation to update any forward-looking statements contained herein.

Overview

Oragenics, Inc. is a development-stage company dedicated to fighting infectious diseases including coronaviruses and multidrug-resistant organisms. Its lead product is an intranasal immunization vaccine candidate to prevent COVID-19 and variants of the SARS-CoV-2 virus. The NT-CoV2-1 program leverages coronavirus spike protein research licensed from the National Institute of Health and the National Research Council of Canada with a focus on reducing viral transmission and offering a more patient-friendly intranasal administration. Our lantibiotics program features a novel class of antibiotics against bacteria that have developed resistance to commercial antibiotics.

Our SARS-CoV-2 Vaccine Product Candidate— NT-CoV2-1

Following our May 2020 acquisition of one hundred percent (100%) of the total issued and outstanding common stock of Noachis Terra, Inc. ("Noachis Terra") we are focused on the development and commercialization of a vaccine product candidate to provide long lasting immunity from the novel Severe Acute Respiratory Syndrome coronavirus ("SARS-CoV-2"), which causes the coronavirus disease 2019 ("COVID-19"). Noachis Terra is a party to a worldwide, nonexclusive intellectual property and biological materials license agreement with the National Institute of Allergy and Infectious Diseases ("NIAID"), an institute within the National Institutes of Health ("NIH"), relating to certain research, patent applications and biological materials involving pre-fusion stabilized coronavirus spike proteins and their use in the development and commercialization of a vaccine to provide specific, long lasting immunity from SARS-CoV-2. Since the acquisition we have conducted testing in animal models, including SARS-CoV-2 challenge studies in hamsters, using specific formulations for intramuscular administration (our Terra CoV-2 vaccine candidate) and intranasal administration (our NT-CoV2-1 vaccine candidate), both based on the NIAID pre-fusion stabilized spike protein antigens. Following consideration of a number of factors, including but not limited to the competitive landscape, we determined to bring the intranasal vaccine candidate NT-CoV2-1 into further development due to the greater differentiation versus current COVID-19 vaccines and the potential benefits of intranasal over intramuscular administration. We believe these benefits could include a higher reduction of transmission of SARS-CoV-2 and would offer a needle-free delivery option. We therefore are currently focusing our development efforts on our more highly differentiated NT-CoV2-1 vaccine candidate.

Coronaviruses are a family of viruses that can lead to upper-respiratory infections in humans. Recent clinical reports also suggest that the SARS-CoV-2 virus can affect other body-systems, including the nervous, cardiovascular, gastrointestinal and renal systems. Among the recent iterations of coronaviruses to move from animal to human carriers is SARS-CoV-2 (often referred to as COVID-19), which, beginning in Wuhan, China, in late 2019, caused a global pandemic due to its rapid spread and the relatively high mortality rate (as compared to the seasonal influenza). In late January of 2022, the World Health Organization's estimates indicate the number of worldwide COVID-19 infections have exceeded 365 million and the number of deaths directly attributed to COVID-19 have exceeded 5.6 million. Pfizer/-BioNTech received FDA approval for their COVID-19 vaccines in August of 2021 and the Moderna vaccine in January 2022. The Janssen vaccine is currently available in the United States under Emergency Use Authorizations ("EUA") by the FDA. We believe given the size of the worldwide pandemic that even with additional vaccines projected to be available in the months ahead, there will be demand for the highly differentiated NT-CoV2-1 vaccine, once development is successfully completed. We intend to combine the research, patent applications and biological materials covered by our NIAID license with our existing clinical research and manufacturing capabilities to respond rapidly to this ongoing, global, public health crisis. We believe our NT-CoV2-1 vaccine holds the possibility of playing an important role in addressing this crisis.

Coronaviruses, such as SARS-CoV-2, possess signature protein spikes on their outer capsule. The NIAID license covers patents and data on a vaccine candidate that were created based on a stabilized pre-fusion spike trimeric protein. By stabilizing the spike protein in the pre-fusion state, the number of immunogenic centers is increased thereby allowing for a greater likelihood of successful antibody binding, resulting in an improved immunogenic response. The genetic code, acquired from the NIH, for the stabilized pre-fusion spike protein was provided to Aragen Bioscience, Inc. ("Aragen") for the purpose of insertion of the spike protein gene sequence into a Chinese Hamster Ovary ("CHO") cell line. Aragen is a leading contract research organization focused on accelerating pre-clinical biologics product development, has extensive experience building CHO cell lines for recombinant proteins, such as monoclonal antibodies. Aragen has successfully inserted the NIH pre-fusion spike protein gene sequence into a CHO cell line and is currently developing both the analytical tests and identifying preliminary cell line growth conditions to optimize the spike protein titers. Currently, "mini-pool" production and analytical development is underway. The process to transfer to full-scale manufacture has begun.

The NIH's pre-clinical study shows that this spike protein, adjuvanted with the mouse specific TLR-4-agonist Sigma Adjuvant System ("SAS", a TLR-4 agonist) that induces T cell activation), generates neutralizing antibody titers in both a pseudovirus neutralization assay and a plaque reduction neutralization titer (PRNT) assay. Recently released information indicated that pretreatment of mice with the NIH-created COVID-19 spike protein in combination with the SAA adjuvant completely inhibited viral growth in the nasal cavities and lungs of infected animals compared to unvaccinated control animals. In October 2020, we received feedback to our Type B Pre-Investigational New Drug ("IND") Meeting Request from the FDA. The response indicated that the FDA broadly supported our planned approach to the pre-clinical program that would support the clinical development of the Terra CoV-2 vaccine. Due to our focus on our intranasal vaccine product we expect to meet with the FDA in connection with our IND filing.

We also entered into a material transfer agreement with Biodextris Inc. for the use of three intranasal mucosal adjuvants in our Terra CoV-2 and NT-CoV2-1 vaccine candidates. BDX100, BDX300 and BDX301 are proteosome-based adjuvants comprised of proteins and lipopolysaccharides with improved attributes including enhanced immune response, manufacturing efficiency and the benefits of intranasal vaccine administration. The agreement allows for the future collaboration regarding the intranasal delivery of vaccine during clinical development with the opportunity to enter into a commercial agreement upon regulatory approval of the intranasal vaccine.

The NT-CoV2-1 vaccine containing Inspirevax's intranasal mucosal adjuvant BDX301 has been studied in pre-clinical animal studies, including hamster viral challenge studies and mouse immunogenicity studies. A rabbit toxicology study has been initiated and is required for regulatory approval prior to the Phase 1 clinical study. We believe the NT-CoV2-1 vaccine has the potential to lead to a higher reduction of transmission of SARS-CoV-2 and offers a needle-free delivery option. This vaccine could also permit cost effective storage and distribution at refrigerated temperatures, which should facilitate distribution.

On July 26, 2021, we entered into a licensing agreement with the NRC that enables us to pursue the rapid development of next-generation vaccines against the SARS-CoV-2 virus and its variants. The license was subsequently extended to include the Omicron variant. In addition, we broadened the non-exclusive field of use to include all diseases caused by coronaviruses and any genetic variants thereof. The NRC technologies, in combination with the U.S. NIH elements found in our NT-CoV2-1 vaccine candidates, provide us with a platform that can generate cell lines for high-yield production of spike protein antigens for existing and emerging variants of concern. This platform should allow production of cell lines within six to eight weeks of spike gene sequence availability, compared with six to nine months for traditional production of such cell lines. The NRC technologies, developed with support from the NRC's Pandemic Response Challenge Program, are expected to expedite the evaluation of SARS-CoV-2 antigen candidates in pre-clinical and clinical studies.

We began pre-clinical studies in June of 2021 through our collaboration and material transfer agreement with the NRC. We initiated an immunogenicity study in mice to evaluate several adjuvant candidates. On August 30, 2021, we announced the successful completion of these mouse immunogenicity studies that supported further development using either the intramuscular or intranasal routes of administration. A hamster challenge study was initiated in September of 2021 to assess inhibition of viral replication using adjuvants specific for intramuscular and intranasal administration. In December of 2021, we announced that both formulations generated robust immune responses and reduced

the SARS-CoV-2 viral loads to undetectable levels in the nasal passages and lungs five days following a viral challenge. By contrast, hamsters in the control groups that had received saline or adjuvants alone had no detectable immune response and substantial viral loads. The vaccines delivered by intranasal and intramuscular routes generated immune responses as measured by multiple assays.

Through assessment of a variety of factors including evolving variants and available vaccines in use, we have determined to focus our development efforts on the intranasal delivery of our vaccine product candidate, NT-CoV2-1, which is more highly differentiated than the currently available and late-stage COVID-19 vaccines. As a result, we expect to file an IND application with the FDA in the third quarter of 2022 and immediately upon receipt of approval from the FDA to commence a Phase 1 clinical study with NT-CoV2-1, the protocol for which is currently under development.

We expect to use our currently available cash resources to continue to advance the development of NT-CoV2-1 through IND-enabling studies, including immunogenicity, viral challenge studies, toxicology studies, and the Phase 1 trial with further clinical development being contingent upon the receipt of additional funding, including non-dilutive government grant funding which we continue to pursue or partnering or out-licensing opportunities.

Our Antibiotic Product Candidate-Oragenics Derived Compound (ODC-x)

Members of our scientific team discovered that a certain bacterial strain of*Streptococcus mutans,* produces Mutacin 1140 (MU1140), a molecule belonging to the novel class of antibiotics known as lantibiotics. Lantibiotics, such as MU1140, are highly modified peptide antibiotics made by a small group of Gram-positive bacterial species. Over 60 lantibiotics have been discovered, to date. We believe lantibiotics are generally recognized by the scientific community to be potent antibiotic agents.

In nonclinical testing, MU1140 has shown activity against all Gram-positive bacteria against which it has been tested, including those responsible for a number of healthcare associated infections, or HAIs. A high percentage of hospital-acquired infections are caused by highly antibiotic-resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA) or multidrug-resistant Gram-negative bacteria. We believe the need for novel antibiotics is increasing as a result of the growing resistance of target pathogens to existing FDA approved antibiotics on the market.

Lantibiotics have been difficult to investigate for their clinical usefulness as therapeutic agents in the treatment of infectious diseases due to a general inability to produce or synthesize sufficient quantities of pure amounts of these molecules. Traditional fermentation methods can only produce minute amounts of the lantibiotic.

In June 2012, we entered into a worldwide exclusive channel collaboration agreement with Precigen, Inc (formerly known as Intrexon Corporation), ILH Holdings, Inc. (n/k/a Eleszto Genetika, Inc. ("EGI"), for the development and commercialization of the native strain of MU1140 and related homologs to use its advanced transgene and cell engineering platforms. In September of 2021, we and EGI, mutually terminated the amended and restated worldwide exclusive channel collaboration agreement dated March 1, 2021 (the "Lantibiotic ECC") pursuant to which we were pursuing the development of OG716 as a lead product candidate for the treatment of *C. diff*. As a result of the mutual termination of the Lantibiotic ECC, we ceased pre-clinical development of our product candidate OG716 and other compounds covered by the Lantibiotic ECC, all licenses provided pursuant to the Lantibiotic ECC between the parties were terminated and there are no continuing obligations between the parties, except as to confidentiality. We made no payments to EGI in connection with the mutual termination. Each party retained all right and title to their own respective intellectual property. The termination of the Lantibiotic ECC was to enable us to focus on our continuing independent research and development efforts relative to lantibiotics in order to identify new compounds to pursue.

The timing of the filing of an IND regarding any future lantibiotic candidate is subject to our having sufficient available human, material and financing capital, which includes research subjects, both animal and human, given all of our anticipated needs and expected requirements in connection with our ongoing research and development initiatives. We expect to continue to advance our lantibiotics program to an IND filing based on the availability of both human and financial capital. Based upon the current funding we expect to continue to focus on the identification of new potential product lantibiotic candidates, efficient and cost-effective improvements in the manufacturing processes and pre-clinical studies required to support a first in human Phase 1 clinical study.

We recently announced that we were awarded a small business innovation research grant in the amount of $250,000 ("Computer-aided Design for Improved Lantibiotics" R41GM136034) for the Company's continued research and development of lantibiotics, including its collaborative program with the Biomolecular Sciences Institute at Florida International University (FIU). The grant provides the Company with funding to develop novel lantibiotics for the treatment of ESKAPE pathogens (defined as *Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter spp*.).

Product Candidates.

Through our wholly-owned subsidiary, Noachis Terra, we began the research and development stage for our new Terra CoV-2 and NT-CoV2-1 vaccine product candidate. We hold a nonexclusive, worldwide intellectual property license agreement for certain research, patent applications and biological materials relating to the use of pre-fusion coronavirus spike proteins for the development and commercialization of a vaccine against SARS-CoV-2.

Additionally, we are developing semi-synthetic lantibiotic analogs that may be effective against systemic Gram-positive multidrug infections, and analogs that may be effective in treating Gram negative infections. We seek to protect our product candidates through patents and patent applications.

Product/Candidate	Description	Application	Status
NT-CoV2-1	Intranasal vaccine candidate (plasmid + adjuvant) to provide long lasting immunity against SARS-CoV-2	Broad, community-based vaccine immunity against SARS-CoV-2	Pre-clinical
Terra CoV-2	Intramuscular vaccine candidate (plasmid + adjuvant) to provide long lasting immunity against SARS-CoV-2	Broad, community-based vaccine immunity against SARS-CoV-2	Pre-clinical
Antibiotics	Semi-synthetic analogs of MU1140: Member of lantibiotic class of antibiotics	Healthcare-associated infections	Pre-clinical

Our Business Development Strategy

Success in the biopharmaceutical and product development industry relies on the continuous development of novel product candidates. The large majority of product candidates do not make it past all clinical trials which forces companies to look externally for innovation.

Accordingly, we expect from, time to time, to seek strategic opportunities through various forms of business development, which can include strategic alliances, licensing deals, joint ventures, collaborations, equity or debt-based investments, dispositions, mergers and acquisitions. We view these business development activities as a necessary component of our strategies, and we seek to enhance shareholder value by evaluating business development opportunities both within and complementary to our current business as well as new and separate from the development of our existing product candidates due to the experience we are acquiring.

Our SARS-CoV-2 Vaccine Product Candidate-NT-CoV2-1

Market Opportunity

The worldwide revenues for the Pfizer and Moderna mRNA COVID-19 vaccines in 2021 were $37 billion and $18 billion, respectively. Pfizer projects revenues of $32 billion and Moderna projects $22 billion for their COVID-19 vaccines in 2022. In late January of 2022, the World Health Organization's estimates indicate the number of worldwide COVID-19 infections have exceeded 356,000,000 and the number of deaths directly attributed to COVID-19 have exceeded 5,610,000.

The overall disease burden has continued to increase in the US despite 88% of those 65 years of older being fully vaccinated and 68% of those 5 years of age or older. The current vaccines have reduced the rates of hospitalization and death due to COVID-19 in vaccinated individuals but the transmission levels even in vaccinated individuals has allowed the SARS-CoV-2 variants to continue to circulate, especially the Omicron variant since it emerged in late 2021. We believe an intranasally administered COVID-19 vaccine has the potential to reduce transmission more effectively than intramuscularly administered vaccines because the intranasal vaccine could induce mucosal immunity in the nose and throat, which are the early entry points for SARS-CoV-2. Label expansions to include children down to five years of age have already been implemented and Pfizer/BioNTech are submitting data to the FDA requesting use in those 6 months of age or older. The inclusion of COVID-19 vaccines in the routine childhood immunization schedule may be anticipated assuming COVID-19 enters an endemic phase. Intranasal COVID-19 vaccines could play an important role in routine pediatric immunization since they create less anxiety in needle-phobic children and can more easily fit into an increasingly crowded schedule of injected vaccines.

COVID-19 disease epidemiology is closely monitored and as such recommendations as to vaccinations and treatments have been evolving accordingly. The identification of new COVID-19 variants including Delta and Omicron, and the spread of such variants have altered the dynamics of disease spread and led to the requirement of booster shots in the US and other countries to help facilitate control of the newer viral strains.

Our Strategy

We seek to develop NT-CoV2-1 vaccine candidate to the point of entering into a licensing deal or strategic partnership. In connection with the development of our NT-CoV2-1 vaccine candidate we expect to focus on differentiation of our vaccine product candidate by using intranasal administration, which none of the currently available intramuscular vaccines can offer. We believe that development of a vaccine that has differentiated attributes to those currently being used will be beneficial in helping to control the SARS–CoV-2 pandemic. We anticipate that the main use of NT-CoV2-1 will be as a booster dose for those already vaccinated with a different COVID -19 vaccine, since the vaccination coverage rates in developed countries is already very high. A potential longer-term objective would be to offer NT-CoV2-1 as an intranasal vaccine for the primary immunization of infants or children in the routine childhood immunization schedule.

Should the current COVID-19 pandemic be brought under control quickly and thereby potentially impact our efforts to commercialize our NT-CoV2-1 as a vaccine candidate, we believe we could identify and pursue other vaccines to develop that are capable of preventing new infectious disease threats.

Regulatory

We held a pre- IND meeting with the FDA on our Terra CoV-2 vaccine candidate. The broad support for our approach by the FDA included a number of activities, including: (i) use of the Research Cell Bank in the early manufacturing process development; (ii) Use of early pilot batch manufacture under Good Manufacturing Processes (GMP) for the anticipated Phase 1 clinical trials; and, (iii) submission of draft toxicology reports during IND filing. We have conducted the pre-clinical studies including the Syrian Hamster virus challenge study, the mouse immunogenicity study with positive results for both the intramuscular formulation (Terra CoV-2) and the intranasal formulation (NT-CoV2-1). Due to the potential for greater differentiation with the intranasal vaccine NT-Cov2-1, we are moving that candidate forward into a rabbit toxicology study. Data from the hamster and mouse studies and the rabbit toxicology study will be submitted as part of the IND filing prior to initiation of the Phase 1 human clinical trial for NT-CoV2-1.

Manufacturing

The creation of a stable pool Master Cell Bank is complete and GMP manufacturing of the bulk drug substance has been completed by our Phase 1 biologics contract development and manufacturing organization, Biodextris, Inc. Creation of the clonal Research Cell Bank, required for later stage manufacturing, is completed and will be followed by manufacturing of the clonal Master Cell Bank prior to Phase 2 GMP manufacturing. We use third-party suppliers for the development of our vaccine product candidate, including with respect to the manufacturing of our vaccine candidate for use in pre-clinical studies and expected clinical trials. We enter into agreements with these third-party suppliers as part of, and in connection with, our product development plans and timing. In order to have sufficient product available for anticipated future clinical trials we need to enter into agreements with GMP certified manufactures that have the capability and capacity to meet our expected product needs and timing in advance of when our actual needs will arise in order for us to be positioned to continue development without delays due to the manufacturing process and capabilities of qualified manufacturers.

In March 2022 we entered into an agreement with KBI Biopharma, Inc. for the process transfer, process optimization and cGMP manufacturing of our vaccine candidate in anticipation of a future Phase 2 clinical trial. This agreement obligates us to make certain payments to KBI in connection with the manufacture of our vaccine product candidate based upon our current expected timing. If the timing of our current development plans changes, we could be required to make additional payments to KBI associated with such delays and/or associated with the cancellation of the agreement without achieving the benefits anticipated from the agreement. Additionally, a fill/finish, packaging and labeling company has been identified to support the Phase 1 program and is scheduled for GMP manufacturing of clinical material in 2Q22.

Homologs of MU1140 and Other Lantibiotics

In the course of research and development, MU1140 was found to be a potent antibiotic that is naturally produced by the parent of the SMaRT strain. MU1140 shows antibacterial activity against all Gram-positive bacteria against which it has been tested, including those responsible for a variety of multi-drug resistant organisms and healthcare-associated infections, or HAIs.

We intend to develop lantibiotics, a novel class of antibiotics, as active pharmaceutical ingredients toward the goal of commercialization for the treatment of infectious diseases in humans, focusing on infections caused by the most dangerous bacteria identified by the WHO and CDC priority list. Antibiotic resistance is spurred by overuse and misuse of antibiotics and worsened by the lack of scientific innovation. The timing of the filing of an IND regarding homologs of MU1140 is subject to our having sufficient available capital given all of our anticipated needs and expected requirements in connection with our ongoing research and development initiatives. We expect to continue to advance our lantibiotics program to an IND filing based on the availability of both human and financial capital. Based upon the current funding we expect to continue to focus on the identification of new potential product lantibiotic candidates, efficient and cost-effective improvements in the manufacturing processes and pre-clinical studies required to support a first in human Phase 1 clinical study. In addition, we have undertaken research programs to expand our capabilities to improve the physical chemical characteristics (i.e., solubility and stability) of lantibiotics for use to treat systemic Gram-positive infections and also exploring lantibiotics that may be efficient against Gram negative bacteria.

Market Opportunity

Many Gram-positive related HAIs are caused by drug-resistant bacteria, including methicillin-resistant *Staphylococcus aureus*, or MRSA; vancomycin-resistant *Enterococcus*

faecalis, or VRE; and *Clostridium difficile,* or *C. diff*. According to the most recent Centers for Disease Control and Prevention, (CDC) report on Antibiotic Resistance Threats in the US (2019), the number of people facing antibiotic resistance in the United States is too high. More than 2.8 million antibiotic-resistant infections occur in the United States each year, and more than 35,000 people die as a result. In addition, nearly 223,900 people in the United States required hospital care for *C. difficile* and at least 12,800 people died in 2017.

Antimicrobial resistance is one of the greatest threats to global health. Without innovation, we risk falling into a post-antimicrobial era in which minor infections will become life threatening, and routine medical procedures will be nearly impossible to perform. The World Health Organization predicts that by 2050, antimicrobial resistance could cause 10 million deaths each year, surpassing the projected number of deaths due to cancer. Notably, antimicrobials have a prominent role in the treatment of secondary bacterial infection complications of viral respiratory infections, such as the novel coronavirus.

The literature review findings indicate that the cost of AMR across the globe is extremely high. The CDC estimated that the cost of antimicrobial resistance is $55 billion every year in the United States, $20 billion for health care and about $35 billion for loss of productivity. Recent research by the World Bank indicates that antimicrobial resistance would elevate the rate of poverty and impact low-income countries compared to the rest of the world. Studies show that annual global GDP could decrease by approximately 1% and there would be a 5–7% loss in developing countries by 2050. This percentage ultimately translates into $100-210 trillion.

The need for novel antibiotics is increasing but unfortunately, the worldwide rise of bacterial pathogens resistant to antibacterial agents cannot be counteracted by the current low development pace of therapeutics with new mode(s) of action. While there are nearly 4,000 immuno-oncology agents in development, only about 30–40 new antibacterial compounds are currently in the clinical trial phases of development, and, notably, those candidates targeting World Health Organization (WHO) priority pathogens are derivatives of existing classes. Less than 25% of current drugs in the clinical development pipeline represent a novel class or act through a novel mechanism, and none of these are potentially active against Gram-negative ESKAPE or WHO critical threat pathogens. Only a small fraction of the antibiotics approved over the past 40 years represents new compound classes, while the majority were derived from already known chemical structures, and the most recent new class of antibiotics was discovered during the 1980s. According to Nature.com, no new class of Gram-negative antibiotics has been launched for more than 50 years.

Lantibiotics such as MU1140 are highly modified peptide antibiotics made by a small group of Gram-positive bacterial species. Over 60 lantibiotics have been discovered since the first lantibiotic, nisin, was discovered. Lantibiotics are generally known to be potent antibiotic agents; however, attempts to investigate their clinical usefulness have generally met with failure due to the inability to produce sufficient pure amounts of any of these molecules to be able to test them as a therapeutic agent for the treatment of infectious diseases. Standard fermentation methods, such as those used to make a variety of other antibiotics, have historically resulted in the production of only minute amounts of the lantibiotic.

Our Solution

To develop homologs of MU1140 and, engineered in parallel, high producing strains to the point of partnership, and to develop additional lantibiotics in connection with our work on MU1140. MU1140 has demonstrated activity against a wide variety of disease-causing Gram-positive bacteria, including MRSA, VRE, and *C. difficile*.

To develop homologs of MU1140 paired with high producing strains to the point of partnership, and to develop additional lantibiotics in connection with our work on MU1140. MU1140 has demonstrated activity against a wide variety of disease-causing Gram-positive bacteria, including MRSA, VRE, *C. diff, Mycobacterium tuberculosis* and *Bacillus anthracis*.

Our Strategy

We are developing and testing recombinantly derived homologs of the native MU1140 molecule and its chemical derivative with improved therapeutic profiles and physical-chemical characteristics. The data generated over the past few years enabled us to engineer hundreds of homologs of MU1140, and select those homolog candidates with improved profiles, including homologs of higher activity and stability, lower toxicity and with a scalable manufacturability. The best homolog candidates were further developed internally and through the use of several Contract Research Organizations ("CROs"). We believe that this strategy represented the best and most efficient path to produce sufficient quantities of MU1140 homologs, to support continued research, selection of a lead candidate, nonclinical studies, clinical studies and ultimately commercialization. We intend to continue to follow this proven discovery path to identify novel MU1140 derivatives to treat other multi-drug resistant infections and HAIs.

Regulatory Status

We have performed nonclinical testing on MU1140 and several of its homologs, which has demonstrated the molecule's novel mechanism of action. We expect to continue our research and pre-clinical development activities on derivatives of MU1140 subject to the availability of adequate financing as we move towards the filing of an IND.

Manufacturing

While we have been able to produce a significant increase in the fermentation titer of homologs of MU1140, we continue to work to improve on the manufacturing through collaborations with fermentation and purification experts and third party CROs. We will need to further optimize and scale up the production/purification scheme internally and through third party vendors. The need to examine many new homologs of MU1140 has resulted in the need to reproduce the fermentation and purification steps on each individual homolog candidate being studied. Each homolog requires different optimizations for both the fermentation, purification and chemical derivatization steps and in some cases requires a new approach. As such, our work on the research and development of new lantibiotic homologs using genetically modified bacteria continues. We believe these developments represent progress toward our goal of commercial production of sufficient quantities of our MU1140 homologs and deliver a step in validating the lantibiotics platform targeting infectious diseases.

We are working with a third-party manufacturer to produce additional quantities of designated homologs, based upon the developments achieved from our work with our outside contractors. The production of additional quantities of designated homologs, that are needed for the consummation and pursuit of our nonclinical testing activities supporting the IND filing, are ongoing. We will continue to explore improved methods of manufacturing and synthesis to improve our yields and ultimately, potentially reduce our cost of manufacture.

Our License Agreements

Our NIH License Agreement

Through our wholly-owned subsidiary, Noachis Terra, we are party to a Patent License and Biological Materials License Agreement (the "License Agreement" or "NIH License"), dated March 23, 2020, with the United States Department of Health and Human Services (the "HHS"), as represented by the NIAID, an Institute of the NIH. Under the terms of the License Agreement, we hold a nonexclusive, worldwide license to certain specified patent rights (including patent applications, provisional patent applications and Patent Cooperation Treaty ("PCT") patent applications) and biological materials relating to the use of prefusion coronavirus spike proteins to exploit products ("Licensed Products") and practice processes ("Licensed Processes") that are covered by the licensed patent rights and biological materials for the purpose of developing and commercializing a vaccine product candidate for SARS-CoV-2. The License Agreement is subject to certain statutory limits and reserved rights, as required under federal law and NIH requirements, including the requirement to provide reasonable quantities of Licensed Products or materials made through the Licensed Processes for NIH research and to manufacture Licensed Products or materials made through the Licensed Processes substantially in the United States. We may not sublicense the intellectual property or biological materials licensed to us under the License Agreement.

Pursuant to the License Agreement, we must use reasonable commercial efforts to manufacture, practice or operate the Licensed Products and the Licensed Processes, including adhering to a commercial development plan and achieving certain benchmarks. Additionally, following the first commercial sale of any Licensed Products or the practice of any Licensed Processes, we must use reasonable commercial efforts to make the Licensed Products and the Licensed Processes reasonably accessible to the United States public and reasonable quantities of the Licensed Products and the Licensed Processes available to patient assistance program, among other educational support activities. The NIAID has agreed to assume responsibility for the preparation, filing, prosecution and maintenance of all patent applications and patents covered by the licensed patent rights.

Under the terms of the License Agreement, the NIAID is entitled to receive a non-creditable, nonrefundable upfront license issue royalty (which has already been paid), as well as reimbursement for our pro rata share of the NIAID's past and future patent prosecution-related expenses. Additionally, the NIAID is entitled to receive nonrefundable minimum annual royalties, which increase each year after the first commercial sale of any Licensed Products or the practice of any Licensed Processes, as well as benchmark royalties following our completion of certain commercial development and sales-related benchmarks. The NIH is entitled to receive earned royalties on the annual net sales of Licensed Products and the practice of any Licensed Processes (subject to certain reductions), at certain low- to mid-single digit royalty rates, which rates vary based on the total amount of annual net sales and the geographic market in which those sales occur. We must provide regular written reports to the NIAID on the development status of and royalty payments relating to the Licensed Products and the Licensed Processes.

We must indemnify and hold the NIAID and its associates harmless from and against all liability and damages in connection with or arising out of (a) the use or beneficial use of the Licensed Patent rights by us, our directors, employees or third parties and (b) the design, manufacture, distribution or use of any Licensed Products or Licensed Processes, including other products or processes developed in connection with the Licensed Patent Rights.

Unless terminated earlier, the License Agreement will terminate upon the earlier of (a) twenty (20) years from the first commercial sale where no licensed patent rights exist or have ceased to exist or (b) the expiration of the last to expire of any licensed patent rights. At this time, no patents covered by the licensed patent rights have been issued. We may terminate the License Agreement at any time, subject to advance notice. Subject to certain cure and appeal rights, the NIAID may terminate or modify the License Agreement in the event of a material breach or default, including, among others, the following:

(i) We become insolvent or the subject of a bankruptcy petition;

(ii) We fail to follow the commercial development plan, fail to achieve certain commercial development and sales-related benchmarks or cannot otherwise demonstrate progress toward a practical application of the Licensed Products or Licensed Processes;

(iii) We fail to keep any Licensed Products or Licensed Processes reasonably available to the public following the commencement of commercial use or fail to reasonably justify noncompliance with its domestic production obligation;

(iv) We cannot reasonably satisfy public health and safety needs; or

(v) The NIAID determines termination or modification is necessary because we cannot meet federal public use regulatory requirements, as issued after the effective date of the License Agreement.

Our NRC License Agreement

On July 26, 2021, we entered into a non-exclusive Technology License Agreement (the "License Agreement") with the National Research Council of Canada ("NRC") pursuant to which the NRC granted us a license to use NRC's inventions, patents, trade secrets, know-how, copyright, biological material, designs, and/or technical information created by or on behalf of the NRC (the "NRC Technologies") relating to the derivatives of CHO 2353 TM Cell Line listed in the License Agreement (the "Stable Cells") to: (i) make, research, and develop SARS-CoV-2 spike protein manufactured by a Stable Cell (the "Drug Substance") within Canada, Australia, the United Kingdom, the European Union and the United States (U.S.) (collectively the "Territory"); (ii) file regulatory approval, export and sell the final formulation of the Drug Substance ("Products") and (iii) engage contractors to use the Stable Cells to make Drug Substance or Products on our behalf to be used and sold, worldwide, by us. The License Agreement was subsequently amended to include the Delta and Omicron variants. In addition, we subsequently amended the License Agreement to broaden the non-exclusive field of use to include all diseases caused by coronaviruses and any genetic variants thereof.

As consideration for the grant of the license, we will pay to the NRC an annual (low five digits) license fee, with the initial portion of the fee covering the first three years of the license. Additionally, we will pay certain milestone payments (a) upon transfer of each Stable Cell listed in the Agreement and (b) with regard to each of the first three Products, (i) upon submission of the IND application related thereto, (ii) upon dosing the first patient in a Phase 1 or Phase 2 clinical trial, (iii) upon dosing the first patient in a Phase 3 clinical trial and (iv) upon first regulatory approval. Milestone payments range from the low five digits to high six digits. In addition, Oragenics will pay a low single-digit royalty to the NRC for the sale of Products, based on sales revenue, commencing after the first commercial sale.

Pursuant to the License Agreement, the NRC is required to bear the responsibility and pay the costs to obtain and maintain patents related to the NRC Technologies in the U.S., Canada, Brazil, European Union, Japan, South Korea, Singapore, Australia, China, and India, and the NRC shall use reasonable efforts to obtain and maintain those patents. Additional countries may be requested by us, in which event, the NRC will file and maintain such patents, at our expense.

Pursuant to the License Agreement, we are required to indemnify and hold the NRC and its employees and agents harmless from and against all liability and damages in connection with or arising out of all claims, demands, losses, damages, costs including solicitor and client costs, actions, suits or proceedings brought by any third party that are in any manner based upon, arising out of, related to, occasioned by, or attributable to the manufacturing, distribution, shipment, offering for sale, sale, or use of Products, services based on the NRC Technologies and product liability and infringement of intellectual property rights other than copyright, if any, licensed under the License Agreement.

Unless terminated earlier, the License Agreement will terminate twenty (20) years from the effective date of the License Agreement. Either party may terminate the License Agreement, by giving written notice to the other party, if the other party defaults or is in breach of the License Agreement, provided that if the defaulting party cures the breach within 60 days after the notice is given, the License Agreement shall continue in full force and effect. The NRC may terminate the License Agreement if we become bankrupt, or insolvent, or has a receiver appointed to continue its operations, or passes a resolution for winding up. The License Agreement contains customary confidentiality obligations.

Other Product Candidates and Technologies

We have historically developed other product candidates and potential product candidates. For example, we developed a weight loss candidate, LPT3-04, and a topical treatment to prevent dental carries which we refer to as SMaRT Replacement Therapy. We out licensed LPT3-04 to a third party and continue to monitor our licensee's performance under the license. We do not expect the LPT3-04 license to have a material effect on our business or operations. While we retain certain intellectual property rights with respect to homologs through our (i) prior relationship with Texas A&M University Systems and (ii) ILH Holdings (as assignee of Precigen) that could allow for the continued research and development of compounds for the SMaRT replacement Therapy, we do not intend to pursue further development of SMaRT Replacement Therapy and as such we do not consider these rights to be a material part of our business and operations.

Government Regulations

In the United States, foods (including dietary supplements), drugs (including biological products), medical devices, cosmetics, tobacco products and radiation-emitting products are subject to extensive regulation by the FDA. The FDC Act and other federal and state statutes and regulations govern, among other things, the manufacture, distribution and sale of these products. These laws and regulations prescribe criminal and civil penalties that can be assessed, and violation of these laws and regulations can result in enforcement action by the FDA and other regulatory agencies.

FDA Regulation of Drugs-New Drug Approval Process

Pharmaceutical products are subject to extensive regulation by the FDA. 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. Failure to comply with applicable U.S. requirements may subject a company to a variety of administrative or judicial sanctions, such as FDA refusal to approve pending NDAs or BLAs, warning or untitled letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, civil penalties and criminal prosecution.

Pharmaceutical product development for a new product or certain changes to an approved product in the United States typically involves the following steps before a biological product or new drug may be marketed in the United States:

- pre-clinical laboratory tests, animal studies and formulation studies in compliance with the FDA's Good Laboratory Practice and Good Manufacturing Practice regulations;
- submission to the FDA of an IND application for human clinical testing, which must become effective before human clinical trials may commence;
- performance of adequate and well-controlled clinical trials in three phases, as described below, to establish the safety and efficacy of the drug for each indication according to Good Clinical Practices;
- submission of an NDA or Biologics License Application ("BLA") to the FDA for review;
- random inspections of clinical sites to ensure validity of clinical safety and efficacy data;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities at which the drug is produced to assess compliance with current good manufacturing practices;
- FDA approval of the NDA or BLA; and
- payment of user and establishment fees, if applicable.

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.

Pre-clinical 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 pre-clinical tests must comply with federal regulations and requirements, including good laboratory practices. The results of pre-clinical 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 pre-clinical tests, such as animal tests of reproductive toxicity and carcinogenicity, 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 IND 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, or 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 is not being conducted in accordance with FDA requirements or presents an unacceptable risk to the clinical trial patients. The trial protocol and informed consent information for patients in clinical trials must also be submitted to an institutional review board or IRB for approval. 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.

Clinical trials to support NDAs or BLAs for marketing approval are typically conducted in three sequential phases, but the phases may overlap. In Phase 1, after the initial introduction of the drug into healthy human subjects or patients, the drug is tested to assess metabolism, pharmacokinetics, pharmacological actions, side effects associated with increasing doses, and, if possible, early evidence on effectiveness. Phase 2 usually involves trials in a limited patient population to determine the effectiveness of the drug for a particular indication, dosage tolerance, and optimum dosage, 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 the additional information about clinical 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 drug and to provide adequate information for the labeling of the drug. In most cases the FDA requires two adequate and well-controlled Phase 3 clinical trials to demonstrate the efficacy of the drug. A single Phase 3 clinical trial with other confirmatory evidence may be sufficient in rare instances where 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.

The length of time and related costs necessary to complete clinical trials varies significantly and may be difficult to predict. Clinical trial results are frequently susceptible to varying interpretations that may delay, limit or prevent regulatory approvals. Additional factors that can cause delay or termination of our clinical trials, or cause the costs of these clinical trials to increase, include:

- slow patient enrollment due to the nature of the protocol, the proximity of patients to clinical sites, the eligibility criteria for the trial, competition with clinical trials for other drug candidates or other factors;

- inadequately trained or insufficient personnel at the trial site to assist in overseeing and monitoring clinical trials;
- delays in approvals from a trial site's IRB;
- longer than anticipated treatment time required to demonstrate effectiveness or determine the appropriate product dose;
- lack of sufficient supplies of the drug candidate for use in clinical trials;
- adverse medical events or side effects in treated patients; and
- lack of effectiveness of the drug candidate being tested.

Any drug is likely to produce some toxicities or undesirable side effects in animals and in humans when administered at sufficiently high doses and/or for sufficiently long periods of time. Unacceptable toxicities or side effects may occur at any dose level, and at any time in the course of animal studies designed to identify unacceptable effects of a drug candidate, known as toxicological studies, or in clinical trials of our drug candidates. The appearance of any unacceptable toxicity or side effect could cause us or regulatory authorities to interrupt, limit, delay or abort the development of any of our drug candidates, and could ultimately prevent their marketing approval by the FDA or foreign regulatory authorities for any or all targeted indications.

The FDA's fast track and breakthrough therapy designation programs are intended to facilitate the development and expedite the review of drug candidates intended for the treatment of serious or life-threatening conditions and that demonstrate the potential to address unmet medical needs for these conditions. Under these programs, FDA can, for example, review portions of an NDA or BLA for a drug candidate before the entire application is complete, thus potentially beginning the review process at an earlier time.

We cannot guarantee that the FDA will grant any of our requests for fast track or breakthrough therapy designations, that any such designations would affect the time of review or that the FDA will approve the NDA or BLA submitted for any of our drug candidates, whether or not these designations are granted. Additionally, FDA approval of a fast track/breakthrough product can include restrictions on the product's use or distribution (such as permitting use only for specified medical conditions or limiting distribution to physicians or facilities with special training or experience). Approval of such designated products can be conditioned on additional clinical trials after approval.

In addition, the manufacturer of an investigational drug 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 expanded access.

After completion of the required clinical testing, an NDA or BLA is prepared and submitted to the FDA. FDA approval of the NDA or BLA is required before marketing of the product may begin in the U.S. The NDA or the BLA must include the results of all pre-clinical, 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 an NDA is substantial. The submission of most NDAs and BLAs is additionally subject to a substantial application user fee, currently approximately $2,875,842 for fiscal year 2021. These fees typically increase annually.

The FDA has 60 days from its receipt of an NDA or BLA to determine whether the application will be filed based on the agency's threshold determination that it is sufficiently complete to permit substantive review. If the NDA or BLA submission is filed, the FDA reviews the NDA or BLA to determine, among other things, whether the proposed product is safe and effective for its intended use. The FDA has agreed to certain performance goals in the review of NDAs or BLAs. Most such applications for standard review drug products are reviewed within ten to twelve months; most applications for priority review drugs are reviewed in six to eight months. Priority review can be applied to drugs that the FDA determines offer major advances in treatment, or provide a treatment where no adequate therapy exists. For biologics, priority review is further limited to drugs intended to treat a serious or life-threatening disease relative to the currently approved products. The review process for both standard and priority review may be extended by the FDA for three additional months to consider certain late-submitted information, or information intended to clarify information already provided in the submission.

The FDA may also refer applications for novel drug products, or drug products that present difficult questions of safety or efficacy, to an advisory committee – typically a panel that includes clinicians and other experts – for review, evaluation and a recommendation as to whether the application should be approved. The FDA is not bound by the recommendation of an advisory committee, but it generally follows such recommendations. Before approving an NDA or 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 drug is manufactured. The FDA will not approve the product unless compliance with cGMPs is satisfactory and the NDA or BLA contains data that provide substantial evidence that the drug is safe and effective in the indication studied.

After the FDA evaluates the NDA or BLA and the manufacturing facilities, it issues either an approval letter or a complete response letter. A complete response letter generally outlines the deficiencies in the submission and may require substantial additional testing, or information, in order for the FDA to reconsider the application. If, or when, those deficiencies have been addressed to the FDA's satisfaction in a resubmission of the NDA or 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 of the drug with specific prescribing information for specific indications. As a condition of NDA or BLA approval, the FDA may require a risk evaluation and mitigation strategy, or REMS, to help ensure that the benefits of the drug outweigh the potential risks. REMS can include medication guides, communication plans for healthcare professionals, and elements to assure safe use, or ETASU. ETASU can include, but are not limited to, special training or certification for prescribing or dispensing, dispensing only under certain circumstances, special monitoring and the use of patient registries. The requirement for a REMS can materially affect the potential market and profitability of the drug. Moreover, product approval may require substantial post-approval testing and surveillance to monitor the drug'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 application, including changes in indications, labeling, or manufacturing processes or facilities, require submission and FDA approval of a new NDA or BLA supplement before the change can be implemented. An NDA or 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 NDA or BLA supplements as it does in reviewing NDAs or BLAs.

The required testing, data collection, analysis and compilation of an IND and a BLA or NDA are labor intensive and costly and may take a great deal of time. Tests may have to be redone or new tests performed in order to comply with FDA requirements. It can take considerable time (e.g., 5-10 years) and resources to achieve enrollment sufficient to commence such trials and complete Phase 2 or 3 clinical trials. Moreover, there is no guarantee a product will be approved.

In Canada, the Therapeutic Products Directorate and the Biologics and Genetic Therapies Directorate of HC ensure that clinical trials are properly designed and undertaken and that subjects are not exposed to undue risk. Regulations define specific Investigational New Drug Submission (or IND) application requirements, which must be complied with before a new drug can be distributed for trial purposes. The Directorates currently review the safety, efficacy and quality data submitted by the sponsor and approve the distribution of the drug to the investigator. The sponsor of the trial is required to maintain accurate records, report adverse drug reactions, and ensure that the investigator adheres to the approved protocol. Trials in humans should be conducted according to generally accepted principles of good clinical practice. Management believes that these standards provide assurance that the data and reported results are credible and accurate, and that the rights, integrity, and privacy of clinical trial subjects are protected.

Sponsors wishing to conduct clinical trials in Phases 1 to 3 of development must apply under a 30-day default system. Applications must contain the information described in

the regulations, including: a clinical trial attestation; a protocol; statements to be contained in each informed consent form, that set out the risks posed to the health of clinical trial subjects as a result of their participation in the clinical trial; an investigator's brochure; applicable information on excipients (delivery vehicles); and chemistry and manufacturing information.

The sponsor can proceed with the clinical trial if the Directorates have not objected to the sale or importation of the drug within 30 days after the date of receipt of the clinical trial application and Research Ethics Board approval for the conduct of the trial at the site has been obtained. Additional information is available on Health Canada's website - www. hc-sc.gc.ca.

Outside the United States and Canada, our ability to market a product is contingent upon receiving a marketing authorization from the appropriate regulatory authorities. The requirements governing the conduct of clinical trials, marketing authorization, pricing and reimbursement vary widely from country to country. At present, foreign marketing authorizations are applied for at a national level, although within the European Union (EU) registration procedures are available to companies wishing to market a product in more than one EU member state. If the regulatory authority is satisfied that adequate evidence of safety, quality and efficacy has been presented, a marketing authorization may be granted. This foreign regulatory approval process involves all of the risks associated with FDA approval discussed above and may also include additional risks.

The Orphan Drug Act provides incentives to manufacturers to develop and market drugs for rare diseases and conditions affecting fewer than 200,000 persons in the United States at the time of application for orphan drug designation. The first developer to receive FDA marketing approval for an orphan drug is entitled to a seven-year exclusive marketing period in the United States for the orphan drug indication. However, a drug that the FDA considers to be clinically superior to, or different from, another approved orphan drug, even though for the same indication, may also obtain approval in the United States during the seven-year exclusive marketing period.

Under the FDA Modernization Act of 1997, designation as a Fast-Track product for a new drug or biological product means that the FDA will take such actions as are appropriate to expedite the development and review of the application for approval of such product.

Legislation similar to the Orphan Drug Act has been enacted in other countries outside of the United States, including the EU. The orphan legislation in the EU is available for therapies addressing conditions that affect five or fewer out of 10,000 persons, are life-threatening or chronically debilitating conditions and for which no satisfactory treatment is authorized. The market exclusivity period is for ten years, although that period can be reduced to six years if, at the end of the fifth year, available evidence establishes that the product does not justify maintenance of market exclusivity.

Emergency Use Authorization

The FDA also has the authority to grant an EUA to allow unapproved medical products to be used in an emergency to diagnose, treat, or prevent serious or life-threatening diseases or conditions when there are no adequate, approved, and available alternatives. Emergency Use Authorizations granted by the FDA would permit a drug candidate to be able to be distributed under the conditions set forth in the Emergency Use Authorization prior to FDA approval. Due to the global COVID-19 pandemic, certain of our competitors have sought and obtained EUA from the FDA for their COVID-19 vaccines. Furthermore, the FDA may revoke an Emergency Use Authorization where it is determined that the underlying health emergency no longer exists or warrants such authorizations.

Pediatric Information

Under the Pediatric Research Equity Act, or PREA, NDAs, BLAs or supplements to NDAs or BLAs must contain data to assess the safety and effectiveness of the drug for the claimed indications in all relevant pediatric subpopulations and to support dosing and administration for each pediatric subpopulation for which the drug is safe and effective. The FDA may grant full or partial waivers, or deferrals, for submission of data. Unless otherwise required by regulation, PREA does not apply to any drug for an indication for which orphan designation has been granted, except a product with a new active ingredient that is a molecularly targeted cancer product intended for the treatment of an adult cancer and directed at a molecular target determined by FDA to be substantially relevant to the growth or progression of a pediatric cancer that is subject to an NDA submitted on or after August 18, 2020.

The Best Pharmaceuticals for Children Act, or BPCA, provides NDA holders a six-month extension of any exclusivity – patent or non-patent – for a drug if certain conditions are met. For BLAs, the BPCA provides a six-month extension for non-patent exclusivity if certain conditions are met. Conditions for exclusivity include the FDA's determination that information relating to the use of a new drug in the pediatric population may produce health benefits in that population, the FDA making a written request for pediatric studies, and the applicant agreeing to perform, and reporting on, the requested studies within the statutory timeframe. Applications under the BPCA are treated as priority applications, with all of the benefits that designation confers.

Disclosure of Clinical Trial Information

Sponsors of clinical trials of FDA-regulated products, including drugs, are required to register and disclose certain clinical trial information. 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.

The Hatch-Waxman Amendments

Orange Book Listing

In seeking approval for a drug through an NDA, applicants are required to list with the FDA each patent with claims covering the applicant's product or method of using the product. Upon approval of a drug, each of the patents listed in the application for the drug is then published in the FDA's Approved Drug Products with Therapeutic Equivalence Evaluations, commonly known as the Orange Book. Drugs listed in the Orange Book can, in turn, be cited by potential generic competitors in support of approval of an abbreviated new drug application, or ANDA. An ANDA provides for marketing of a drug product that has the same active ingredients in the same strengths and dosage form as the listed drug and has been shown to be bioequivalent to the listed drug. Other than the requirement for bioequivalence testing, ANDA applicants are not required to conduct, or submit results of, pre-clinical or clinical tests to prove the safety or effectiveness of their drug product. Drugs approved in this way are commonly referred to as "generic equivalents" to the listed drug, and can often be substituted by pharmacists under prescriptions written for the original listed drug.

The ANDA applicant is required to certify to the FDA concerning any patents listed for the approved product in the FDA's Orange Book. Specifically, the applicant must certify that: (i) the required patent information has not been filed; (ii) the listed patent has expired; (iii) the listed patent has not expired, but will expire on a particular date and approval is sought after patent expiration; or (iv) the listed patent is invalid or will not be infringed by the new product. The ANDA applicant may also elect to submit a section viii statement certifying that its proposed ANDA labeling does not contain (or carves out) any language regarding the patented method-of-use rather than certify to a listed method-of-use patent. If the applicant does not challenge the listed patents, the ANDA application will not be approved until all the listed patents claiming the referenced product have expired.

A certification that the new product will not infringe the already approved product's listed patents, or that such patents are invalid, is called a Paragraph IV certification. If the

ANDA applicant has provided a Paragraph IV certification to the FDA, the applicant must also send notice of the Paragraph IV certification to the NDA and patent holders once the ANDA has been received by the FDA. The NDA and patent holders may then initiate a patent infringement lawsuit in response to the notice of the Paragraph IV certification. The filing of a patent infringement lawsuit within 45 days of the receipt of a Paragraph IV certification automatically prevents the FDA from approving the ANDA until the earlier of 30 months, expiration of the patent, settlement of the lawsuit or a decision in the infringement case that is favorable to the ANDA applicant.

The ANDA application also will not be approved until any applicable non-patent exclusivity listed in the Orange Book for the referenced product has expired.

Exclusivity

Exclusivity provisions under the FDC Act also can delay the submission or the approval of certain applications. The FDC Act provides a five-year period of non-patent exclusivity within the United States to the first applicant to gain approval of an NDA for a new chemical entity, or NCE. A drug is entitled to NCE exclusivity if it contains a drug substance no active moiety of which has been previously approved by the FDA. During the exclusivity period, the FDA may not accept for review an ANDA or file a 505(b)(2) NDA submitted by another company for another version of such drug where the applicant does not own or have a legal right of reference to all the data required for approval. However, an application may be submitted after four years if it contains a Paragraph IV certification. The FDC Act also provides three years of market exclusivity for an NDA, including a 505(b)(2) NDA, or supplement to an existing NDA if new clinical investigations, other than bioavailability studies, that were conducted or sponsored by the applicant are deemed by the FDA to be essential to the approval of the application, for example, for new indications, dosages or strengths of an existing drug. This three-year exclusivity covers only the conditions for use associated with the new clinical investigations and does not prohibit the FDA from approving ANDAs for drugs for the original conditions of use, such as the originally approved indication. Five-year and three-year exclusivity will not delay the submission or approval of a full NDA; however, an applicant submitting a full NDA would be required to conduct or obtain a right of reference to all the non-clinical studies and adequate and well-controlled clinical trials necessary to demonstrate safety and effectiveness.

Patent Term Extension

After NDA approval, the owner of relevant drug patent may apply for up to a five-year patent term extension. Only one patent may be extended for each regulatory review period, which is composed of two parts: a testing phase, and an approval phase. The allowable patent term extension is calculated as half of the drug's testing phase – the time between the day the IND becomes effective and NDA submission – and all of the review phase – the time between NDA submission and approval up to a maximum of five years. The time can be shortened if the FDA determines that the applicant did not pursue approval with due diligence. The total patent term after the extension may not exceed 14 years and only one patent may be extended.

For patents that might expire during the application phase, the patent owner may request an interim patent extension. An interim patent extension increases the patent term by one year and may be renewed up to four times. For each interim patent extension granted, the post-approval patent extension is reduced by one year. The director of the U.S. Patent and Trademark Office must determine that approval of the drug covered by the patent for which a patent extension is being sought is likely. Interim patent extensions are not available for a drug for which an NDA has not been submitted.

Section 505(b)(2) New Drug Applications

Most drug products obtain FDA marketing approval pursuant to an NDA or an ANDA. A third alternative is a special type of NDA, commonly referred to as a Section 505(b)(2), or 505(b)(2), NDA, which enables the applicant to rely, in part, on studies not conducted by, or for, the applicant and for which the applicant has not obtained a right of reference or use, such as the FDA's findings of safety and/or effectiveness for a similar previously approved product, or published literature, in support of its application.

505(b)(2) NDAs often provide an alternate path to FDA approval for new or improved formulations or new uses of previously approved products. Section 505(b)(2) permits the filing of an NDA where at least some of the information required for approval comes from studies not conducted by, or for, the applicant and for which the applicant has not obtained a right of reference. If the 505(b)(2) applicants can establish that reliance on the FDA's previous approval is scientifically appropriate, it may eliminate the need to conduct certain pre-clinical or clinical trials of the new product. The FDA may also require companies to perform additional studies or measurements to support the change from the approved product. The FDA may then approve the new product candidate for all, or some, of the label indications for which the referenced product has been approved, as well as for any new indication sought by the Section 505(b)(2) applicant.

To the extent that the Section 505(b)(2) applicant is relying on studies conducted for an already approved product, the applicant is required to certify to the FDA concerning any patents listed for the approved product in the Orange Book to the same extent that an ANDA applicant would. Thus approval of a 505(b)(2) NDA can be stalled until all the listed patents claiming the referenced product have expired, until any non-patent exclusivity, such as exclusivity for obtaining approval of a new chemical entity, listed in the Orange Book for the referenced product has expired, and, in the case of a Paragraph IV certification and subsequent patent infringement suit, until the earlier of 30 months, settlement of the lawsuit or a decision in the infringement case that is favorable to the Section 505(b)(2) applicant.

Post-Approval Requirements

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

Adverse event reporting and submission of periodic reports are required following FDA approval of an NDA or BLA. The FDA also may require post-marketing testing, known as Phase 4 testing, REMS, and surveillance to monitor the effects of an approved product, or the FDA may place conditions on an approval that could restrict the distribution or use of the product. In addition, quality-control, drug manufacture, packaging and labeling procedures must continue to conform to cGMPs after approval. Drug manufacturers and certain of their subcontractors are required to register their establishments with the FDA and certain state agencies. Registration with the FDA, subjects entities to periodic unannounced inspections by the 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. In addition, prescription drug manufacturers in the United States must comply with applicable provisions of the Drug Supply Chain Security Act and provide and receive product tracing information, maintain appropriate licenses, ensure they only work with other properly licensed entities, and have procedures in place to identify and properly handle suspect and illegitimate products.

Failure to comply with the applicable FDA requirements may subject manufacturers and distributors to administrative or judicial sanctions. These sanctions could include, among other things, warning letters, product seizures, total or partial suspension of production or distribution, injunctions, civil money penalties, fines, restitution, disgorgement, or civil or criminal penalties. Further, the FDA has authority to issue mandatory recalls for medical devices and biologics, and we may need to undertake a voluntary recall for any of our products.

In addition to regulations enforced by the FDA, we are also subject to regulation under the Occupational Safety and Health Act, the Environmental Protection Act, the Toxic Substances Control Act, the Resource Conservation and Recovery Act and other federal, state and local regulations. Our research and development activities involve the

controlled use of hazardous materials, chemicals, biological materials and radioactive compounds.

Biologics

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, except the section of the FDC Act which governs the approval of NDAs. Biological products are approved for marketing under provisions of the Public Health Service Act, or PHSA, via a BLA. However, the application process and requirements for approval of BLAs are very similar to those for NDAs, and biologics are associated with similar approval risks and costs as drugs. 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 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 in the US and between 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 history of manufacture of the lot 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 releasing the lots for distribution by the manufacturer. In addition, the FDA conducts laboratory research related to the regulatory standards on the safety, purity, potency, and effectiveness of biological products. As with drugs, after approval of 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.

The Biologics Price Competition and Innovation Act of 2009, or 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 studies, animal studies, and at least one clinical trial, absent a waiver by the Secretary. A biosimilar product may be deemed interchangeable with a prior 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. To date, only four biosimilar products and no interchangeable products have been approved under the BPCIA. Complexities associated with the larger, and often more complex, structures of biological products, as well as the process by which such products are manufactured, particularly with respect to interchangeability, are still being evaluated by the FDA.

A reference biologic is granted twelve years of exclusivity from the time of first licensure 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 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) eighteen 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.

Regulation Outside the United States

In order to market any product outside of the United States, a company must also comply with numerous and varying regulatory requirements of other countries and jurisdictions regarding quality, safety and efficacy and governing, among other things, clinical trials, marketing authorization, commercial sales and distribution of drug products. Whether or not it obtains FDA approval for a product, the company would need to obtain the necessary approvals by the comparable foreign regulatory authorities before it can commence clinical trials or marketing of the product in those countries or jurisdictions. The approval process ultimately varies between countries and jurisdictions and can involve additional product testing and additional administrative review periods. The time required to obtain approval in other countries and jurisdictions might differ from and be longer than that required to obtain FDA approval. Regulatory approval in one country or jurisdiction does not ensure regulatory approval in another, but a failure or delay in obtaining regulatory approval in one country or jurisdiction may negatively impact the regulatory process in others.

Regulation and Marketing Authorization in the European Union

The process governing approval of medicinal products in the European Union follows essentially the same lines as in the United States and, likewise, generally involves satisfactorily completing each of the following:

- pre-clinical laboratory tests, animal studies and formulation studies all performed in accordance with the applicable EU Good Laboratory Practice regulations;
- submission to the relevant national authorities of a clinical trial application, or CTA, which must be approved before human clinical trials may begin;
- performance of adequate and well-controlled clinical trials to establish the safety and efficacy of the product for each proposed indication;
- submission to the relevant competent authorities of a marketing authorization application, or MAA, which includes the data supporting safety and efficacy as well as detailed information on the manufacture and composition of the product in clinical development and proposed labeling;
- satisfactory completion of an inspection by the relevant national authorities of the manufacturing facility or facilities, including those of third parties, at which the product is produced to assess compliance with strictly enforced current cGMP;
- potential audits of the non-clinical and clinical trial sites that generated the data in support of the MAA; and
- review and approval by the relevant competent authority of the MAA before any commercial marketing, sale or shipment of the product.

Pre-clinical Studies

Pre-clinical tests include laboratory evaluations of product chemistry, formulation and stability, as well as studies to evaluate toxicity in animal studies, in order to assess the potential safety and efficacy of the product. The conduct of the pre-clinical tests and formulation of the compounds for testing must comply with the relevant EU regulations and requirements. The results of the pre-clinical tests, together with relevant manufacturing information and analytical data, are submitted as part of the CTA.

Clinical Trial Approval

Requirements for the conduct of clinical trials in the European Union including GCP are implemented in the Clinical Trials Directive 2001/20/EC and the GCP Directive 2005/28/EC. Pursuant to Directive 2001/20/EC and Directive 2005/28/EC, as amended, a system for the approval of clinical trials in the European Union has been implemented through national legislation of the member states. Under this system, approval must be obtained from the competent national authority of an EU member state in which a study is planned to be conducted, or in multiple member states if the clinical trial is to be conducted in a number of member states. To this end, a CTA is submitted, which must be supported by an investigational medicinal product dossier, or IMPD, and further supporting information prescribed by Directive 2001/20/EC and Directive 2005/28/EC and

other applicable guidance documents. Furthermore, a clinical trial may only be started after a competent ethics committee has issued a favorable opinion on the clinical trial application in that country.

In April 2014, the EU legislators passed the new Clinical Trials Regulation, (EU) No 536/2014, which replaced the current Clinical Trials Directive 2001/20/EC. To ensure that the rules for clinical trials are identical throughout the European Union, the new EU clinical trials legislation was passed as a regulation that is directly applicable in all EU member states. All clinical trials performed in the European Union are required to be conducted in accordance with the Clinical Trials Directive 2001/20/EC until the new Clinical Trials Regulation (EU) No 536/2014 becomes applicable. According to the current plans of the European Medicines Agency, or EMA, the new Clinical Trials Regulation which became applicable in 2019. The Clinical Trials Directive 2001/20/EC will, however, still apply three years from the date of entry into application of the Clinical Trials Regulation to (i) clinical trials applications submitted before the entry into application and (ii) clinical trials applications submitted within one year after the entry into application if the sponsor opts for old system.

The new Regulation (EU) No 536/2014 aims to simplify and streamline the approval of clinical trial in the European Union. The main characteristics of the regulation include:

- A streamlined application procedure via a single-entry point, the EU portal.
- A single set of documents to be prepared and submitted for the application as well as simplified reporting procedures that will spare sponsors from submitting broadly identical information separately to various bodies and different member states.
- A harmonized procedure for the assessment of applications for clinical trials, which is divided in two parts. Part I is assessed jointly by all member states concerned. Part II is assessed separately by each member state concerned.
- Strictly defined deadlines for the assessment of clinical trial application.
- The involvement of the ethics committees in the assessment procedure in accordance with the national law of the member state concerned but within the overall timelines defined by the Regulation (EU) No 536/2014.

Marketing Authorization

Authorization to market a product in the member states of the European Union proceeds under one of four procedures: a centralized authorization procedure, a mutual recognition procedure, a decentralized procedure or a national procedure.

Centralized Authorization Procedure

The centralized procedure enables applicants to obtain a marketing authorization that is valid in all EU member states based on a single application. Certain medicinal products, including products developed by means of biotechnological processes, must undergo the centralized authorization procedure for marketing authorization, which, if granted by the European Commission, is automatically valid in all 28 EU member states. The EMA and the European Commission administer this centralized authorization procedure pursuant to Regulation (EC) No 726/2004.

Pursuant to Regulation (EC) No 726/2004, this procedure is mandatory for:

- medicinal products developed by means of one of the following biotechnological processes:
- recombinant DNA technology;
- controlled expression of genes coding for biologically active proteins in prokaryotes and eukaryotes including transformed mammalian cells; and
- hybridoma and monoclonal antibody methods;
- advanced therapy medicinal products as defined in Article 2 of Regulation (EC) No. 1394/2007 on advanced therapy medicinal products;
- medicinal products for human use containing a new active substance that, on the date of effectiveness of this regulation, was not authorized in the European Union, and for which the therapeutic indication is the treatment of any of the following diseases:
- acquired immune deficiency syndrome;
- cancer;
- neurodegenerative disorder;
- diabetes;
- auto-immune diseases and other immune dysfunctions; and
- viral diseases;
- medicinal products that are designated as orphan medicinal products pursuant to Regulation (EC) No 141/2000.

The centralized authorization procedure is optional for other medicinal products if they contain a new active substance or if the applicant shows that the medicinal product concerned constitutes a significant therapeutic, scientific or technical innovation or that the granting of authorization is in the interest of patients in the European Union.

Administrative Procedure

Under the centralized authorization procedure, the EMA's Committee for Human Medicinal Products, or CHMP, serves as the scientific committee that renders opinions about the safety, efficacy and quality of medicinal products for human use on behalf of the EMA. The CHMP is composed of experts nominated by each member state's national authority for medicinal products, with an expert appointed to act as Rapporteur for the co-ordination of the evaluation with the possible assistance of a further member of the Committee acting as a Co-Rapporteur. After approval, the Rapporteur(s) continue to monitor the product throughout its life cycle. The CHMP has 210 days to adopt an opinion as to whether a marketing authorization should be granted. The process usually takes longer in case additional information is requested, which triggers clock-stops in the

procedural timelines. The process is complex and involves extensive consultation with the regulatory authorities of member states and a number of experts. When an application is submitted for a marketing authorization in respect of a drug that is of major interest from the point of view of public health and in particular from the viewpoint of therapeutic innovation, the applicant may pursuant to Article 14(9) Regulation (EC) No 726/2004 request an accelerated assessment procedure. If the CHMP accepts such request, the time-limit of 210 days will be reduced to 150 days but it is possible that the CHMP can revert to the standard time-limit for the centralized procedure if it considers that it is no longer appropriate to conduct an accelerated assessment. Once the procedure is completed, a European Public Assessment Report, or EPAR, is produced. If the opinion is negative, information is given as to the grounds on which this conclusion was reached. After the adoption of the CHMP opinion, a decision on the MAA must be adopted by the European Commission, after consulting the E.U. member states, which in total can take more than 60 days.

Conditional Approval

In specific circumstances, EU legislation (Article 14(7) Regulation (EC) No 726/2004 and Regulation (EC) No 507/2006 on Conditional Marketing Authorizations for Medicinal Products for Human Use) enables applicants to obtain a conditional marketing authorization prior to obtaining the comprehensive clinical data required for an application for a full marketing authorization. Such conditional approvals may be granted for product candidates (including medicines designated as orphan medicinal products) if (1) the risk-benefit balance of the product candidate is positive, (2) it is likely that the applicant will be in a position to provide the required comprehensive clinical trial data, (3) the product fulfills unmet medical needs and (4) the benefit to public health of the immediate availability on the market of the medicinal product concerned outweighs the risk inherent in the fact that additional data are still required. A conditional marketing authorization may contain specific obligations to be fulfilled by the marketing authorization holder, including obligations with respect to the completion of ongoing or new studies, and with respect to the collection of pharmacovigilance data. Conditional marketing authorizations are valid for one year, and may be renewed annually, if the risk-benefit balance remains positive, and after an assessment of the need for additional or modified conditions and/or specific obligations. The timelines for the centralized procedure described above also apply with respect to the review by the CHMP of applications for a conditional marketing authorization.

Marketing Authorization under Exceptional Circumstances

Under Article 14(8) Regulation (EC) No 726/2004, products for which the applicant can demonstrate that comprehensive data (in line with the requirements laid down in Annex I of Directive 2001/83/EC, as amended) cannot be provided (due to specific reasons foreseen in the legislation) might be eligible for marketing authorization under exceptional circumstances. This type of authorization is reviewed annually to reassess the risk-benefit balance. The fulfillment of any specific procedures/obligations imposed as part of the marketing authorization under exceptional circumstances is aimed at the provision of information on the safe and effective use of the product and will normally not lead to the completion of a full dossier/approval.

Market Authorizations Granted by Authorities of E.U. Member States

In general, if the centralized procedure is not followed, there are three alternative procedures as prescribed in Directive 2001/83/EC:

- The decentralized procedure allows applicants to file identical applications to several EU member states and receive simultaneous national approvals based on the recognition by EU member states of an assessment by a reference member state.
- The national procedure is only available for products intended to be authorized in a single EU member state.
- A mutual recognition procedure similar to the decentralized procedure is available when a marketing authorization has already been obtained in at least one E.U. member state.

A marketing authorization may be granted only to an applicant established in the European Union.

Pediatric Studies

Prior to obtaining a marketing authorization in the European Union, applicants have to demonstrate compliance with all measures included in an EMA-approved Pediatric Investigation Plan, or PIP, covering all subsets of the pediatric population, unless the EMA has granted a product-specific waiver, a class waiver, or a deferral for one or more of the measures included in the PIP. The respective requirements for all marketing authorization procedures are set forth in Regulation (EC) No 1901/2006, which is referred to as the Pediatric Regulation. This requirement also applies when a company wants to add a new indication, pharmaceutical form or route of administration for a medicine that is already authorized. The Pediatric Committee of the EMA, or PDCO, may grant deferrals for some medicines, allowing a company to delay development of the medicine in children until there is enough information to demonstrate its effectiveness and safety in adults. The PDCO may also grant waivers when development of a medicine in children is not needed or is not appropriate, such as for diseases that only affect the elderly population.

Before a marketing authorization application can be filed, or an existing marketing authorization can be amended, the EMA determines that companies actually comply with the agreed studies and measures listed in each relevant PIP.

Periods of Authorization and Renewals

A marketing authorization is valid for five years in principle and the marketing authorization may be renewed after five years on the basis of a re-evaluation of the risk-benefit balance by the EMA or by the competent authority of the authorizing member state. To this end, the marketing authorization holder must provide the EMA or the competent authority with a consolidated version of the file in respect of quality, safety and efficacy, including all variations introduced since the marketing authorization was granted, at least six months before the marketing authorization ceases to be valid. Once renewed, the marketing authorization is valid for an unlimited period, unless the European Commission or the competent authority decides, on justified grounds relating to pharmacovigilance, to proceed with one additional five-year renewal. Any authorization which is not followed by the actual placing of the drug on the EU market (in case of centralized procedure) or on the market of the authorizing member state within three years after authorization ceases to be valid (the so-called sunset clause).

Regulatory Data Protection

EU legislation also provides for a system of regulatory data and market exclusivity. According to Article 14(11) of Regulation (EC) No 726/2004, as amended, and Article 10(1) of Directive 2001/83/EC, as amended, upon receiving marketing authorization, new chemical entities approved on the basis of complete independent data package benefit from eight years of data exclusivity and an additional two years of market exclusivity. Data exclusivity prevents regulatory authorities in the European Union from referencing the innovator's data to assess a generic (abbreviated) application. During the additional two-year period of market exclusivity, a generic marketing authorization can be submitted, and the innovator's data may be referenced, but no generic medicinal product can be marketed until the expiration of the market exclusivity. The overall ten-year period will be extended to a maximum of 11 years if, during the first eight years of those ten years, the marketing authorization holder, or MAH, obtains an authorization for one or more new therapeutic indications which, during the scientific evaluation prior to their authorization, are held to bring a significant clinical benefit in comparison with existing therapies. Even if a compound is considered to be a new chemical entity and the innovator is able to gain the period of data exclusivity, another company nevertheless could also market another version of the drug if such company obtained marketing authorization based on an MAA with a complete independent data package of pharmaceutical test, pre-clinical tests and clinical trials. However, products designated as orphan medicinal products enjoy, upon receiving marketing authorization, a period of ten years of orphan market exclusivity. Depending upon the timing and duration of the EU marketing authorization process, products may be eligible for up to five years' supplementary protection certificates, or SPCs, pursuant to Regulation (EC) No 469/2009. Such SPCs extend the rights under the basic patent for the drug.

Regulatory Requirements After a Marketing Authorization has been Obtained

If we obtain authorization for a medicinal product in the European Union, we will be required to comply with a range of requirements applicable to the manufacturing, marketing, promotion and sale of medicinal products:

Pharmacovigilance and other requirements

We will, for example, have to comply with the EU's stringent pharmacovigilance or safety reporting rules, pursuant to which post-authorization studies and additional monitoring obligations can be imposed. Other requirements relate, for example, to the manufacturing of products and APIs in accordance with good manufacturing practice standards. EU regulators may conduct inspections to verify our compliance with applicable requirements, and we will have to continue to expend time, money and effort to remain compliant. Non-compliance with EU requirements regarding safety monitoring or pharmacovigilance, and with requirements related to the development of products for the pediatric population, can also result in significant financial penalties in the European Union. Similarly, failure to comply with the EU's requirements regarding the protection of individual personal data can also lead to significant penalties and sanctions. Individual EU member states may also impose various sanctions and penalties in case we do not comply with locally applicable requirements.

Manufacturing

The manufacturing of authorized drugs, for which a separate manufacturer's license is mandatory, must be conducted in strict compliance with the EMA's Good Manufacturing Practices, or GMP, requirements and comparable requirements of other regulatory bodies in the European Union, which mandate the methods, facilities and controls used in manufacturing, processing and packing of drugs to assure their safety and identity. The EMA enforces its current GMP requirements through mandatory registration of facilities and inspections of those facilities. The EMA may have a coordinating role for these inspections while the responsibility for carrying them out rests with the member states competent authority under whose responsibility the manufacturer falls. Failure to comply with these requirements could interrupt supply and result in delays, unanticipated costs and lost revenues, and could subject the applicant to potential legal or regulatory action, including but not limited to warning letters, suspension of manufacturing, seizure of product, injunctive action or possible civil and criminal penalties.

Marketing and Promotion

The marketing and promotion of authorized drugs, including industry-sponsored continuing medical education and advertising directed toward the prescribers of drugs and/or the general public, are strictly regulated in the European Union under Directive 2001/83/EC. The applicable regulations aim to ensure that information provided by holders of marketing authorizations regarding their products is truthful, balanced and accurately reflects the safety and efficacy claims authorized by the EMA or by the competent authority of the authorizing member state. Failure to comply with these requirements can result in adverse publicity, warning letters, corrective advertising and potential civil and criminal penalties.

Patent Term Extension

In order to compensate the patentee for delays in obtaining a marketing authorization for a patented product, a supplementary certificate, or SPC, may be granted extending the exclusivity period for that specific product by up to five years. Applications for SPCs must be made to the relevant patent office in each E.U. member state and the granted certificates are valid only in the member state of grant. An application has to be made by the patent owner within six months of the first marketing authorization being granted in the European Union (assuming the patent in question has not expired, lapsed or been revoked) or within six months of the grant of the patent (if the marketing authorization is granted first). In the context of SPCs, the term "product" means the active ingredient or combination of active ingredients for a medicinal product and the term "patent" means a patent protecting such a product or a new manufacturing process or application for it. The duration of an SPC is calculated as the difference between the patent's filing date and the date of the first marketing authorization, minus five years, subject to a maximum term of five years.

A six-month pediatric extension of an SPC may be obtained where the patentee has carried out an agreed pediatric investigation plan, the authorized product information includes information on the results of the studies and the product is authorized in all member states of the European Union.

Pharmaceutical Coverage, Pricing and Reimbursement

Significant uncertainty exists as to the coverage and reimbursement status of products approved by the FDA and other government authorities. Sales of products will depend, in part, on the extent to which the costs of the products will be covered by third-party payors, including government health programs in the United States such as Medicare and Medicaid, commercial health insurers and managed care organizations. The process for determining whether a payor will provide coverage for a product may be separate from the process for setting the price or reimbursement rate that the payor will pay for the product once coverage is approved. Third-party payors may limit coverage to specific products on an approved list, or formulary, which might not include all of the approved products for a particular indication.

In order to secure coverage and reimbursement for any product that might be approved for sale, a company may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of the product, in addition to the costs required to obtain FDA or other comparable regulatory approvals. A payor's decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved. Third-party reimbursement may not be sufficient to maintain price levels high enough to realize an appropriate return on investment in product development.

There has been an increased focus on drug pricing in recent years in the United States. Although there are no direct government price controls over private sector purchases in the United States, there are rebates and other financial requirements for federal and state health care programs. The Medicare Modernization Act, enacted in December 2003, established the Medicare Part D outpatient prescription drug benefit, which is provided primarily through private entities that attempt to negotiate price concessions from pharmaceutical manufacturers. The health care reform legislation enacted in 2010, known as the Affordable Care Act, requires drug manufacturers to pay 50% of the Medicare Part D coverage gap, also known as the "donut hole," on prescriptions for branded products filled when the beneficiary reaches this coverage. The Deficit Reduction Act of 2005 resulted in changes to the way drug prices are reported to the government and the formula using such information to calculate the required Medicaid rebates. The Affordable Care Act increased the minimum basic Medicaid rebate for branded prescription drugs from 15.1% to 23.1% and requires pharmaceutical manufacturers to pay states rebates on prescription drugs dispensed to Medicaid managed care enrollees. In addition, the Affordable Care Act increased the additional Medicaid rebate on "line extensions" (such as extended-release formulations) of solid oral dosage forms of branded products, revised the definition of average manufacturer price by changing the classes of purchasers included in the calculation, and expanded the entities eligible for discounted pricing under the federal 340B drug pricing program. Current orphan drugs are excluded from the expanded 340B hospitals eligible for discounts.

The Affordable Care Act imposes a significant annual fee on companies that manufacture or import branded prescription drug products. The fee (which is not deductible for federal income tax purposes) is based on the manufacturer's market share of sales of branded drugs and biologics (excluding orphan drugs) to, or pursuant to coverage under, specified U. S. government programs. The Affordable Care Act also contains a number of provisions, including provisions governing the way that health care is financed by both governmental and private insurers, enrollment in federal health care programs, reimbursement changes, the increased use of comparative effectiveness research in health care decision-making, and enhancements to fraud and abuse requirements and enforcement, that are affecting existing government health care programs and will result in the development of new programs. The Affordable Care Act also contains requirements for manufacturers to publicly report certain payments or other transfers of value made to physicians and teaching hospitals. We are unable to predict the future course of federal or state health care legislation and regulations, including regulations that will be issued to

implement provisions of the Affordable Care Act. The Affordable Care Act and further changes in the law or regulatory framework that reduce our revenues or increase our costs could also have a material adverse effect on our business, financial condition and results of operations and cash flows.

Public and private health care payers control costs and influence drug pricing through a variety of mechanisms, including through negotiating discounts with the manufacturers and through the use of tiered formularies and other mechanisms that provide preferential access to certain drugs over others within a therapeutic class. Payers also set other criteria to govern the uses of a drug that will be deemed medically appropriate and therefore reimbursed or otherwise covered. Payers may require physicians to seek approval from them before a product will be reimbursed or covered, commonly referred to as prior authorization. In particular, many public and private health care payers limit reimbursement and coverage to the uses of a drug that are either approved by the FDA or appear in a recognized drug compendium. Drug compendia are publications that summarize the available medical evidence for particular drug products and identify which uses of a drug are supported or not supported by the available evidence, whether or not such uses have been approved by the FDA. For example, in the case of Medicare Part D coverage for oncology drugs, the Medicare Modernization Act, with certain exceptions, provides for Medicare coverage of unapproved uses of an FDA-approved drug if the unapproved use is reasonable and necessary and is supported by one or more citations in CMS-approved compendia, such as the National Comprehensive Cancer Network Drugs and Biologics Compendium. Different pricing and reimbursement schemes exist in other countries. For example, in the European Union, governments influence the price of pharmaceutical products through their pricing and reimbursement rules and control of national health care systems that fund a large part of the cost of such products to consumers. The approach taken varies from member state to member state. Some jurisdictions operate positive or negative list systems under which products may only be marketed once a reimbursement price has been agreed. Other member states allow companies to fix their own prices for medicines, but monitor and control company profits and may limit or restrict reimbursement. The downward pressure on health care costs in general, and prescription drugs in particular, has become very intense. As a result, increasingly high barriers are being erected to the entry of new products, as exemplified by the actions of the National Institute for Clinical Excellence in the United Kingdom, which evaluates the data supporting new medicines and passes reimbursement recommendations to the government. In addition, in some countries cross-border imports from low-priced markets (parallel imports) exert a commercial pressure on pricing within a country.

In the European Union, pricing and reimbursement schemes vary widely from country to country. Some countries provide that drug products may be marketed only after a reimbursement price has been agreed. Some countries may require the completion of additional studies that compare the cost-effectiveness of our drug candidate to currently available therapies (so called health technology assessment) in order to obtain reimbursement or pricing approval. For example, the European Union provides options for its member states to restrict the range of drug products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. E.U. member states may approve a specific price for a drug product or it may instead adopt a system of direct or indirect controls on the profitability of the company placing the drug product on the market. Other member states allow companies to fix their own prices for drug products, but monitor and control prescription volumes and issue guidance to physicians to limit prescriptions. The downward pressure on health care costs in general, particularly prescription drugs, has become intense. As a result, increasingly high barriers are being erected to the entry of new products. In addition, there can be considerable pressure by governments and other stakeholders on prices and reimbursement levels, including as part of cost containment measures. Political, economic and regulatory developments may further complicate pricing negotiations, and pricing negotiations may continue after reimbursement has been obtained. Reference pricing used by various E.U. member states, and parallel distribution (arbitrage between low-priced and high-priced member states), can further reduce prices. Any country that has price controls or reimbursement limitations for drug products may not allow favorable reimbursement and pricing arrangements.

Healthcare Law and Regulation

Healthcare providers, physicians and third-party payors play a primary role in the recommendation and prescription of drug products that are granted marketing approval. Arrangements with third-party payors and customers are subject to broadly applicable fraud and abuse and other healthcare laws and regulations. Such restrictions under applicable federal and state healthcare laws and regulations, include the following:

- the federal Anti-Kickback Statute prohibits, among other things, persons from knowingly and willfully soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward either the referral of an individual for, or the purchase, order or recommendation of, any good or service, for which payment may be made, in whole or in part, under a federal healthcare program such as Medicare and Medicaid;

- the federal False Claims Act imposes civil penalties, and provides for civil whistleblower or qui tam actions, against individuals or entities for knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent or making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government;

- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program or making false statements relating to healthcare matters;

- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act and its implementing regulations, also imposes obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of individually identifiable health information;

- the federal false statements statute prohibits knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services;

- the federal transparency requirements under the Health Care Reform Law requires manufacturers of drugs, devices, biologics and medical supplies to report to the Department of Health and Human Services information related to payments and other transfers of value to physicians and teaching hospitals and physician ownership and investment interests; and

- analogous state and foreign laws and regulations, such as state anti-kickback and false claims laws, may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers.

An increasing number of states have enacted legislation requiring pharmaceutical and biotechnology companies to file periodic reports of expenses relating to the marketing and promotion of drug products and gifts and payments to individual healthcare practitioners in these states; to make periodic public disclosures on sales, marketing, pricing, clinical trials and other activities; to report information pertaining to and justifying price increases; or to register their sales representatives. Other states prohibit various marketing-related activities, such as the provision of certain kinds of gifts or meals; price gouging; or pharmacies and other healthcare entities from providing certain physician prescribing data to pharmaceutical and biotechnology companies for use in sales and marketing. In addition, states such as California, Connecticut, Nevada, and Massachusetts require pharmaceutical companies to implement compliance programs and/or marketing codes. State and foreign laws also govern 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.

Environmental, Health and Safety Matters

The manufacturing facilities of the third-parties that develop our product candidates are subject to extensive environmental, health and safety laws and regulations in a number of jurisdictions, governing, among other things: the use, storage, registration, handling, emission and disposal of chemicals, waste materials and sewage; chemicals, air, water and ground contamination; air emissions and the cleanup of contaminated sites, including any contamination that results from spills due to our failure to properly dispose of

chemicals, waste materials and sewage.

These laws, regulations and permits could potentially require the expenditure by us of significant amounts for compliance or remediation. If the third-party manufacturers fail to comply with such laws, regulations or permits, we may be subject to fines and other civil, administrative or criminal sanctions, including the revocation of permits and licenses necessary to continue our business activities. In addition, we may be required to pay damages or civil judgments in respect of third-party claims, including those relating to personal injury (including exposure to hazardous substances we use, store, handle, transport, manufacture or dispose of), property damage or contribution claims. Some environmental, health and safety laws allow for strict, joint and several liability for remediation costs, regardless of comparative fault. We may be identified as a responsible party under such laws. Such developments could have a material adverse effect on our business, financial condition and results of operations.

In addition, laws and regulations relating to environmental, health and safety matters are often subject to change. In the event of any changes or new laws or regulations, we could be subject to new compliance measures or to penalties for activities that were previously permitted.

Competition

Our industry is subject to rapid and intense technological change. Competition is intense among manufacturers of nutritional, non-prescription, and prescription pharmaceuticals. We face, and will continue to face, competition from nutraceutical, pharmaceutical, biopharmaceutical, medical device and biotechnology companies developing similar products and technologies both in the United States and abroad, as well as numerous academic and research institutions, governmental agencies and private organizations engaged in drug funding or research and discovery activities both in the United States and abroad. Academic institutions, government agencies and other public and private research organizations may also conduct research, seek patent protection and establish collaborative arrangements for discovery, research and clinical development of technologies and products similar to ours. We also face competition from entities and healthcare providers using more traditional methods. We believe there are a substantial number of products under development by numerous nutraceutical, pharmaceutical, biopharmaceutical, medical device and biotechnology companies, and it is likely that other competitors will emerge.

Many of our existing and potential competitors are large, well established pharmaceutical, chemical or healthcare companies with considerably greater research and product development capabilities and financial, scientific, marketing and human resources than we have. As a result, these competitors may succeed in developing competing products earlier than we do; obtain patents that block or otherwise inhibit our ability to further develop and commercialize our product candidates; obtain approvals from the FDA or other regulatory agencies for products more rapidly than we do; or develop treatments or cures that are safer or more effective than those we propose to develop. These competitors may also devote greater resources to marketing or selling their products and may be better able to withstand price competition. In addition, these competitors may introduce or adapt more quickly to new technologies or scientific advances, which could render our technologies obsolete, and may introduce products or technologies that make the continued development, production, or marketing of our product candidates uneconomical. These competitors may also be more successful in negotiating third-party licensing or collaborative arrangements and may be able to take advantage of acquisitions or other strategic opportunities more readily than we can. These actions by competitors or potential competitors could materially affect our business, financial condition and results of operations. We cannot assure you that we will be able to compete successfully.

We have a limited ability to predict how competitive our products and product candidates will be in the market place. The competition we believe currently exists with respect to each of our products is as follows:

NT-CoV2-1 Vaccine

The COVID-19 vaccine market is intensely competitive, characterized by rapid technological progress. The SARS-CoV-2 pandemic is also evolving rapidly with the generation of new virus variants including Delta and Omicron that impact vaccine efficacy. This creates a changing competitive landscape for the Terra CoV-2 and NT-CoV2-1 vaccine candidates. We compete with worldwide research-based biopharmaceutical companies and smaller companies that manufacture and sell products that treat diseases or indications similar to those treated by our vaccine candidate. In December 2020, Pfizer and Moderna both received EUA to begin distributing their vaccines. Pfizer received full FDA approval in August 2021 and Moderna in January 2022. The combined market shares of these two mRNA vaccines are 96% in the US and 89% in the EU. Johnson & Johnson has developed a single dose vaccine and received an EUA in the US in February 2021. In early February 2022, the WHO listed 10 vaccines approved for use, including those from Oxford/Astra Zeneca, Novavax, the Serum Institute of India, Bharat Biotech, Sinopharma (Beijing) and Sinovac as well as those from Pfizer, Moderna and Janssen.

According to the WHO, there are 172 vaccines currently in clinical development, of which 65 are currently in Phase 3 clinical trials, and there are currently 194 vaccines which are in the pre-clinical development phase. There are just 7 vaccines in active clinical development that contemplate use of intranasal administration. Our intranasal NT-CoV2-1 vaccine candidate is in pre-clinical development.

Additionally, several companies are working on antiviral drugs, some of which are already in use against other illnesses, to treat people who have COVID-19.The FDA has also issued EUAs for several other treatments, including antivirals, monoclonal antibodies, convalescent plasma therapy, a drug used to sedate people placed on a ventilator, and drugs for people undergoing a type of blood purification known as continuous renal replacement therapy. To the extent these drug treatments are effective there can reduce demand for vaccines against the disease and the potential market for our vaccine product candidate.

Our vaccine development will depend on our ability to identify key points of product differentiation relative to our competitors and conduct pre-clinical testing and file an IND followed by proceeding to a Phase 1 clinical trial. If the Phase 1 trial results support further development, a Phase 2 clinical trial may be initiated and/or a partnership to advance further development may be sought. The competition we face with the development of our vaccines is extensive and could adversely affect us in many ways including the increased numbers of vaccines currently being administered under emergency use authorizations, supplies of raw materials including adjuvants for clinical testing, timing of manufacturers to make our vaccine for testing, available government funding and other funding through partnerships.

MU1140 Homologs and Other Lantibiotics

MU1140 will likely compete directly with antibiotic drugs such as vancomycin and newer drugs, including Cubicin® (daptomycin) and Zyvox ® (linezolid). Given the growing resistance of target pathogens to even new antibiotics, we believe that there is ample room in the marketplace for additional antibiotics. Many of our competitors are taking approaches to drug development differing from our approach, including using traditional screening of natural products; genomics to identify new targets, and combinatorial chemistry to generate new chemical structures. Competition in the pharmaceutical industry is based on drug safety, efficacy, ease of use, patient compliance, price, marketing, and distribution. Our lantibiotic development will depend on our success in developing MU1140 homologs and to the point of commercialization or partnership and in the process securing and protecting our intellectual property.

Our Intellectual Property

We rely upon a combination of licenses, patents, trade secrets, know-how, and licensing opportunities to develop our business. Our future prospects depend on our ability to protect our intellectual property. We also need to operate without infringing the proprietary rights of third parties.

Patents

We attempt to protect our technology and products through patents and patent applications pursuant to the terms of our license agreements. We have a worldwide, nonexclusive intellectual property and biological materials license agreement with NIAID, an institute within the NIH, relating to certain research, patent applications and biological materials involving prefusion coronavirus spike proteins and their use in the development and commercialization of vaccine to provide specific, lifetime immunity from SARS-CoV-2.

We also have worldwide, nonexclusive intellectual property and biological materials license agreement with the NRC which provides us with a platform that can generate cell lines for high-yield production of spike protein antigens for existing and emerging variants of concern. This platform should allow production of cell lines within six to eight weeks of spike gene sequence availability, compared with six to nine months for traditional production of such cell lines. We co-own the intellectual property for certain homologs of our MU1140 product candidate with the Texas A&M University System.

The effect of issued patents is that they provide patent protection for the claims covered by the patents. While the expiration of a product patent normally results in a loss of market exclusivity for the covered product or product candidate, commercial benefits may continue to be derived from: (i) later-granted patents on processes and intermediates related to the most economical method of manufacture of the active ingredient of such product; (ii) patents relating to the use of such product; (iii) patents relating to novel compositions and formulations; and (iv) in the United States and certain other countries, market exclusivity that may be available under relevant law. The effect of patent expiration on products or product candidates also depends upon many other factors such as the nature of the market and the position of the product in it, the growth of the market, the complexities and economics of the process for manufacture of the active ingredient of the product and the requirements of new drug provisions of the Federal Food, Drug and Cosmetic Act or similar laws and regulations in other countries.

We believe that the protection of discoveries in connection with our development activities, our proprietary products, technologies, processes and know-how and all of our intellectual property are important to our business. To achieve a competitive position, we rely on trade secrets, non-patented proprietary know-how and continuing technological innovation, where patent protection is not believed to be appropriate or attainable. In addition, as outlined above, we have a number of patent licenses from third parties, some of which may be important to our business. There can be no assurance that any of our patents, licenses or other intellectual property rights will afford us any protection from competition.

Trademarks

Our trademarks are important to our business. We currently use the following unregistered trademarks: SMaRT Replacement Therapy™, MU1140™, and LPT3-04™. We currently have pending with the USPTO, an application for registration of the mark of ORAGENICS™ (therapeutic products; anti-infectives and vaccine products). We also have rights to use other names essential to our business. Federally registered trademarks have a perpetual life, as long as they are maintained and renewed on a timely basis and used properly as trademarks, subject to the rights of third parties to seek cancellation of the trademarks if they claim priority or confusion of usage. We regard our trademarks and other proprietary rights as valuable assets and believe they have significant value to us.

Protection of Trade Secrets

We attempt to protect our trade secrets, including the processes, concepts, ideas and documentation associated with our technologies, through the use of confidentiality agreements and non-competition agreements with our current employees and with other parties to whom we have divulged such trade secrets. There can be no assurance that these agreements will not be breached, that we will have adequate remedies for any breach, that others will not independently develop equivalent proprietary information or that other third parties will not otherwise gain access to our trade secrets and other intellectual property. If our employees or other parties breach our confidentiality agreements and non-competition agreements or if these agreements are not sufficient to protect our technology or are found to be unenforceable, our competitors could acquire and use information that we consider to be our trade secrets and we may not be able to compete effectively. Most of our competitors have substantially greater financial, marketing, technical and manufacturing resources than we have and we may not be profitable if our competitors are also able to take advantage of our trade secrets.

We may find it necessary to initiate litigation to enforce our patent rights, to protect our intellectual property or to determine the scope and validity of the proprietary rights of others. Litigation is costly and time-consuming, and there can be no assurance that our litigation expenses will not be significant in the future or that we will prevail in any such litigation.

Government Grants

We have previously received funding from government agencies under the National Science Foundation's and National Institute of Health's Small Business Innovation Research, or SBIR, grants. Eligibility of public companies to receive such grants is based on size and ownership criteria which are under review by the Small Business Administration, or SBA. As a result, our eligibility may change in the future and additional funding from this source may not be available. We have also applied for funding pursuant to BARDA but did not receive a grant award. While we continue to pursue grants and or government funding related to the COVID-19 pandemic it may not be available to us. In addition, although we seek to protect the competitive benefits we derive from our patents, proprietary information, and other intellectual property, we may not have the right to prohibit the U.S. government from using certain technologies developed or acquired by us due to federal research grants or to prohibit third-party companies, including our competitors, from using those technologies in providing products and services to the U.S. government. The U.S. government could have the right to royalty-free use of technologies that we may develop under such grants. We may commercially exploit those government-funded technologies and may assert our intellectual property rights against other non-government users of technology developed by us, but we may not be successful in our efforts to do so.

We recently announced that we were awarded a small business innovation research grant in the amount of $250,000 ("Computer-aided Design for Improved Lantibiotics" R41GM136034) for our continued research and development of lantibiotics, including its collaborative program with the Biomolecular Sciences Institute at (FIU). The grant provides us with funding to develop novel lantibiotics for the treatment of ESKAPE pathogens (defined as *Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter spp.).*

Human Capital

Employees

We have five full-time employees. We enjoy good relations with our employees. None of our employees are a member of any labor union, and we are not a party to any collective bargaining agreement.

Consultants

We have consulting agreements with a number of scientists, clinicians and regulatory experts. They serve as important contacts for us throughout the broader scientific and clinical communities. They are distinguished individuals with expertise in numerous fields, including vaccine development and regulatory matters.

We retain each consultant according to the terms of a consulting agreement. Under such agreements, we pay them a consulting fee and reimburse them for out-of-pocket expenses incurred in performing their services for us. In addition, some consultants hold options to purchase our common stock, subject to the vesting requirements contained in separate award agreements. Our consultants may be employed by other entities and therefore may have commitments to their employer or may have other consulting or advisory agreements that may limit their availability to us.

Corporate Information

We were incorporated in November 1996 and commenced operations in 1999. We consummated our initial public offering in June 2003. Our corporate office is located at 4902 Eisenhower Boulevard, Suite 125, Tampa, Florida 33634.

Available Information

Our website is www.oragenics.com. On our website we make available at no cost our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished as soon as reasonably practicable after we electronically file such material with, or furnish them to, the United States Securities and Exchange Commission ("SEC"). The information contained on our website is not a part of this annual report on Form 10-K.

ITEM 1A. RISK FACTORS.

An investment in our common stock involves a high degree of risk. You should carefully consider the risks described below before making an investment decision in our securities. These risk factors are effective as of the date of this Form 10-K and shall be deemed to be modified or superseded to the extent that a statement contained in our future filings modifies or replaces such statement. All of these risks may impair our business operations. The forward-looking statements in this Form 10-K involve risks and uncertainties and actual results may differ materially from the results we discuss in the forward-looking statements. If any of the following risks actually occur, our business, financial condition or results of operations could be materially adversely affected. In that case, the trading price of our stock could decline, and you may lose all or part of your investment.

Risk Factor Summary

The below summary of risk factors provides an overview of many of the risks we are exposed to in the normal course of our business activities. As a result, the below summary risks do not contain all of the information that may be important to you, and you should read the summary risks together with the more detailed discussion of risks set forth following this section as well as elsewhere in this Annual Report. Additional risks, beyond those summarized below or discussed elsewhere in this Annual Report, may apply to our activities or operations as currently conducted or as we may conduct them in the future or in the markets in which we operate or may in the future operate. Consistent with the foregoing, we are exposed to a variety of risks, including risks associated with the following:

Risks Related to Our Business

- We have incurred significant losses since our inception and expect to continue to experience losses for the foreseeable future.

- We will need to raise additional capital in the future to complete the development and commercialization of our product candidates and operate our business.

- We were denied funding from the Biomedical Advanced Research and Development Authority ("BARDA") and we may be unable to win any government contracts, grants, agreement or other funding in the future. Even if we are successful in obtaining such contracts, grants, agreements or other funding, we cannot assure the success of our NT-CoV2-1 vaccine product candidate, that it will be approved by the FDA or other public health regulatory authority or that any funding provided will be sufficient to complete development and successful commercialization.

- We may rely on government funding and collaboration with government entities for our vaccine development, which adds uncertainty to our research and development efforts and may impose requirements that increase the costs of development, commercialization and production of any programs developed under those government-funded programs.

- We have limited vaccine-specific research, development, manufacturing, testing, regulatory, commercialization, sales, distribution, and marketing experience, and we may need to invest significant financial and management resources to establish these capabilities. Despite such investments and our best efforts, our strategic acquisition of Noachis Terra may turn out to be unsuccessful.

- We have limited financial resources and we may not be able to maintain our current level of operations or be able to fund the further development of our new NT-CoV2-1 vaccine product candidate.

- Our vaccine product candidate is at the pre-clinical stage and has not been approved for sale. We have not conducted substantial research and development for a vaccine product candidate, and we may be unable to produce a vaccine that successfully prevents the virus in a timely and economical manner, if at all.

- The market opportunities for our vaccine product candidate may be smaller than we believe them to be. Moreover, any pandemic threat may abate, the underlying virus may mutate, or alternative vaccines or technologies may be adopted, before our vaccines achieve regulatory approval.

- If we are unable to successfully develop our product candidates, our operating results and competitive position could be harmed. Research and development involves a lengthy and complex process, and we may not be successful in our efforts to develop and commercialize our product candidates. The further development and ultimate commercialization of product candidates for SARS-CoV-2 and COVID-19, as well as our other product candidates, are keys to our strategy.

- If we are successful in producing a vaccine against SARS-CoV-2, we may need to devote significant resources to its scale-up and development, including for use by the U.S. government or other foreign authorities. Moreover, government involvement may limit the commercial success of our vaccine product candidate.

- Our product candidates, if approved, will face significant competition and our failure to compete effectively may prevent us from achieving significant market penetration.

- Because our vaccine product development efforts depend on new and rapidly evolving technologies, we cannot be certain that our efforts will be successful.

- Our SARS-CoV-2 vaccine product candidate may face competition from biosimilars approved through an abbreviated regulatory pathway.

- We may be unable to refine a method to produce MU1140 homologs in large-scale commercial quantities. If we cannot, we will be unable to generate significant revenues from sales of a MU1140 homolog product candidate.

- Our success will depend on our ability to obtain regulatory approval of our product candidate under our Lantibiotics Program and its successful commercialization.

- We may choose not to continue developing or commercializing any of our product candidates at any time during development or after approval, which would reduce or eliminate our potential return on investment for those product candidates.

- We have limited experience in the conduct of clinical trials. We have never initiated a vaccine-related clinical trial. We have never obtained approval of any product

candidates. We may be unable to undertake any of those actions successfully.

● We cannot assure you that the market and consumers will accept our products or product candidates. If they do not, we will be unable to generate significant revenues from our products or product candidates and our business, financial condition and results of operations will be materially adversely affected.

● Failure to obtain marketing approval in international jurisdictions would prevent our product candidates from being marketed abroad.

● We will need to further increase the size and complexity of our organization in the future, and we may experience difficulties in executing our growth strategy and managing our growth.

● If our manufacturers and suppliers in general fail to meet our requirements and the requirements of regulatory authorities, our research and development may be materially adversely affected.

● We rely on the significant experience and specialized expertise of our senior management and scientific team and the loss of any of our key personnel or our inability to successfully hire their successors could harm our business.

● We need to hire and retain additional qualified scientists and other highly skilled personnel to maintain and grow our business.

● If any of our product candidates are shown to be ineffective or harmful in humans, we will be unable to generate revenues from these product candidates.

● Because we are new to vaccine development, we must identify vaccines for development with our technologies and establish successful third-party relationships.

● We intend to seek licensing partners to cover a portion of the costs associated with obtaining regulatory approval for, and manufacturing and marketing of, our product candidates. If we are unable to obtain agreements with third parties to fund these costs, we will have to fund such costs ourselves or we may be unable to extract any value from these technologies.

● We might not be successful at acquiring, investing in or integrating businesses, entering into joint ventures or divesting businesses.

● We may face product liability exposure, and if successful claims are brought against us, we may incur substantial liability if our insurance coverage for those claims is inadequate.

● We may be adversely affected by natural disasters, pandemics and other catastrophic events, and by man-made problems such as terrorism, that could disrupt our business operations and our business continuity and disaster recovery plans may not adequately protect us from a serious disaster.

● Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited, each of which could harm our business.

● Our auditor has previously expressed substantial doubt about our ability to continue as a going concern and absent additional financing we may be unable to remain a going concern.

Risks Related to Our Intellectual Property and Data Security and Privacy

● Our vaccine research and development efforts are to a large extent dependent upon our intellectual property and biologicals materials license with the NIAID, the NIH, and the NRC(“Licensors”).

● We may incur additional expenses and obligations in connection with our NIH and NRC licenses (“Licenses Agreements”).

● The intellectual property covered by our License Agreements concerns patent applications and provisional applications. We cannot assure investors that any of the currently pending or future patent applications will result in granted patents, nor can we predict how long it will take for such patents to be granted.

● We cannot prevent the Licensors or other companies, including our competitors, from licensing the same intellectual property and biological materials that we have licensed or from otherwise duplicating our business model and operations.

● Our Lantibiotic Development program development efforts are to a large extent dependent upon our intellectual property and is based on early-stage technology in its field.

● We may be subject to claims challenging the inventorship of our patents and other intellectual property.

● Changes in patent law or patent jurisprudence could diminish the value of patents in general, thereby impairing our ability to protect our product candidates.

● If we are unable to protect our trademarks or other intellectual property from infringement, our business prospects may be harmed.

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

● If we fail to comply with our obligations under our intellectual property license agreements, we could lose our license rights that are important to our business and development of our product candidates.

● If we are sued for infringing intellectual property rights of third parties, it will be costly and time-consuming and an unfavorable outcome in that litigation could have a material adverse effect on our business.

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

● Our success will depend on our ability to partner or sub-license our product candidates and their subsequent successful commercialization.

● If our intellectual property rights do not adequately protect our products or product candidates, or if third parties claim we are infringing their intellectual property rights, others could compete against us more directly or we could be subject to significant litigation. Such results could prevent us from marketing our products or product candidates and hurt our profitability.

● Our business and operations would suffer in the event of cybersecurity/information systems risk.

● We may incur costs of addressing a cybersecurity incident.

● Our business and operations would suffer in the event of failures in our internal computer systems or those of our collaborators.

Risks Related to Government Regulations

● Our product candidates are subject to substantial government regulation, including the regulation of nonclinical testing and clinical trials. If we are unable to obtain regulatory approval for our product candidates, we will be unable to generate revenues.

● We may be unable to obtain regulatory approval for our SARS-CoV-2 vaccine product candidate, or other early-stage product candidates under applicable regulatory requirements. The FDA and foreign regulatory bodies have substantial discretion in the approval process, including the ability to delay, limit or deny approval of product candidates. The delay, limitation or denial of any regulatory approval would adversely impact commercialization, our potential to generate revenue, our business and our operating results.

● Delays or difficulties in the enrollment of patients in clinical trials may result in additional costs and delays in our ability to generate significant revenues, and may delay or prevent our receipt of any regulatory approvals necessary to commercialize our planned and future products.

● Any product candidates that we commercialize will be subject to ongoing and continued regulatory review.

● Our product candidates may cause serious or undesirable side effects or possess other unexpected properties that could delay or prevent their regulatory approval, limit the commercial profile of approved labeling or result in post-approval regulatory action.

● If any of our product candidates are approved for marketing and we are found to have improperly promoted off-label uses, or if physicians misuse our products or use our products off-label, we may become subject to prohibitions on the sale or marketing of our products, product liability claims and significant fines, penalties and sanctions, and our brand and reputation could be harmed.

● We may also be subject to healthcare laws, regulation and enforcement and our failure to comply with those laws could adversely affect our business, operations and financial condition.

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

● Even if our current product candidates or any future product candidates obtain regulatory approval, they may fail to achieve the broad degree of health care payers, physician and patient adoption and use necessary for commercial success.

● If we are unable to achieve and maintain coverage and adequate levels of reimbursement for any of our product candidates for which we receive regulatory approval, or any future products we may seek to commercialize, their commercial success may be severely hindered.

● If our products do not receive favorable third-party reimbursement, or if new restrictive legislation is adopted, market acceptance of our products may be limited and we may not generate significant revenues.

Risks Related to Coronavirus Disease (COVID-19)

● Our business is subject to risks arising from public health crises, epidemic or pandemic diseases, such as the recent global outbreak of the coronavirus disease (COVID-19).

● Our ability to conduct clinical trials may be impeded, delayed, limited or prevented entirely due to the spread of COVID-19, the imposition of government restrictions and the concurrent disruptions to ordinary business activities globally.

● Our business involves international components, and we are exposed to various global and local risks related to the coronavirus disease 2019 (COVID-19) that could have a material adverse effect on our financial condition and results of operations.

● Macroeconomic pressures in the markets in which we operate, including, but not limited to, the effectives of the coronavirus disease (COVID-19) may alter the ways in which we conduct our business operations and manage our financial capacities.

● Economic uncertainty may adversely affect our access to capital, cost of capital and ability to execute our business plan as scheduled.

● Inadequate funding for the FDA, the SEC and other government agencies in light of the coronavirus pandemic could hinder their ability to hire and retain key leadership and other personnel, prevent new products and services from being developed or commercialized in a timely manner or otherwise prevent those agencies from performing normal business functions on which the operation of our business may rely, which could negatively impact our business.

Risks Related to Our Common Stock

● The issuance of additional equity securities by us in the future would result in dilution to our existing common shareholders.

● Our financial results could vary significantly from quarter to quarter and are difficult to predict.

● Our Series A and Series B preferred stock, if not converted into common stock, has a distribution and liquidation preference senior to our common stock in liquidation which could negatively affect the value of our common stock and impair our ability to raise additional capital.

● The conversion of our Series A Preferred Stock, and Series B Preferred Stock and the exercise of currently outstanding warrants and options could result in significant dilution to the holders of our common stock.

● Certain provisions of our articles of incorporation, bylaws, executive employment agreements and stock option plan may prevent a change of control of our company that a shareholder may consider favorable.

● The price and volume of our common stock has been volatile and fluctuates substantially, which could result in substantial losses for stockholders.

● We may be subject to securities litigation, which is expensive and could divert management attention.

● Future sales or issuances of our common stock in the public markets, or the perception of such sales, could depress the trading price of our common stock.

● The requirements of being a public company may strain our resources, divert management's attention and affect our ability to attract and retain qualified members for our Board of Directors.

● If we fail to maintain an effective system of internal controls, we may not be able to accurately report our financial results or prevent fraud which could subject us to regulatory sanctions, harm our business and operating results and cause the trading price of our stock to decline.

● We will continue to incur significant costs as a result of and devote substantial management time to operating as a public company listed on the NYSE American.

● If securities or industry analysts publish research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

● We may issue debt or debt securities convertible into equity securities, any of which may be senior to our common stock as to distributions and in liquidation, which could negatively affect the value of our common stock.

● We are a "smaller reporting company" and, as a result of the reduced disclosure and governance requirements applicable to smaller reporting companies, our common stock may be less attractive to investors.

● We have never paid cash dividends on our capital stock, and we do not anticipate paying any cash dividends in the foreseeable future.

Risks Related to Our Business

We have incurred significant losses since our inception and expect to continue to experience losses for the foreseeable future.

We have incurred significant net losses and negative cash flow in each year since our inception, including net losses of approximately $15.7 million and $26.4 million for the years ended December 31, 2021, and 2020, respectively. As of December 31, 2021, our accumulated deficit was approximately $171.3 million. We have devoted a significant amount of our financial resources to research and development, including our nonclinical development activities and clinical trials, as well as licensing and acquisitions related to our product candidates. We expect that the costs associated with our plans to continue pre-clinical research, contract manufacturing and file an IND for our vaccine product candidate and the research and development of our product candidates in the area of lantibiotics ("Lantibiotics Program") will increase the level of our overall expenses significantly going forward. Additionally, our License Agreements also requires the payment of certain recurring and performance-based royalties that may negatively impact our financial capabilities. As a result, we expect to continue to incur substantial net losses and negative cash flow for the foreseeable future. These losses and negative cash flows have had, and will continue to have, an adverse effect on our shareholders' equity and working capital. Because of the numerous risks and uncertainties associated with product development and commercialization, we are unable to accurately predict the timing or amount of substantial expenses or when, or if, we will be able to generate the revenue necessary to achieve or maintain profitability.

We will need to raise additional capital in the future to complete the development and commercialization of our product candidates and operate our business.

Developing and commercializing biopharmaceutical products, including conducting nonclinical studies and clinical trials and establishing manufacturing capabilities, is expensive, and the progress of our efforts to develop and commercialize our product candidates, including our acquisition of a vaccine product candidate, can cause us to use our limited, available capital resources faster than we currently anticipate. Our actual costs may ultimately vary from our current expectations, which could materially impact our use of capital and our forecast of the period of time through which our financial resources will be adequate to support our operations. Our current cash, cash equivalents and short-term investments are not sufficient to fully implement our business strategy and sustain our operations beyond the end of the current year, 2022. Accordingly, we will need to seek additional sources of financing and such additional financing may not be available on favorable terms, if at all. Until we can generate a sufficient amount of product revenue, if ever, we expect to finance future cash needs through public or private equity offerings, debt financings or corporate or government collaboration and licensing arrangements. If we do not succeed in raising additional funds on acceptable terms, we may be unable to complete existing nonclinical and planned clinical trials or obtain approval of our product candidates from the FDA and other regulatory authorities. We expect capital outlays and operating expenditures to increase over the next several years as we continue our research and development activities. Specifically, we need to raise additional capital to, among other things:

- conduct pre-clinical research for our NT-CoV2-1 vaccine product candidate, file an IND with the FDA and, if approved, engage in Phase 1 clinical trial and commence preparation for Phase 2 clinical trials;
- engage third parties in GMP and non-GMP manufacturing for our product candidates at the pre-clinical research and clinical trial stages;
- expand our clinical laboratory operations;
- fund our clinical validation study activities;
- expand our research and development activities; and
- finance our capital expenditures and general and administrative expenses.

Our present and future funding requirements will depend on many factors, including:

- the current and continued microeconomic impact of the COVID-19 pandemic on our ability, the ability of our third-party contractors and suppliers, and the ability of government regulators to conduct ordinary business operations in a timely and efficient manner, as well as the pandemic's broader, macroeconomic impact on the U.S., foreign and global economic markets;
- the level of research and development investment budgeted to develop our current and future product candidates;
- costs of filing, prosecuting, defending and enforcing patent claims and other intellectual property rights;
- our need or decision to acquire or license complementary technologies or acquire complementary businesses;
- changes in test development plans needed to address any difficulties in product candidate selection to pursue for commercialization;
- competing vaccines and technological and market developments;
- our interaction and relationship with the FDA, or other, regulatory agencies; and
- changes in regulatory policies or laws that affect our operations.

Additional capital may not be available on satisfactory terms, or at all. Furthermore, if we raise additional funds by issuing equity securities, dilution to our existing stockholders would result. Any equity securities issued also may provide for rights, preferences or privileges senior to those of holders of our common stock. If we raise

additional funds by issuing debt securities, these debt securities would have rights, preferences and privileges senior to those of holders of our common stock, and the terms of the debt securities issued could impose significant restrictions on our operations. If we raise additional funds through collaborations and licensing arrangements, we might be required to relinquish significant rights to our technologies or our products under development, or grant licenses on terms that are not favorable to us, which could lower the economic value of those programs to us. If adequate funds are not available, we may have to scale back our operations or limit our research and development activities, which may cause us to progress at a slower pace, or not at all, and our business could be adversely affected.

In addition, we could be forced to discontinue product development and commercialization of one or more of our product candidates, and/or forego licensing attractive business opportunities.

We were denied funding from the Biomedical Advanced Research and Development Authority ("BARDA") and we may be unable to win any government contracts, grants, agreement or other funding in the future. Even if we are successful in obtaining such contracts, grants, agreements or other funding, we cannot assure the success of our NT-CoV2-1 vaccine product candidate, that it will be approved by the FDA or other public health regulatory authority or that any funding provided will be sufficient to complete development and successful commercialization.

From time to time, we may apply for contracts, grants, agreements or other funding from government agencies, academic institutions and non-profit organizations. Such contracts or grants can be highly attractive because they provide capital to fund the ongoing development of our technologies and vaccine candidates without diluting our stockholders. However, significant competition exists for these contracts, grants, agreements or other funding. Entities offering such contracts, grants, agreements or other funding may have requirements to apply for or to otherwise be eligible to receive such contracts, grants, agreements or other funding that our competitors may be able to satisfy that we cannot. In addition, such entities have limited funding available to award and may make arbitrary decisions as to whether to offer contracts or make grants, to whom the contracts or grants will be awarded and the size of the contracts or grants to each awardee. Even if we are able to satisfy the award requirements, we may not be a successful awardee. Therefore, we may not be able to win any contracts or grants in a timely manner, if at all. For example, we applied for BARDA funding in connection with our license with the NIH and received notification that are request for BARDA funding had been denied.

Even if we receive a financing through one of the aforementioned mechanisms, the success of our NT-CoV2-1 vaccine product candidate cannot be assured solely by our ability to obtain such financing, nor can it assure that any vaccine product candidate so financed will succeed in clinical trials and receive regulatory approval from the FDA or other public health regulatory authorities. Moreover, we cannot guarantee that our receipt of such financing will obviate the need for future financial resources to support the further development of our NT-CoV2-1 vaccine product candidate, as additional development activities may be needed, and the vaccine approval and development process can be costly and unpredictable. We have no control over the resources and funding that government agencies may devote to these agreements, which may be subject to annual renewal and which generally may be terminated by the government agencies at any time. Accordingly, our receipt of such funding cannot be relied upon solely as an indicator or guarantee of the success of our NT-CoV2-1 vaccine product candidate.

We may rely on government funding and collaboration with government entities for our vaccine development, which adds uncertainty to our research and development efforts and may impose requirements that increase the costs of development, commercialization and production of any programs developed under those government-funded programs.

Because we anticipate the resources necessary to develop our new NT-CoV2-1 vaccine product candidate will be substantial, we may explore funding and development collaboration opportunities with the U.S. government and its agencies. For example, we may continue to apply for certain grant funding from BARDA, the NIH or other government agencies to further the research, development, manufacture, testing, and regulatory approval of our NT-CoV2-1 vaccine product candidate. We have no control or input over whether an application for BARDA grant funding or any other funding will be accepted or approved, in full or in part, and we cannot provide investors with any assurances that we will receive such funding.

Similar to the requirements imposed by our new NIH license, contracts and grants funded by the U.S. government and its agencies, contain provisions that reflect the government's substantial rights and remedies, many of which are not typically found in commercial contracts, including powers of the government to:

- reduce or modify the government's obligations under such agreements without the consent of the other party;
- claim rights, including IP rights, in products and data developed under such agreements;
- audit contract-related costs and fees, including allocated indirect costs;

- suspend the contractor or grantee from receiving new contracts pending resolution of alleged violations of procurement laws or regulations;
- impose U.S. manufacturing requirements for products that embody inventions conceived or first reduced to practice under such agreements;
- suspend or debar the contractor or grantee from doing future business with the government;
- control and potentially prohibit the export of products;
- pursue criminal or civil remedies under the False Claims Act, False Statements Act, and similar remedy provisions specific to government agreements; and
- limit the government's financial liability to amounts appropriated by the U.S. Congress on a fiscal-year basis, thereby leaving some uncertainty about the future availability of funding for a program even after it has been funded for an initial period.

In addition, government contracts and grants, ordinarily contain additional requirements that may increase our costs of doing business, reduce our profits, and expose us to liability for failure to comply with these terms and conditions, including the following:

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

If we received such grants or agreements, we may not have the right to prohibit the U.S. government from using certain technologies developed by us, and we may not be able to prohibit third-parties, including our competitors, from using those technologies in providing products and services to the U.S. government. Further, under such agreements we

could be subject to obligations to and the rights of the U.S. government set forth in the Bayh-Dole Act of 1980, meaning the U.S. government may have rights in certain inventions developed under these government-funded agreements, including a non-exclusive, non-transferable, irrevocable worldwide license to use inventions for any governmental purpose. In addition, the U.S. government could have the right to require us to grant exclusive, partially exclusive, or nonexclusive licenses to any of these inventions to a third party if it determines that: (i) adequate steps have not been taken to commercialize the invention; (ii) government action is necessary to meet public health or safety needs; or (iii) government action is necessary to meet requirements for public use under federal regulations, also referred to as "march-in rights." Although the U.S. government's historic restraint with respect to these rights indicates they are unlikely to be used, any exercise of the march-in rights could harm our competitive position, business, financial condition, results of operations, and prospects. In the event we would be subject to the U.S. government's exercise such march-in rights, we may receive compensation that is deemed reasonable by the U.S. government in its sole discretion, which may be less than what we might be able to obtain in the open market.

Additionally, as is the case under our new NIH license, the U.S. government requires that any products embodying any invention generated through the use of U.S. government funding be manufactured substantially in the United States. The license with the NRC also contains similar manufacturing requirements which may conflict with the NIH license. The manufacturing preference requirement can be waived if the owner of the intellectual property can show that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible. This preference for U.S. manufacturers may limit our ability to contract with non-U.S. manufacturers for products covered by such intellectual property. Obligations relating to manufacturing preferences and vaccine availability in Canada are included in the NRC license agreement.

Although we will need to comply with some of these obligations in relation to our NIH license, not all of the aforementioned obligations may be applicable to us unless and only to the extent that we receive a government grant, contract or other agreement. However, as an organization, we are relatively new to government contracting and new to the regulatory compliance obligations that such contracting entails. If we were to fail to maintain compliance with those obligations, we may be subject to potential liability and to termination of our contracts, including the NIH license, which may have a materially adverse effect on our ability to develop our NT-CoV2-1 vaccine product candidate.

We have limited vaccine-specific research, development, manufacturing, testing, regulatory, commercialization, sales, distribution, and marketing experience, and we may need to invest significant financial and management resources to establish these capabilities. Despite such investments and our best efforts, our strategic acquisition of Noachis Terra may turn out to be unsuccessful.

As part of our business strategy, we monitor and analyze strategic acquisition opportunities that we believe will be strategic fits for the Company and beneficial to the Company's shareholders. As demonstrated by our acquisition of Noachis Terra in May of 2020, we may acquire companies, businesses, products and technologies that complement, augment or transform our existing business. However, such acquisitions could involve numerous risks that may prevent us from fully realizing the benefits that we anticipated as a result of such transactions.

Prior to our acquisition of Noachis Terra, we had little-to-no experience in the development and commercialization of vaccines. Although, in connection with the acquisition, we added experienced vaccine researchers and consultants and appointed an experienced vaccine industry professional to our board of directors, given our size and current pre-clinical stage of development, we still have limited vaccine-specific research, development, manufacturing, testing, regulatory, commercialization, sales, distribution, and marketing experience. To successfully develop our NT-CoV2-1 vaccine product candidate, we will need to dedicate significant amounts of our limited financial and management resources to bolster our expertise in this area. Our success depends significantly on the continued contributions of our executive officers, financial, scientific and technical personnel and consultants, and on our ability to attract additional personnel.

During our operating history, many essential responsibilities have been assigned to a relatively small number of individuals, and we currently depend heavily upon the efforts and abilities of our management team. However, as we advance into vaccine development, the demands on our key employees will expand and we will need to recruit additional qualified employees or consultants for our Company. The competition for such qualified personnel is intense, particularly in light of the demand for vaccines or other treatment for SARS-CoV-2 and/or COVID-19. The loss of services of any of our existing consultants or our inability to attract additional personnel to fill critical positions could adversely affect our ability to efficiently develop our NT-CoV2-1 vaccine product candidate. The loss or unavailability of the services of any of these individuals could have a material adverse effect on our business, prospects, financial condition and results.

Alternatively, or in addition to the above, we may enter into strategic alliances or partnership with other vaccine industry entities to utilize their research, development, manufacturing, testing, regulatory or commercialization skills, but we may be unable to enter into such agreements on favorable terms, if at all. If our future strategic collaborators do not commit sufficient resources to our alliances or partnerships and the progress of our vaccine development, if any, and we are unable to develop the necessary capabilities on our own, we may be unable to advance the development of our NT-CoV2-1 vaccine product candidate to the point of commercialization, even if we obtain regulatory approval. We will be competing with many companies that currently have existing, extensive and well-funded operations, and without a significant internal team or the support of a third party to perform essential functions related to vaccine research, development, manufacturing, testing, regulatory approval, and commercialization, we may be unable to compete successfully against these more established companies and our NT-CoV2-1 vaccine product candidate may fail.

Any failure by us to effectively limit such risks as we implement our strategic acquisition could have a material adverse effect on our business, financial condition or results of operations and cause the price of our securities to fall.

We have limited financial resources and we may not be able to maintain our current level of operations or be able to fund the further development of our new NT-CoV2-1 vaccine product candidate.

To date, Oragenics has never developed a vaccine product candidate, and we cannot assure investors that we will be able to successfully develop a vaccine to prevent SARS-CoV-2 or COVID-19 with our current resources and capabilities. Because our new NT-CoV2-1 vaccine product candidate is in early stages of development, and contemplates nasal administration it will require extensive pre-clinical and clinical testing, and we will need significant additional funding to conduct such research and testing. We do not expect to generate revenue from product sales, licensing fees, royalties, milestones, contract research or other sources of funds in amounts sufficient to fully fund our operations for the foreseeable future, and we will therefore use our cash resources, and expect to require additional funds, to maintain our existing operations, continue our research and development programs, commence future pre-clinical studies and clinical trials for our NT-CoV2-1 vaccine product candidate, and to seek regulatory approvals.

We anticipate seeking such additional funds through a combination of public or private equity or debt financings, as well as potential collaborations, strategic alliances and marketing, distribution or licensing arrangements and non-dilutive funding from government and nongovernment funding entities, as well as other sources to further the research, development, manufacturing, testing, and regulatory approval of vaccine product candidates. While we may continue to apply for contracts or grants from academic institutions, nonprofit organizations and governmental entities, we may not be successful. Adequate additional funding may not be available to us on acceptable terms, if at all. If we cannot raise the additional funds required for our anticipated operations or to support our development efforts, we may be required to delay significantly, reduce the scope of or eliminate one or more of our research or development programs, downsize our organization, or seek alternative measures to avoid insolvency, including arrangements with collaborative partners or others that may require us to relinquish rights to certain of our technologies or our vaccine candidate. If we raise additional funds through future offerings of shares of our common stock or other debt or equity securities, such offerings would cause dilution of current stockholders' percentage ownership in the Company, which could be substantial. Additionally, future offerings also could have a material and adverse effect on the price of our common stock.

Our vaccine product candidate is at the pre-clinical stage and has not been approved for sale. We have not conducted substantial research and development for a vaccine product candidate, and we may be unable to produce a vaccine that successfully prevents the virus in a timely and economical manner, if at all.

Our NT-CoV2-1 vaccine development program is in the early stages of research and development, and currently includes only one product candidate, which is in the pre-clinical stage. Limited data exist regarding the safety and efficacy of our vaccine product candidate, and we must conduct a substantial amount of additional research, development and clinical testing before any regulatory authority will approve our vaccine product candidate. The success of our efforts to develop and commercialize our product candidates could fail for a number of reasons. For example, we could experience delays in product development and clinical trials or unsatisfactory clinical trial results.

In addition, adverse events, or the perception of adverse events, relating to a vaccine product candidate administered intranasally and delivery technologies may negatively impact our ability to develop commercially successful products. For example, pharmaceutical companies have been subject to claims that the use of some pediatric vaccines has caused personal injuries, including brain damage, central nervous system damage and other ailments. Regardless of the veracity of or the data supporting these claims, these and other claims may influence public perception of the use of vaccine product candidates and could result in greater governmental regulation, stricter labeling requirements and potential regulatory delays in the testing or approval of our potential vaccine product candidate. Such greater government regulation could have a material effect on our ability to develop and market our NT-CoV2-1 vaccine product candidate.

We have not conducted substantial research on the NT-CoV2-1 vaccine product candidate and we lack experience in the research, development, manufacture, regulatory approval, marketing, commercialization and implementation of a vaccine product candidate. Also, uncertainties exist surrounding the longevity and severity of COVID-19 as a global health concern. The success of our efforts to develop and commercialize our product candidates could fail for a number of reasons. Accordingly, we may be unable to produce a vaccine that successfully targets SARS-CoV-2 in a timely and economical manner, if at all.

For example, we expect to commit significant financial resources and personnel to the development of our NT-CoV2-1 vaccine product candidate, which may cause delays in or otherwise negatively impact our other product candidate development program. The outcome of any research and development program is highly uncertain. Only a small fraction of biotechnology and vaccine development programs ultimately result in commercial products or even product candidates and a number of events could delay our development efforts and negatively impact our ability to obtain regulatory approval for, and to manufacture, market and sell, a nasally administered vaccine. Additionally, our ability to develop an effective vaccine will depend on our ability to work on an accelerated timeline, with uncertain access to financial resources beyond those that we currently possess, and in competition with a significant number of better-funded and more experienced vaccine-development companies. Moreover, if the COVID-19 pandemic is effectively contained or the risk of further spread is diminished or eliminated before we can successfully develop, manufacture and commercialize NT-CoV2-1, we may be unable to identify strategic partners willing to work with and support us in our development efforts and, even if we obtain regulatory approval, the market that we anticipate for this product candidate may not exist or may be much smaller than we previously anticipated. Alternatively, even if a market exists, our vaccine product candidate could be found to be ineffective or unsafe, or otherwise fail to receive necessary regulatory clearances. Our vaccine product candidate, even if safe and effective, could be difficult to manufacture on a large scale or uneconomical to market, or our competitors could develop superior products more quickly and efficiently or more effectively market their competing products. Accordingly, our inability to develop a commercially-successful vaccine product will materially harm our business. In addition, other parties are currently producing and administering approved vaccines for the treatment for SARS-CoV-2 or under the FDA's Emergency Use Authorization and other competitive vaccines are expected to seek such authorization as well. Such competitive vaccines already in the market may also lead to the diversion of governmental and nongovernmental resources away from us and toward our competitors.

The market opportunities for our vaccine product candidate may be smaller than we believe them to be. Moreover, any pandemic threat may abate, or alternative vaccines or technologies may be adopted, before our vaccines achieve regulatory approval.

The primary area of focus for our future research and product development activities is the development of a nasally administered vaccine candidate to prevent SARS-CoV-2 and the disease it principally causes, COVID-19. Our current projections of both the number of people who are or will be affected by this disease, as well as the subset of people who may be affected by this disease and who have the potential to benefit from immunity through our NT-CoV2-1 vaccine product candidate, are based on estimates. These estimates have been derived from a variety of sources, including scientific literature, surveys of clinics, patient foundations, or market research, and may prove to be incorrect. Further, because coronaviruses have evolved in recent decades and research on SARS-CoV-2 and COVID-19 are continuously changing due to the complicated nature of the virus, new studies may change the estimated incidence or prevalence of COVID-19. The number of clinical trial participants in the United States, Europe, and elsewhere may turn out to be lower than expected, potential clinical trial participants may not be otherwise amenable to treatment with our products, or new clinical trial participants may become increasingly difficult to identify or gain access to, all of which would adversely affect our ability to conduct the research and development necessary to complete the vaccine product candidate.

Moreover, the threat of the COVID-19 pandemic outbreak may subside before we are able to complete research and development for our NT-CoV2-1 vaccine product candidate, obtain regulatory approval for the vaccine product candidate and realize any return on our investment in the research and development. Other organizations some of which are currently broadly administering vaccines under the FDA approval, or Emergency Use Authorization authority, may obtain licenses for their own pandemic vaccines, or government health organizations may acquire adequate stockpiles of pandemic vaccines or adopt other technologies or strategies to prevent or limit outbreaks before our NT-CoV2-1 vaccine product candidate reaches the marketplace. We may not achieve a return on our investment before the threat of the COVID-19 pandemic subsides or a competing product is adopted.

If we are unable to successfully develop our product candidates, our operating results and competitive position could be harmed. Research and development involves a lengthy and complex process, and we may not be successful in our efforts to develop and commercialize our product candidates. The further development and ultimate commercialization of product candidates for SARS-CoV-2 and COVID-19, as well as our other product candidates, are keys to our strategy.

A key element of our business strategy is to discover, develop, validate and commercialize a vaccine product candidate to provide immunity from SARS-CoV-2, which we aim to market globally to both public and private payers. Additionally, our focus concerns the development of a portfolio of additional antibiotic product candidates to combat multi drug resistant organism, or MDRO, outbreaks and the associated costs to patients, inpatient facilities and the health care industry. We cannot assure you that we will be able to successfully complete development of, or commercialize any or all of our planned future product candidates, or that they will be clinically usable. The product development process involves a high degree of risk and may take up to several years or more. Our new product development efforts may fail for many reasons, including:

- our recent entry into the vaccine research and development industry;
- failure of future tests at the research or development stages;
- lack of clinical validation data to support effectiveness;
- delays resulting from the failure of third-party suppliers or contractors to meet their obligations in a timely and cost-effective manner;
- regulatory delays at the FDA or from other independent oversight authorities, particularly in light of the demands placed on public health resources during and following the COVID-19 pandemic;
- failure to obtain or maintain necessary certifications, licenses, clearances or approvals to market or perform the test; or
- lack of commercial acceptance by the health care marketplace.

Few research and development projects result in commercial products, and success in early clinical trials often is not replicated in later trials. At any point, we may abandon development of products in favor of the development or acquisition of new products, or we may be required to expend considerable resources repeating clinical studies or trials, which would adversely impact the timing for generating potential revenues from those new products. In addition, as we advance the development of new products through to the commercialization stage, we will have to make additional investments in our sales and marketing operations, which may be prematurely or unnecessarily incurred if the commercial launch of a product is abandoned or delayed.

If we are successful in producing a vaccine against SARS-CoV-2, we may need to devote significant resources to its scale-up and development, including for use by the U.S. government or other foreign authorities. Moreover, government involvement may limit the commercial success of our vaccine product candidate.

Because the COVID-19 outbreak has been classified as a pandemic by public health authorities, it is possible that one or more government entities may take actions that directly or indirectly have the effect of abrogating some of our rights or opportunities with respect to the research, development and commercialization of our NT-CoV2-1 vaccine product candidate. We have not manufactured a pandemic vaccine to date, but if we were to do so, the economic value of such a vaccine to us could be limited by such government action or inaction. Various government entities, including the U.S. government, are offering, but may not continue to offer, incentives, grants and contracts to encourage additional investment by commercial organizations into preventative and therapeutic agents against SARS-CoV-2 and/or COVID-19, which may have the effect of increasing the number of competitors and/or providing advantages to known competitors. Accordingly, there can be no assurance that we will be able to successfully establish a competitive market share for our NT-CoV2-1 vaccine product candidate.

In the event that any of the pre-clinical research or, if an IND is accepted by the FDA, the Phase 1 clinical trials for our SARS-CoV-2 vaccine product candidate are perceived to be successful, we may need to work toward the large-scale technical development, manufacturing scale-up and larger scale deployment of this potential vaccine through a variety of U.S. government-sponsored mechanisms, such as an Expanded Access Program or an Emergency Use Authorization program. In this case we may need to divert significant resources to this program, which would require diversion of resources from our other existing product candidate programs. In addition, since the path to licensure of any vaccine against SARS-CoV-2 is unclear, and widely-used vaccines in circulation in the United States and other countries could impact our receipt of marketing approval. Unexpected safety issues in these circumstances could lead to significant reputational damage for us and our technology platform going forward and other issues, including delays in our other programs, the need for re-design of our clinical trials and the need for significant additional financial resources.

Our product candidates, if approved, will face significant competition and our failure to compete effectively may prevent us from achieving significant market penetration.

The pharmaceutical industry is characterized by rapidly advancing technologies, intense competition and a strong emphasis on developing proprietary therapeutics. Numerous companies are engaged in the development, patenting, manufacturing and marketing of healthcare products competitive with those that we are developing. We face competition from a number of sources, such as pharmaceutical companies, including generic drug companies, biotechnology companies and academic and research institutions, many of which have greater financial resources, marketing capabilities, sales forces, manufacturing capabilities, research and development capabilities, clinical trial expertise, intellectual property portfolios, experience in obtaining patents and regulatory approvals for product candidates and other resources than us. Some of the companies that offer competing products also have a broad range of other product offerings, large direct sales forces and long-term customer relationships with our target physicians, which could inhibit our market penetration efforts. In addition, certain of our product candidates, if approved, may compete with other products, for a share of some patients' discretionary budgets and for physicians' attention within their clinical practices.

We anticipate that, if we obtain regulatory approval of our product candidates, we will face significant competition from other approved therapies and may need to compete with unregulated, unapproved and off-label treatments. Certain of our product candidates, if approved, will present novel therapeutic approaches for the approved indications and will have to compete with existing therapies, some of which are widely known and accepted by physicians and patients. To compete successfully in this market, we will have to demonstrate that the relative cost, safety and efficacy of our approved products, if any, provide an attractive alternative to existing and other new therapies. Such competition could lead to reduced market share for our product candidates and contribute to downward pressure on the pricing of our product candidates, which could harm our business, financial condition, operating results and prospects.

Due to less stringent regulatory requirements in certain foreign countries, there are many more products and procedures available for use in those international markets than are approved for use in the United States. In certain international markets, there are also fewer limitations on the claims that our competitors can make about the effectiveness of their products and the manner in which they can market them. As a result, we expect to face more competition in these markets than in the United States.

Because our vaccine product development efforts depend on new and rapidly evolving technologies, we cannot be certain that our efforts will be successful.

Currently, the FDA has given full approval to Moderna and Pfizer for their vaccines and Janssen has an EUA. A number of other vaccine manufacturers, academic institutions and other organizations currently have programs to develop such a vaccine. The WHO currently lists 10 COVID-19 vaccines approved for use and 65 COVID-19 vaccine candidates in Phase 3 evaluation. These companies have greater experience and expertise in securing government contracts and grants to support their research and development efforts, conducting testing and clinical trials, obtaining regulatory approvals to market products, manufacturing such products on a broad scale and marketing approved products. These companies may also partner or collaborate with large and established companies, such as Merck & Co., Inc., GlaxoSmithKline plc, CSL Ltd, Pfizer Inc. and AstraZeneca, among others, or they may partner or collaborate with or obtain funding from governments, academic institutions or other nongovernmental organizations. In order to effectively compete, we will have to make substantial investments in development, testing, manufacturing and sales and marketing or partner with one or more established companies.

Moreover, our new vaccine development efforts depend on new, rapidly evolving technologies. Our development efforts and, if those are successful, commercialization of our NT-CoV2-1 vaccine product candidate could fail for a variety of reasons, and include the possibility that:

- Our SARS-CoV-2 vaccine product candidate or technologies, any or all of the products based on such technologies or any manufacturing process will be ineffective or unsafe, or otherwise fail to receive necessary regulatory approvals or achieve commercial viability;
- third-party supplier or manufacturer facilities will be unable or unwilling to provide necessary supplies or scale-up manufacturing capabilities for our products in a cost-effective manner or at all;
- the products, if safe and effective, may be difficult to manufacture on a large-scale or uneconomical to market;
- third-party manufacturing facilities will fail to continue to pass regulatory inspections;
- proprietary rights of third-parties will prevent us or our collaborators from exploiting technologies, and manufacturing or marketing products; and
- third-party competitors with approval or Emergency Use Authorization from the FDA and use of vaccines will gain greater market share and limit or impair development efforts.

We may be unable to refine a method to produce MU1140 homologs in large-scale commercial quantities. If we cannot, we will be unable to generate significant revenues from sales of an MU1140 homolog product candidate.

Our antibiotic product candidates, all homologs of MU1140, are produced by our strain of*S. mutans* and variants thereof. We have successfully developed a methodology for producing MU1140 in quantities sufficient to undertake its nonclinical testing. If we are not able to further adequately scale up fermentation and purification methodologies for large-scale manufacture, we will be unable to partner and generate revenues from this product candidate and our business, financial condition and results of operations will be materially adversely affected. The manufacturing of MU1140 homologs or any other possible antibiotic product candidates based on lantibiotics, is a highly exacting and complex process. Manufacturing MU1140 homologs or any other antibiotic candidates derived from lantibiotics on a commercial scale has not yet been achieved to our knowledge, so there are additional risks that such efforts will not be successful. Third-party manufacturers must have additional technical skills and must take multiple steps to attempt to control the manufacturing processes. If we are unable to identify and produce MU1140 homologs in large-scale commercial quantities, we will be unable to generate significant revenues from sales of our MU1140 product candidate and our financial condition and results of operations will be materially adversely affected.

Our success will depend on our ability to obtain regulatory approval of our product candidate under our Lantibiotics Program and its successful commercialization.

We have not received regulatory approval in any jurisdiction for lantibiotic product candidate and we may never receive approval or, if approvals are obtained, may never be commercialized successfully. We have incurred and will continue to incur significant costs relating to the nonclinical development of our antibiotic product candidates (including MU1140 homologs we may develop). We have performed extensive nonclinical testing using native MU1140 and continue to seek to identify homologs as potential product candidates which would require additional nonclinical testing. This work will be done solely by us through the use of outside contractors. If our nonclinical work is successful, we would expect the IND for a first-in-human clinical trial of a lantibiotic compound to be filed with the FDA based on our ability to complete the requisite studies, contingent on sufficient funding.

Even if we are able to conduct successful clinical trials or the required regulatory approvals are obtained, we may never be able to generate significant revenues from our product candidates. If our product candidates are unsuccessful, we may be unable to generate sufficient revenues to sustain and grow our business, and our business, financial condition and results of operations will be materially adversely affected.

We may choose not to continue developing or commercializing any of our product candidates at any time during development or after approval, which would reduce or eliminate our potential return on investment for those product candidates.

At any time, we may decide to discontinue the development or commercialization of any of our products or product candidates for a variety of reasons, including inadequate financial resources the appearance of new technologies that render our product obsolete, competition from a competing product or changes in or failure to comply with applicable regulatory requirements. If we terminate a program in which we have invested significant resources, we will not receive any return on our investment and we will have missed the opportunity to allocate those resources to potentially more productive uses. For example, we mutually agreed to terminate our Exclusive Channel Collaboration Agreement with Eleszto Genetika, Inc. in September 2021 and in connection therewith ceased future development of our lead lantibiotic homolog candidate.

We have limited experience in the conduct of clinical trials. We have never initiated a vaccine-related clinical trial. We have never obtained approval of any product candidates. We may be unable to undertake any of those actions successfully.

As a company, we have limited experience and capacity for the conduct of pre-clinical research and clinical trials, as well as the progression of a product candidate through to regulatory approval. Because we are in the early stages of development for NT-CoV2-1 and because the SARS-CoV-2 vaccine landscape continues to evolve, our clinical trials may require more time and incur greater costs than we anticipate. We cannot be certain that planned clinical trials will begin or conclude on time, if at all. Large-scale trials would require significant additional financial and management resources, and reliance on third-party clinical investigators, CROs and/or consultants. Any performance failure on the part of such third parties could delay clinical development or delay or prevent us from obtaining regulatory approval or commercializing our current or future product candidates, depriving us of potential product revenue and resulting in additional losses. By contrast, larger pharmaceutical and biopharmaceutical companies often have substantial staff or departments with extensive experience in conducting clinical trials with multiple product candidates across multiple indications and obtaining regulatory approval in various countries. In addition, these companies may have greater financial resources to compete for the same clinical investigators, sites and patients that we may attempt to recruit or retain for our pre-clinical research and clinical trials. As a result, we may be at a competitive disadvantage that could delay the initiation, recruitment, timing and completion of our pre-clinical research and clinical trials and obtaining regulatory, marketing and related approvals, if achieved at all, for our NT-CoV2-1 vaccine product candidate.

We cannot assure you that the market and consumers will accept our products or product candidates. If they do not, we will be unable to generate significant revenues from our products or product candidates and our business, financial condition and results of operations will be materially adversely affected.

The commercial success of our NT-CoV2-1 vaccine product candidate, our MU1140 homologs antibiotic product candidates, and any of our other product candidates and technologies, will depend in part on market acceptance by consumers. Biopharmaceutical companies have received substantial support from the scientific community, regulatory agencies and many governmental officials in the United States and internationally. Future scientific developments, media coverage and political events may diminish such support. Public attitudes may be influenced by claims that health products are unsafe for consumption or pose unknown risks to the environment or to traditional social or economic practices. Securing governmental approvals for, and consumer confidence in, such products pose numerous challenges, particularly outside the United States. The market success of product candidates developed by biopharmaceutical companies could be delayed or impaired in certain geographical areas as a result. Products based on our product candidates may compete with a number of traditional therapies and drugs manufactured and marketed by major pharmaceutical companies and biotechnology companies. Market acceptance of products based on our product candidates will depend on a number of factors including potential advantage over alternative treatment methods. We can offer you no assurance that physicians, patients or the medical communities in general will accept and utilize products developed from our product candidates. If they do not, we may be unable to generate significant revenues from our product candidates and our business, financial condition and results of operations will be materially adversely affected.

Failure to obtain marketing approval in international jurisdictions would prevent our product candidates from being marketed abroad.

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

We will need to further increase the size and complexity of our organization in the future, and we may experience difficulties in executing our growth strategy and managing our growth.

Our current management, personnel, systems and facilities are not adequate to support our future growth plans. We will need to further expand our scientific, sales and

marketing, operational, financial and other resources to support our planned research, development, clinical trial work, and commercialization activities.

To manage our operations, growth and various projects effectively, we must:

- continue to improve our operational, financial, management and regulatory compliance controls and reporting systems and procedures;
- attract and retain sufficient numbers of talented employees;
- develop a plan for marketing, sales, and distribution capability;
- manage our commercialization activities for our product candidates effectively;
- establish and maintain relationships with development and commercialization partners;
- manage our pre-clinical and clinical trials effectively;
- manage our third-party supply and manufacturing operations effectively and in a cost-effective manner, while increasing production capabilities for our current product candidates to commercial levels; and
- manage our development efforts effectively while carrying out our contractual obligations to partners and other third parties.

In addition, we have utilized and continue to utilize the services of part-time outside consultants to perform a number of tasks for us, including tasks related to pre-clinical and clinical testing. Our growth strategy may also entail expanding our use of consultants to implement these and other tasks going forward. We rely on consultants for certain functions of our business and will need to effectively manage these consultants to ensure that they successfully carry out their contractual obligations and meet expected deadlines. There can be no assurance that we will be able to manage our existing consultants or find other competent outside consultants, as needed, on economically reasonable terms, or at all. If we are not able to manage our growth effectively and expand our organization by hiring new employees and expanding our use of consultants, we might be unable to implement successfully the tasks necessary to execute effectively on our planned research, development and commercialization activities and, accordingly, might fail to achieve our research, development and commercialization goals.

If we, or our manufacturers and suppliers in general, fail to meet contractual obligations, requirements and the requirements of regulatory authorities, our research and development may be materially adversely affected.

We do not have the internal capability to manufacture our SARS-CoV-2 vaccine, MU1140 homologs, or any other product candidates and all of their constituent parts under GMPs, as required by the FDA and other regulatory agencies. In order to continue to develop and commercialize our product candidates and to apply for regulatory approvals for our product candidates, we will need to contract with third parties that have, or otherwise develop, the necessary manufacturing capabilities in full compliance with applicable regulatory requirements.

We enter into agreements with these third-party suppliers as part of, and in connection with, our product development plans and timing. In order to have sufficient product available for anticipated future clinical trials we need to enter into agreements with GMP certified manufactures that have the capability and capacity to meet our expected product needs and timing in advance of when our actual needs will arise in order for us to be positioned to continue development without delays due to the manufacturing process and capabilities of qualified manufacturers. These agreements may obligate us to make certain payments in connection with the manufacture of our vaccine product candidate based upon our current expected timing. If the timing of our current development plans changes, we could be required to make additional payments to associated with such delays and/or associated with the cancellation of the agreement without achieving the benefits anticipated from the agreement.

There are a limited number of manufacturers that operate under GMPs that are capable of manufacturing our product candidates. Due to the early-stage development of our SARS-CoV-2 vaccine product candidate, we cannot at this time accurately predict the numbers and capabilities of manufacturers that will be required and capable of manufacturing the vaccine product candidate and any of its components. Manufacturing on a commercial scale has not yet been undertaken and there are additional technical skills needed for the manufacture of MU1140 homologs that will further limit the number of potential manufacturers. As such, if we are unable to enter into supply and processing contracts with any of these manufacturers or processors for our NT-CoV2-1 vaccine product candidate, our MU1140 product candidates, or our other product candidates for the conduct of clinical trials on such product candidate we may incur additional costs and delays in development and commercialization.

Problems with these manufacturing processes such as equipment malfunctions, facility contamination, labor problems, raw material shortages or contamination, natural disasters, power outages, terrorist activities, or disruptions in the operations of our suppliers and even minor deviations from normal procedures, could result in product defects or manufacturing failures that result in lot failures, product recalls, product liability claims and insufficient inventory or supply of product for the conduct of clinical trials. For example, the COVID-19 pandemic and government shutdowns in response have interrupted supply chains, the manufacture and transmission of goods and the regularity with which manufacturers ordinarily operate. Such interruptions, unless remedied entirely, can disrupt our research and development efforts and our clinical trials, and even if remedied, could create delays that materially impact our business.

If we are required to find an additional or alternative source of supply, there may be additional costs and delays in the development, clinical trial timing, or commercialization of our product candidates. Additionally, the FDA and other regulatory agencies routinely inspect manufacturing facilities before approving a New Drug Application, or NDA, or Biologic License Application, or BLA, for a drug or biologic manufactured at those sites. If any of our manufacturers or processors fails to satisfy regulatory requirements, the approval and eventual commercialization of our commercial products and product candidates may be delayed.

All of our contract manufacturers must comply with the applicable GMPs, which include quality control and quality assurance requirements as well as the corresponding maintenance of records and documentation. If our contract manufacturers do not comply with the applicable GMPs and other FDA regulatory requirements, we may be subject to product liability claims, the availability of marketed products for sale could be reduced, our product commercialization could be delayed or subject to restrictions, we may be unable to meet demand for our products and may lose potential revenues and we could suffer delays in the progress of nonclinical testing and clinical trials for products under development. We do not have control over our third-party manufacturers' compliance with these regulations and standards. Moreover, while we may choose to manufacture our products ourselves in the future, we have no experience in the manufacture of pharmaceutical or biological products for clinical trials or commercial purposes. If we decide to manufacture products, we would be subject to the regulatory requirements described above. In addition, we would require substantial additional capital and would be subject to delays or difficulties encountered in manufacturing pharmaceutical or biological products. Regardless of the manufacturer of our products, we will be subject to continuing obligations regarding the submission of safety reports and other post-market information.

In March 2022 we entered into an agreement with KBI Biopharma, Inc. for the process transfer, process optimization and cGMP manufacturing of our vaccine candidate in anticipation of a future Phase 2 clinical trial. This agreement obligates us to make certain payments to KBI in connection with the manufacture of our vaccine product candidate based upon our current expected timing. If the timing of our current development plans changes, we could be required to make additional payments to KBI associated with such delays and/or associated with the cancellation of the agreement without achieving the benefits anticipated from the agreement. Additionally, a fill/finish, packaging and labeling company has been identified to support the Phase 1 program and is schedule for GMP manufacturing of clinical material in 2Q22.

We rely on the significant experience and specialized expertise of our senior management and scientific team and the loss of any of our key personnel or our inability to successfully hire their successors could harm our business.

Our performance is substantially dependent on the continued services and on the performance of our senior management and scientific team, who have extensive experience and specialized expertise in our business. Our performance also depends on our ability to retain and motivate our other key employees. In February 2012 we hired Mr. Michael Sullivan, Certified Public Accountant as our Chief Financial Officer, Mr. Sullivan also served as our Interim Principal Executive Officer from October of 2014 through June of 2016 and is currently serving again as our Interim Principal Executive Officer as a result of the resignation of our former CEO and President in May 2021. The loss of the services of senior management or any key employees could harm our ability to develop and commercialize our product candidates. We have no key man life insurance policies.

In connection with our acquisition of Noachis Terra, we added vaccine consultants and advisors, who were engaged in various capacities related to the research and development of a SARS-CoV-2 vaccine product candidate. Our ability to successfully continue the vaccine development depends in large part on our ability to retain certain consultants. Despite our efforts to retain these consultants, one or more may terminate their engagement with us on short notice. The loss of the services of any of these consultants could have substantial negative effects on our research and development efforts, which are necessary to further development of our NT-CoV2-1 vaccine product candidate.

We need to hire and retain additional qualified scientists and other highly skilled personnel to maintain and grow our business.

Our future success depends on our ability to identify, attract, hire, train, retain and motivate highly skilled technical, managerial and research personnel in all areas within our organization. We plan to continue to execute on our business strategy and expect to hire additional personnel to support our product development efforts. We believe that there are only a limited number of individuals with the requisite skills to serve in many of our key positions, and we compete for key personnel with other more established biotechnology companies, as well as universities and research institutions. It is often difficult to hire and retain these persons, and we may be unable to replace key persons if they leave or be unable to fill new positions requiring key persons with appropriate experience. If we fail to attract, integrate and retain the necessary personnel, our ability to maintain and grow our business could suffer significantly.

If any of our product candidates are shown to be ineffective or harmful in humans, we will be unable to generate revenues from these product candidates.

Before obtaining regulatory approvals for the commercial sale of our product candidates, we must demonstrate through nonclinical testing and clinical trials that our products are safe and effective for use in humans. To date the testing of the antibiotic substance MU1140 homologs has been undertaken solely in the laboratory and in animals. We have not yet conducted human trials with any MU1140 homolog nor have we initiated clinical trials for our NT-CoV2-1 vaccine product candidate. It is possible that when and if future lantibiotic trials and/or our NT-CoV2-1 vaccine product candidate trials are conducted in humans, they will show that our antibiotic or vaccine candidates are ineffective or harmful in humans. If MU1140 homologs or our vaccine product candidate are shown to be ineffective or harmful in humans, we will be unable to commercialize and generate revenues from sales of such product candidates. If we are unable to generate revenues from the first generation of MU1140 and homologs, or any other product candidates, our business, financial condition and results of operations will be materially adversely affected.

Because we are new to vaccine development, we must identify vaccines for development with our technologies and establish successful third-party relationships.

Because we are new to vaccine development and lack substantial experience in the research and development of vaccines, the near and long-term viability of our SARS-CoV-2 vaccine product candidate will depend in part on our ability to successfully establish new strategic collaborations with biotechnology companies, non-profit organizations. government agencies and other vaccine industry entities. Establishing and maintaining strategic collaborations and obtaining government funding is difficult and time-consuming. Potential collaborators may reject collaborations based upon their assessment of our financial, regulatory or intellectual property position or based on their internal pipeline; government agencies may reject contract or grant applications based on their assessment of public need, the public interest, our products' ability to address these areas, or other reasons beyond our expectations or control. If we fail to establish a strategic collaborations or government relationships on acceptable terms, we may not be able to develop and commercialize our NT-CoV2-1 vaccine product candidate or generate sufficient revenue to fund further research and development efforts.

Additionally, we do not have our own clinical research and development facilities dedicated to vaccine development and manufacture. We have in the past and may in the future engage consultants and independent contract research organizations, subject to regulatory considerations, to design and conduct our clinical trials in connection with the development of our SARS-CoV-2 vaccine product candidate. As a result, these important aspects of a product's development will be outside of our direct control. Even if we establish new collaborations or obtain government funding, these relationships may never result in the successful development or commercialization of our vaccine product candidate for several reasons, including the fact that:

- we may not have the ability to control the activities of our partners and cannot provide assurance that they will fulfill their obligations to us, including with respect to the license, development and commercialization of our vaccine product candidate, in a timely manner or at all;
- such partners may not devote sufficient resources to our vaccine product candidate or properly maintain or defend our intellectual property rights;
- any failure on the part of our partners to perform or satisfy their obligations to us could lead to delays in the development or commercialization of our vaccine product candidate and affect our ability to realize product revenue; and
- disagreements, including disputes over the ownership of technology developed with such collaborators, could result in litigation, which would be time consuming and expensive, and may delay or terminate research and development efforts, regulatory approvals and commercialization activities.

Our collaborators will be subject to the same regulatory approval of their manufacturing facility and process as us. Before we could begin commercial manufacturing of any of our vaccine candidates, we and our collaborators must pass a pre-approval inspection before FDA approval and comply with the FDA's GMP regulations. If our collaborators fail to comply with these requirements, our vaccine candidate may not be approved. If our collaborators fail to comply with these requirements after approval, we could be subject to possible regulatory action and may be limited in the jurisdictions in which we are permitted to sell our products. If we or our collaborators fail to establish agreements as necessary, we could be required to undertake research, development, manufacturing and commercialization activities solely at our own expense. These activities would significantly increase our capital requirements and, given our lack of sales, marketing and distribution capabilities, significantly delay the commercialization of our vaccine product candidate.

We intend to seek licensing partners to cover a portion of the costs associated with obtaining regulatory approval for, and manufacturing and marketing of, our product candidates. If we are unable to obtain agreements with third parties to fund these costs, we will have to fund such costs ourselves or we may be unable to extract any value from these technologies.

As we continue our development of product candidates, we intend to either license these product candidates to, or partner with, one or more major pharmaceutical companies at the earliest possible time in their product development. If we do so, we intend for these licensees or partners to pay the costs associated with any remaining development work, regulatory submissions, clinical trials and the manufacturing and marketing of our product candidates. If we are unable to license our product candidates or otherwise partner with third parties, we will have to fund the costs of our clinical trials ourselves or we will be unable to extract any value from these technologies. We may also have to establish our own manufacturing facilities and find our own distribution channels. This would greatly increase our future capital requirements and we cannot assure you that we would be

able to obtain the necessary financing to pay these costs. If we are unable to cover the associated costs or we cannot obtain financing on acceptable terms or at all, our business, financial condition and results of operations will be materially adversely affected.

Our dependence on collaborative arrangements with third parties subjects us to a number of risks. These collaborative arrangements may not be on terms favorable to us. Agreements with collaborative partners typically allow partners significant discretion in electing whether or not to pursue any of the planned activities. We cannot control the amount and timing of resources our collaborative partners may devote to products based on the collaboration, and our partners may choose to pursue alternative products. Our partners may not perform their obligations as expected. Business combinations or significant changes in a collaborative partner's business strategy may adversely affect a partner's willingness or ability to complete its obligations under the arrangement. Moreover, we could become involved in disputes with our partners, which could lead to delays or termination of the collaborations and time-consuming and expensive litigation or arbitration. Even if we fulfill our obligations under a collaborative agreement, our partner may be able to terminate the agreement under certain circumstances. If any collaborative partner were to terminate or breach our agreement with it, or otherwise fail to complete its obligations in a timely manner, our chances of successfully commercializing our product candidates would be materially and adversely affected.

We might not be successful at acquiring, investing in or integrating businesses, entering into joint ventures or divesting businesses.

We expect to continue pursuing strategic acquisitions, investments and joint ventures to enhance or add to our skills and capabilities or offerings of services and solutions, or to enable us to expand in certain geographic and other markets. Depending on the opportunities available, we may increase the amount of capital invested in such opportunities. We may not succeed in completing targeted transactions, including as a result of the market becoming increasingly competitive, or achieve desired results of operations. Furthermore, we face risks in successfully integrating any businesses we might acquire or create through a joint venture. Ongoing business may be disrupted, and our management's attention may be diverted by acquisition, investment, transition or integration activities. In addition, we might need to dedicate additional management and other resources, and our organizational structure could make it difficult for us to efficiently integrate acquired businesses into our ongoing operations and assimilate and retain employees of those businesses into our culture and operations. The loss of key executives, employees, customers, suppliers, vendors and other business partners of businesses we acquire may adversely impact the value of the assets, operations or businesses. Furthermore, acquisitions or joint ventures may result in significant costs and expenses, including those related to retention payments, equity compensation, severance pay, early retirement costs, intangible asset amortization and asset impairment charges, assumed litigation and other liabilities, and legal, accounting and financial advisory fees, which could negatively affect our profitability. We may have difficulties as a result of entering into new markets where we have limited or no direct prior experience or where competitors may have stronger market positions. We might fail to realize the expected benefits or strategic objectives of any acquisition, investment or joint venture we undertake. We might not achieve our expected return on investment or may lose money. We may be adversely impacted by liabilities that we assume from a company we acquire or in which we invest, including from that company's known and unknown obligations, intellectual property or other assets, terminated employees, current or former clients or other third parties. In addition, we may fail to identify or adequately assess the magnitude of certain liabilities, shortcomings or other circumstances prior to acquiring, investing in or partnering with a company, including potential exposure to regulatory sanctions or liabilities resulting from an acquisition target's previous activities, internal controls and security environment. If any of these circumstances occurs, they could result in unexpected legal or regulatory exposure, unfavorable accounting treatment, unexpected increases in taxes or other adverse effects on our business. In addition, we have a lesser degree of control over the business operations of the joint ventures and businesses in which we have made minority investments or in which we have acquired less than 100% of the equity. This lesser degree of control may expose us to additional reputational, financial, legal, compliance or operational risks. Litigation, indemnification claims and other unforeseen claims and liabilities may arise from the acquisition or operation of acquired businesses. For example, we may face litigation or other claims as a result of certain terms and conditions of the acquisition agreement, such as earnout payments or closing net asset adjustments. Alternatively, shareholder litigation may arise as a result of proposed acquisitions. If we are unable to complete the number and kind of investments for which we plan, or if we are inefficient or unsuccessful at integrating any acquired businesses into our operations, we may not be able to achieve our planned rates of growth or improve our market share, profitability or competitive position in specific markets or services. We also periodically evaluate, and have engaged in, the disposition of assets and businesses. Divestitures could involve difficulties in the separation of operations, services, products and personnel, the diversion of management's attention, the disruption of our business and the potential loss of key employees. After reaching an agreement with a buyer for the disposition of a business, the transaction may be subject to the satisfaction of pre-closing conditions, including obtaining necessary regulatory and government approvals, which, if not satisfied or obtained, may prevent us from completing the transaction. Divestitures may also involve continued financial involvement in or liability with respect to the divested assets and businesses, such as indemnities or other financial obligations, in which the performance of the divested assets or businesses could impact our results of operations. Any divestiture we undertake could adversely affect our results of operations.

We may face product liability exposure, and if successful claims are brought against us, we may incur substantial liability if our insurance coverage for those claims is inadequate.

We face an inherent risk of product liability as a result of the clinical testing of our product candidates and will face an even greater risk if we commercialize any products. This risk exists even if a product is approved for commercial sale by the FDA and manufactured in facilities regulated by the FDA or an applicable foreign regulatory authority. Our products and product candidates are designed to affect bodily functions and processes. Any side effects, manufacturing defects, misuse or abuse associated with our product candidates could result in injury and possibly death to a patient. An inability to obtain sufficient insurance coverage on commercially reasonable terms or otherwise to protect against potential product liability claims could inhibit our business.

In addition, a liability claim may be brought against us even if our product candidates merely appear to have caused an injury. Product liability claims may be brought against us by consumers, healthcare providers, pharmaceutical companies or others selling or otherwise coming into contact with our product candidates, among others. If we cannot successfully defend ourselves against product liability claims we will incur substantial liabilities and reputational harm. In addition, regardless of merit or eventual outcome, product liability claims may result in:

- withdrawal of clinical trial participants;
- termination of clinical trial sites or entire trial programs;
- the inability to commercialize our product candidates;
- decreased demand for our product candidates;
- impairment of our brand and/or reputation;
- product recall or withdrawal from the market or labeling, marketing or promotional restrictions;
- substantial costs of any related litigation or similar disputes;
- distraction of management's attention and other resources from our primary business;
- substantial monetary awards to patients or other claimants against us that may not be covered by insurance; or
- loss of potential revenue.

Although we may maintain product liability insurance coverage for clinical trials, our insurance coverage may not be sufficient to cover all of our product liability-related expenses or losses and may not cover us for any expenses or losses we suffer. Moreover, insurance coverage is becoming increasingly expensive, and, in the future, we may not be able to maintain insurance coverage at a reasonable cost, in sufficient amounts or upon adequate terms to protect us against losses due to product liability, particularly if any of our product candidates receive regulatory approval. Further, a successful product liability claim or series of claims brought against us could cause our stock price to decline and, if judgments exceed our insurance coverage, could decrease our cash and harm our business, financial condition, operating results and prospects.

We may be adversely affected by natural disasters, pandemics and other catastrophic events, and by man-made problems such as terrorism, that could disrupt our business operations and our business continuity and disaster recovery plans may not adequately protect us from a serious disaster.

Our corporate headquarters is located in Tampa, Florida, a hurricane zone. If a disaster, power outage or other event occurred that prevented us from using all or a significant portion of our headquarters, that damaged critical infrastructure, such as enterprise financial systems, manufacturing resource planning or enterprise quality systems, or that otherwise disrupted operations, it may be difficult or, in certain cases, impossible for us to continue our business for a substantial period of time. Our contract manufacturers' and suppliers' facilities are located in multiple locations, where other natural disasters or similar events, such as blizzards, tornadoes, fires, explosions or large-scale accidents or power outages, and other public health emergencies could severely disrupt our operations and have a material adverse effect on our business, financial condition, operating results and prospects. For example, the recent COVID-19 pandemic may cause significant disruption to our business operations, the operations of our third-party contractors and suppliers and the operations of our clinical trials, including as a result of significant restrictions or bans on travel into and within the geographic areas in which our manufacturers product our product candidates or where we conduct our clinical trials. A public health emergency could also affect the operations of the FDA and other regulatory or public health authorities, resulting in delays to meetings related to planned or completed clinical trials and ultimately of reviews and approvals of our product candidates. Such disruption could impede, delay, limit or prevent our employees and third-party contractors from beginning or continuing research and development or clinical trial-related activities, which may impede, delay, limit or prevent initiation or completion of our ongoing clinical trials and pre-clinical research and ultimately lead to the delay or denial of regulatory approval of our product candidates, which could seriously harm our operations and financial condition.

In addition, acts of terrorism and other geo-political unrest could cause disruptions in our business or the businesses of our partners, manufacturers or the economy as a whole. All of the aforementioned risks may be further increased if we do not implement a disaster recovery plan or our partners' or manufacturers' disaster recovery plans prove to be inadequate. To the extent that any of the above should result in delays in the regulatory approval, manufacture, distribution or commercialization of our product candidates, our business, financial condition, operating results and prospects would suffer.

Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited, each of which could harm our business.

As of December 31, 2021, we had U.S. federal and state net operating loss carryforwards of approximately $145,260,000. We also accumulated U.S. federal and state research tax credits of approximately $4,027,000 as of December 31, 2021 Under Sections 382 and 383 of the Internal Revenue Code (the "Code"), if a corporation undergoes an "ownership change," the corporation's ability to use its pre-ownership change net operating loss carryforwards and other pre-ownership change tax attributes, such as research tax credits, to offset its post-ownership change income and taxes may be limited. In general, an ownership change will occur when the percentage of the Corporation's ownership (by value) of one or more "5-percent shareholders" (as defined in the Code) has increased by more than 50 percent over the lowest percentage owned by such shareholders at any time during the prior three years (calculated on a rolling basis). Similar rules may apply under state tax laws. An entity that experiences an ownership change generally will be subject to an annual limitation on its pre-ownership change tax loss and credit carryforwards equal to the equity value of the corporation immediately before the ownership change, multiplied by the long-term, tax-exempt rate posted monthly by the IRS (subject to certain adjustments). The annual limitation would be increased each year to the extent that there is an unused limitation in a prior year. In the event that it is determined that we have in the past experienced an ownership change as a result of transactions in our stock, or if we experience one or more ownership changes as a result of future transactions in our stock, then we may be limited in our ability to use our net operating loss carryforwards and other tax assets to reduce taxes owed on the net taxable income that we earn. Any limitations on the ability to use our net operating loss carryforwards and other tax assets could harm our business.

Our auditor has expressed substantial doubt about our ability to continue as a going concern and absent additional financing we may be unable to remain a going concern.

In light of our recurring losses, accumulated deficit and negative cash flow as described in our notes to our audited consolidated financial statements, the report of our independent registered public accounting firm on our consolidated financial statements for the year ended December 31, 2021 contained an explanatory paragraph raising substantial doubt about our ability to continue as a going concern. Our financial statements did not include any adjustments that may have been necessary in the event we were unable to continue as a going concern. If we are unable to establish to the satisfaction of our independent registered public accounting firm that the net proceeds from our financing efforts will be sufficient to allow for the removal of this going concern qualification, we may need to significantly modify our operational plans for us to continue as a going concern. We believe we can continue our current level of operations with the cash we have on hand without additional financing through the fourth quarter of 2022. Absent sufficient additional financing, we may be unable to remain a going concern.

Risks Related to Our Intellectual Property and Data Security and Privacy

Our vaccine research and development efforts are to a large extent dependent upon our intellectual property and biologicals materials license with the Licensors.

An important element of our intellectual property portfolio are our License Agreements. Pursuant to the NIH Patent License and Biological Materials License Agreement, we hold a nonexclusive, worldwide license to certain specified patent rights (including patent applications, provisional patent applications and PCT patent applications) and biological materials relating to the use of prefusion coronavirus spike proteins for the purpose of developing and commercializing a vaccine product candidate for SARS-CoV-2. This intellectual property and biological materials license are essential to our operations and our ability to research and develop our NT-CoV2-1 vaccine product candidate. The terms of the license agreement will terminate upon the earlier of (a) twenty (20) years from the first commercial sale where no licensed patent rights exist or have ceased to exist or (b) the expiration of the last to expire of any licensed patent rights. Additionally, we must use reasonable commercial efforts to develop, manufacture, and commercialize our vaccine product candidate, to manufacture our vaccine product candidate substantially within the United States and provide the United States public with reasonable access to our vaccine, if approved for commercialization by the FDA. If we breach the terms of the license agreement, including any failure to make minimum royalty payments required thereunder or failure to reach certain developmental milestones, using best efforts to introduce a licensed product or practice a licensed process in certain territories by certain dates, the NIAID has the right to terminate the license.

If we were to lose or otherwise be unable to maintain the License Agreements on acceptable terms, or find that it is necessary or appropriate to secure new licenses from other third parties, it would halt our ability to continue to develop our NT-CoV2-1 vaccine product candidate, which would have an immediate material adverse effect on our business, operating results and financial condition. Thus, our inability to retain the rights and technologies identified by the licenses, or those that we may in the future identify, could have a material adverse impact on our ability to complete the development of our vaccine product candidate. No assurance can be given that we will be successful in licensing any additional rights or technologies from the Licensors or others. If we fail to retain the License Agreements or if we fail to obtain additional rights and licenses necessary to further the development and commercialization of our vaccine product candidate, our planned development for our vaccine product candidate may be materially impacted and the costs associated with the development may increase significantly, and we may be entirely unable to complete development of a SARS-CoV-2 vaccine product

candidate.

We may incur additional expenses and obligations in connection with our License Agreements.

We must use reasonable commercial efforts to bring to market a vaccine product candidate covered by our licenses, which means we must adhere to an existing commercial development plan and existing performance benchmarks. Additionally, we are obliged to pay to the Licensors certain minimum annual royalties, certain benchmark-related royalties and royalties based upon a share of any net sales of our vaccine product candidate, following regulatory approval and the first commercial sale. Additionally, among other obligations, we must provide regular written reports to the Licensors on the development status of our vaccine product candidate and pay for our pro rata share of the NIH's patent prosecution-related expenses and fees. Moreover, we must use reasonable commercial efforts to develop, manufacture, and commercialize the vaccine product candidate, to manufacture the vaccine product candidate substantially within the United States and or Canada and provide the United States and Canadian public with reasonable access to the vaccine, if approved for commercialization by the FDA and Canadian regulatory agencies. All of these additional obligations beyond ordinary research and development and regulatory compliance related to the approval of our vaccine product candidate may impose delays or greater costs upon our ability to timely develop our vaccine product candidate.

Although our forecasts for expenses and the sufficiency of our capital resources will take into account the funds available for the research and development of our vaccine product candidate development, our actual cash requirements may vary materially from our current expectations for a number of other factors that may include, but are not limited to, changes in the focus and direction of our development programs, competitive and technical advances, costs associated with the development of our product candidates and our share of the costs of filing, prosecuting, defending and enforcing the intellectual property rights covered by the NIH license. If we exhaust the funds available for the development of NT-CoV2-1 more quickly than anticipated, regardless of the reason, and we are unable to obtain additional financing on terms acceptable to us or at all, we may be unable to meet our obligations under the License Agreements, which may be terminated, and we will be unable to proceed with development of our product candidates on expected timelines and will be forced to prioritize among them.

The intellectual property covered by our License Agreements concerns patent applications and provisional applications. We cannot assure investors that any of the currently pending or future patent applications will result in granted patents, nor can we predict how long it will take for such patents to be granted.

The intellectual property covered by the License Agreements concerns certain, specified patent rights (including patent applications, provisional patent applications and PCT patent applications). Although the Licensors have agreed to assume responsibility for the preparation, filing, prosecution and maintenance of all patent applications covered by the licensed patent rights, we cannot be certain as to when or if final patents will be issued for those patent applications covered by the licensed patent rights. However, the Licensors may not successfully prosecute certain patent applications, the prosecution of which they control, under which we are only a licensee and on which our business substantially depends. Even if patents issue from these applications, the Licensors may fail to maintain these patents, may decide not to pursue litigation against third-party infringers, may fail to prove infringement or may fail to defend against counterclaims of patent invalidity or unenforceability.

Moreover, it is possible that the licensed pending patent applications will not result in granted patents, and even if such pending patent applications grant as patents, they may not provide a basis for intellectual property protection of commercially viable vaccine products or may not provide us with any competitive advantages. Further, it is possible that, for any of the patents that may be granted in the future, others will design around the Licensors' patent rights or identify methods for preventing or treating SARS-CoV-2 that do not concern the rights covered by our licenses. Further, we cannot assure investors that other parties will not challenge any patents granted to the Licensors or that courts or regulatory agencies will hold Licensors' patents to be valid or enforceable. We cannot guarantee investors that, if required to defend the covered patents, we will be successful in defending challenges made against the Licensors' patents and patent applications. Any successful third-party challenge to the NIH patents could result in the unenforceability or invalidity of such patents, or to such patents being interpreted narrowly or otherwise in a manner adverse to our interests. Our ability to establish or maintain a technological or competitive advantage over our competitors may be diminished because of these uncertainties.

Risks with respect to the Licensors and our License Agreements may also arise out of circumstances beyond our control. In spite of our best efforts, the Licensors may conclude that we have materially breached the license agreement and may therefore terminate the agreement, thereby removing our ability to market vaccine product candidates covered by the agreement. If the License Agreement are terminated, or if the underlying patents fail to provide the intended market protection, competitors would have the freedom to seek regulatory approval of, and to market, products similar or identical to ours. Moreover, if the License Agreements are terminated, the Licensors may be able to prevent us from utilizing the technology covered by the licensed patent rights. This could have a material adverse effect on our competitive business position and our financial condition, results of operations and our business prospects.

We cannot prevent the Licensors or other companies, including our competitors, from licensing the same intellectual property and biological materials that we have licensed or from otherwise duplicating our business model and operations.

Our License Agreements are nonexclusive licenses and we are not permitted to sublicense the intellectual property or biological materials covered by the license. Therefore, we cannot be certain that the Licensors have not previously licensed, or that the Licensors will not, in the future, license the intellectual property or biological materials to other biotechnology companies, including those who intend to develop a vaccine product candidate for SARS-CoV-2, some or all of the nonexclusive intellectual property and biological materials available to us under the License Agreements. Moreover, we do not currently own any exclusive rights or licenses necessary to fully develop our NT-CoV2-1 vaccine product candidate, and such rights or licenses, if in existence, could be held by our competitors or used by other third parties to otherwise directly compete against us. If our competitors or others have or acquire exclusive rights or licenses that they could enforce against us, then we may be required to alter our products, pay licensing fees or cease activities. If our products conflict with rights or licenses of others, third parties could bring legal actions against us or our collaborators, licensees, suppliers or customers, claiming damages and seeking to enjoin manufacturing and marketing of the affected products. If these legal actions are successful, in addition to any potential liability for damages, we could be required to obtain a license in order to continue to manufacture or market the affected products. We may not prevail in any legal action and a required license under the patent may not be available on acceptable terms or at all. Accordingly, while we may develop, acquire or license the additional technologies necessary to the development of our vaccine candidate we cannot assure you that we will be able to develop, acquire or license such technologies or that alternatives will be sufficient to enable development of our NT-CoV2-1 vaccine product candidate or to prevent others from competing with us and developing substantially-similar products.

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

We or the Licensors may be subject to claims that former employees, collaborators or other third parties have an interest in the licensed patents or other intellectual property as an inventor or co-inventor. For example, we or the Licensors may have inventorship disputes arise from conflicting obligations of employees, consultants or others who are involved in developing the intellectual property covered by the License Agreements or our product candidates. Litigation may be necessary to defend against these and other claims challenging inventorship or our license or the Licensors' ownership, as applicable, of the licensed patents, trade secrets or other intellectual property. If we or our licensors fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as our right to use intellectual property that is important to our NT-CoV2-1 vaccine product candidate. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees. Any of the foregoing could have a material adverse effect on our business, financial condition, results of operations and prospects.

Changes in patent law or patent jurisprudence could diminish the value of patents in general, thereby impairing our ability to protect our product candidates.

The United States has recently enacted and is currently implementing wide-ranging patent reform legislation. Further, recent United States Supreme Court rulings have either narrowed the scope of patent protection available in certain circumstances or weakened the rights of patent owners in certain situations. Moreover, patent law and protection in foreign countries, particularly developing countries, may be insufficient or otherwise unclear in its efficacy to protect our intellectual property. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the scope and value of patents, once

obtained.

For our U.S. patent applications containing a priority claim after March 16, 2013, there is a greater level of uncertainty in the patent law. In September 2011, the Leahy-Smith America Invents Act, also known as the America Invents Act, or AIA, was signed into law. The AIA includes a number of significant changes to U.S. patent law, including provisions that affect the way patent applications will be prosecuted and may also affect patent litigation. The USPTO is currently developing regulations and procedures to govern administration of the AIA, and many of the substantive changes to patent law associated with the AIA. It is not clear what other, if any, impact(s) the AIA will have on the operation of our business. Moreover, the AIA and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents, all of which could have an adverse effect on our business. One important change introduced by the AIA is that, as of March 16, 2013, the United States transitioned 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. A third party who files a patent application with the USPTO after such date but prior to us may therefore be awarded a patent covering an invention of ours even if we were the first to invent. This "first-inventor-to-file" system will require us both to remain cognizant, going forward, of the timing between invention and filing of a patent application.

Among some of the other changes introduced by the AIA are those that (i) limit where a patentee may file a patent infringement suit and (ii) provide opportunities for third parties to challenge any issued patent in the USPTO. Such changes apply to all of our U.S. patents, even those issued prior to March 16, 2013. Because of a lower evidentiary standard in USPTO proceedings, as compared to the evidentiary standard applied in U.S. federal courts, necessary to invalidate a patent claim, a third party could potentially present evidence in a USPTO proceeding sufficient for the USPTO to find a claim invalid, notwithstanding that the same evidence would be insufficient to invalidate a claim first presented in a district court action. Accordingly, a third party may attempt opportunistically to use USPTO procedures to invalidate our patent claims.

Depending on decisions by the United States Congress, the U.S. federal courts, the USPTO or similar authorities in foreign jurisdictions, the laws and regulations governing patents could change in unpredictable ways that may weaken our and our licensors' abilities to obtain new patents or to enforce existing patents we and our licensors or partners may obtain in the future.

If we are unable to protect our trademarks or other intellectual property from infringement, our business prospects may be harmed.

We have applied for trademark protection for trademarks in the United States, the European Union and China. Although we take steps to monitor the possible infringement or misuse of our trademarks, it is possible that third parties may infringe, dilute or otherwise violate our trademark rights. Any unauthorized use of our trademarks or other intellectual property rights could harm our reputation or commercial interests. Moreover, our License Agreements do not commit to defend any declaratory judgment action alleging the invalidity of any of the licensed patent rights covered by the license, nor does the NIAID commit to commence legal actions against third parties alleged to infringe upon those licensed patent rights. Our enforcement against third-party infringers or violators may be unduly expensive and time-consuming, and any remedy obtained may constitute insufficient redress relative to the damages we may suffer.

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

Filing, prosecuting and defending patents on our product candidates in all countries throughout the world would be prohibitively expensive. The requirements for patentability may differ in certain countries, particularly developing countries. In addition, the laws of some foreign countries do not protect intellectual property rights to the same extent as laws in the United States. Consequently, we may not be able to prevent third parties from practicing our inventions in all countries outside the United States. Competitors may use our 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 have patent protection insufficient to guard against such infringement. These products may compete with our products, and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property protection, particularly those relating to pharmaceuticals. In such instances, we may be unable to enjoin or otherwise prevent infringement of our patents or marketing of competing products in violation of our proprietary rights, generally. Proceedings to enforce our patent rights in foreign jurisdictions could (i) result in substantial costs and divert our efforts and attention from other aspects of our business, (ii) put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing and (iii) 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. In addition, certain countries in Europe and certain developing countries have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In those countries, we may be unable to seek adequate remedies to address infringement and/or material diminishment of the value of our patents, which could limit our potential revenue opportunities in such jurisdictions. Accordingly, our efforts to establish or enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from our intellectual property. Finally, our ability to protect and enforce our intellectual property rights may be adversely affected by unforeseen changes in foreign intellectual property laws.

If we fail to comply with our obligations under our intellectual property license agreements, we could lose our license rights that are important to our business and development of our product candidates.

The License Agreements impose various royalty and other obligations on us as well as development plans. If we fail to comply with these obligations, our licensors may have the right to terminate the license, in which event we may not be able to develop or market the affected product candidate. The License Agreements may be terminated in the event of a breach. The loss of such rights could materially adversely affect our business, financial condition, operating results and prospects.

If we are sued for infringing intellectual property rights of third parties, it will be costly and time-consuming and an unfavorable outcome in that litigation could have a material adverse effect on our business.

Our commercial success depends upon our ability to develop, manufacture, market, and sell our product candidates and use our proprietary technologies without infringing the proprietary rights of third parties. We cannot guarantee that marketing and selling such candidates and using such technologies will not infringe existing or future patents. Numerous U.S. and foreign issued patents and pending patent applications owned by third parties exist in the fields relating to our product candidates. As the biotechnology and pharmaceutical industries expand and more patents issue, the risk increases that others may assert that our product candidates, technologies or methods of delivery or use infringe their patent rights. Moreover, it is not always clear to industry participants, including us, which patents cover various drugs, biologics, drug delivery systems or their methods of use, and which of these patents may be valid and enforceable. Thus, due to the large number of patents issued and patent applications filed in our fields, third parties may allege they have patent rights encompassing our product candidates, technologies or methods.

In addition, our product candidates or proprietary technologies may infringe patents owned and/or filed by third parties, or third parties may allege such infringement. Because (i) some patent applications in the United States may be maintained in secrecy until the patents are issued, (ii) patent applications in the United States and many foreign jurisdictions are typically not published until 18 months after filing and (iii) publications in the scientific literature often lag behind actual discoveries, we cannot be certain that others have not filed patent applications for technology covered by our own and in-licensed issued patents or our pending applications. Our competitors may have filed, and may in the future file, patent applications covering our product candidates or technology similar to ours. Any such patent application may have priority over our own and in-licensed patent applications or patents, which could further require us to obtain rights to issued patents covering such technologies. If another party has filed a U.S. patent application on inventions similar to those owned or in-licensed to us, we or, in the case of in-licensed technology, the licensor may have to participate, in the United States, in an

interference proceeding to determine priority of invention.

We may be exposed to, or threatened with, future litigation by third parties having patent or other intellectual property rights alleging that our product candidates or proprietary technologies infringe such third parties' intellectual property rights, including litigation resulting from filing under Paragraph IV of the Hatch-Waxman Act. Such lawsuits can be costly and could adversely affect our operating results and divert the attention of managerial and technical personnel, even if we do not infringe such patents or the patents asserted against us are later invalidated. A court may, however, decide that we are infringing the third party's patents and order us to cease the activities covered by the patents. In addition, there is a risk that a court will order us to pay to such third-party damages for having violated the other party's patents.

As a result of patent infringement claims, or to avoid potential claims, we may choose or be required to seek licenses from third parties. These licenses may not be available on commercially acceptable terms, or at all. Even if we are able to obtain a license, the license would likely obligate us to pay license fees or royalties or both, and the rights granted to us might be nonexclusive, which could result in our competitors gaining access to the same intellectual property, or such rights might be restrictive and limit our present and future activities. Ultimately, we or a licensee could be prevented from commercializing a product, or forced to cease some aspect of our business operations, if, as a result of actual or threatened patent infringement claims, we are unable to enter into licenses on acceptable terms.

In addition to possible infringement claims against us, we may become a party to other patent litigation and other proceedings, including interference, derivation, re-examination or other post-grant proceedings declared or granted by the USPTO, and similar proceedings in foreign countries, regarding intellectual property rights with respect to our current or future products.

There is a substantial amount of litigation involving patent and other intellectual property rights in the biotechnology and pharmaceutical industries, generally. To date, no litigation asserting infringement claims has ever been brought against us. If a third-party claims that we infringe its intellectual property rights, we may face a number of issues, including:

- infringement and other intellectual property claims which, regardless of merit, may be expensive and time-consuming to litigate and may divert our management's attention from our core business;
- substantial damages for infringement, which we may have to pay if a court decides that the product or technology at issue infringes or violates the third party's rights, and if the court finds that the infringement was willful, we could be ordered to pay treble damages and the patent owner's attorneys' fees;
- a court prohibiting us from selling or licensing the product or using the technology unless the third party licenses its intellectual property rights to us, which it is not required to do;
- if a license is available from a third party, we may have to pay substantial royalties or upfront fees or grant cross-licenses to intellectual property rights for our products or technologies; and
- redesigning our products or processes so they do not infringe, which may not be possible or may require substantial monetary expenditures and time.

Some of our competitors may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. In addition, any uncertainties resulting from the initiation and continuation of any litigation could harm our ability to raise additional funds or otherwise adversely affect our business, financial condition, operating results and prospects.

Because we rely on certain third-party licensors and partners, and will continue to do so in the future, if one of our licensors or partners is sued for infringing a third party's intellectual property rights, our business, financial condition, operating results and prospects could suffer in the same manner as if we were sued directly. In addition to facing litigation risks, we have agreed to indemnify certain third-party licensors and partners against claims of infringement caused by our proprietary technologies, and we have entered or may enter into cost-sharing agreements with some our licensors and partners that could require us to pay some of the costs of patent litigation brought against those third parties whether or not the alleged infringement is caused by our proprietary technologies. In certain instances, these cost-sharing agreements could also require us to assume greater responsibility for infringement damages than our technology alone would otherwise suggest.

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

Competitors may infringe our intellectual property, including our patent applications or the patents of our licensors. As a result, we may be required to file infringement claims to stop third-party infringement or unauthorized use. Such proceedings and/or litigation can be expensive – particularly for a company of our size – and time-consuming. In addition, in an infringement proceeding, a court may decide that a patent of ours is not valid or is unenforceable, or may refuse to enjoin the other party from using the technology at issue on the grounds that our patent claims do not cover its technology or that the factors necessary to grant an injunction are not satisfied. An adverse determination in such case could put one or more of our patents at risk of being invalidated, interpreted narrowly or amended such that they fail to cover or otherwise protect our product candidates. Moreover, such adverse determinations could subject our patent applications to the risk that they will not issue, or issue with limited and potentially inadequate scope to cover our product candidates.

Interference, derivation or other proceedings brought at the USPTO may be necessary to determine the priority or patentability of inventions with respect to our patent applications or those of our licensors or potential partners. Litigation or USPTO proceedings brought by us may fail or may be invoked against us by third parties. Even if we are successful, domestic or foreign litigation, or USPTO or foreign patent office proceedings may result in substantial costs and distraction to our management. We may not be able, alone or with our licensors or potential partners, to prevent misappropriation of our proprietary rights, particularly in countries where the laws may not protect such rights as fully as in the United States.

Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation or other proceedings, there is a risk that we may, intentionally or incidentally, disclose some of our confidential results of hearings, motions or other interim proceedings or developments or public access to related documents. If investors perceive these results to be negative, the market price for our common stock could be significantly harmed.

Our success will depend on our ability to partner or sub-license our product candidates and their subsequent successful commercialization.

Our MU1140 homologs product candidate is in early-stage development and is expected to require partners with substantial financial resources to continue the development of the product to commercialization. In addition, the product candidate has not received regulatory approval in any jurisdiction and it may never receive approval or, if approvals are obtained, may never be commercialized successfully. In addition, we do not know whether any of our clinical trials will be successful or can be completed within our current expected budget. For our MU1140 homologs and other antibiotic product candidates, we have performed nonclinical testing using native MU1140 and expect to continue to pursue the nonclinical testing of our MU1140 homologs and other antibiotic product candidates during 2022. We would expect the IND for a first-in-human clinical trial of a lantibiotic compound to be filed with the FDA based on our ability to identify a new lead compound and complete the requisite pre-clinical studies, contingent on sufficient funding. Even if we are able to partner and conduct successful clinical trials or the required regulatory approvals are obtained, we may never be able to generate significant

revenues from our MU1140 homologs or other antibiotic product candidates or other product candidates. If our MU1140 homologs product candidate or our other product candidates under the Lantibiotics Program are unsuccessful, we may be unable to generate sufficient revenues to sustain and grow our business, and our business, financial condition and results of operations will be materially adversely affected.

If our intellectual property rights do not adequately protect our products or product candidates, or if third parties claim we are infringing their intellectual property rights, others could compete against us more directly or we could be subject to significant litigation. Such results could prevent us from marketing our products or product candidates and hurt our profitability.

Our product and product candidates are protected by patents and patent applications. Our success depends in part on our ability to obtain patents or rights to patents, protect trade secrets, operate without infringing upon the proprietary rights of others, and prevent others from infringing on our patents, trademarks and other intellectual property rights. We will be able to protect our intellectual property from unauthorized use by third parties only to the extent that it is covered by valid and enforceable patents, trademarks and licenses. Patent protection generally involves complex legal and factual questions and, therefore, enforceability of patent rights cannot be predicted with certainty. Patents, if issued, may be challenged, invalidated or circumvented. Thus, any patents that we own or license from others may not provide adequate protection against competitors. In addition, any future patent applications may fail to result in patents being issued. Also, those patents that are issued may not provide us with adequate proprietary protection or competitive advantages against competitors with similar product candidates. Moreover, the laws of certain foreign countries do not protect intellectual property rights to the same extent as do the laws of the United States.

In addition to patents and trademarks, we rely on trade secrets and proprietary know-how. We seek protection of these rights, in part, through confidentiality and proprietary information agreements. These agreements may not provide meaningful protection or adequate remedies for violation of our rights in the event of unauthorized use or disclosure of confidential and proprietary information. Failure to protect our proprietary rights could seriously impair our competitive position.

In the event of an infringement or violation, we may face litigation and may be prevented from pursuing product development or commercialization. We may receive in the future, notice of claims of infringement of other parties' proprietary rights. We may not have the financial resources to defend against claims of infringement by other parties or to prosecute third parties for infringement of our intellectual property. Infringement or other claims could be asserted or prosecuted against us in the future and it is possible that past or future assertions or prosecutions could harm our business.

Our business and operations would suffer in the event of cybersecurity/information systems risk.

Despite the implementation of security measures, our internal computer systems, and those of our manufacturers and other third parties on which we rely, are vulnerable to damage from computer viruses, malware, ransomware, unauthorized access, natural disasters, fire, explosions or large-scale accidents, power outages or surges, terrorism, successful breaches, employee malfeasance, or human or technological error, war and telecommunication and electrical failures. In addition, our systems safeguard important confidential personal data regarding our subjects. If a disruption event were to occur and cause interruptions in our operations, it could result in a material disruption of our drug development programs. For example, the loss of clinical trial data from completed, ongoing or planned clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. To the extent that any disruption or security breach results in a loss of or damage to our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability and the further development of our product candidates could be delayed.

We may incur costs of addressing a cybersecurity incident.

Cybersecurity incidents have increased in number and severity recently and it is expected that these trends will continue. Should we be affected by such an incident, we may incur substantial costs and suffer other negative consequences, which may include:

- investigation costs and costs to engage specialized consultants or costs of ransom demands;
- remediation costs, such as liability for stolen assets or information, repairs of system damage, and incentives to customers or business partners in an effort to maintain relationships after an attack; and
- litigation and legal risks, including regulatory actions by state and federal regulators.

Our business and operations would suffer in the event of failures in our internal computer systems or those of our collaborators.

Despite the implementation of security measures, our internal computer systems and those of our current and any future partners, contractors and consultants are vulnerable to damage from computer viruses, unauthorized access, natural disasters, terrorism, war and telecommunication and electrical failures. While we have not experienced any such material system failure, accident or security breach to date, if such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our development programs and our business operations. For example, the loss of clinical development or manufacturing records or clinical trial data from completed or future clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability and the further development of our product candidates could be delayed.

Risks Related to Government Regulations

Our product candidates are subject to substantial government regulation, including the regulation of nonclinical testing and clinical trials. If we are unable to obtain regulatory approval for our product candidates, we will be unable to generate revenues.

The production and marketing of products which may be developed from our NT-CoV2-1 vaccine product candidate, and our MU1140 homologs, or otherwise and our research and development, nonclinical testing and clinical trial activities are subject to extensive regulation and review by numerous governmental authorities. Most of the product candidates we are developing must undergo rigorous nonclinical testing and clinical trials and an extensive regulatory approval process before they can be marketed in the United States or internationally.

If we fail to obtain regulatory approval for our product candidates, we may have to cease further development. Clinical trials on our product candidates are expected to take several years to fully complete. The commencement or completion of nonclinical studies or clinical trials can be delayed or prevented for a number of reasons, including:

- limitations directly caused by, or restrictions imposed in response to, the COVID-19 pandemic, including our ability to conduct research and development and clinical trials, to engage or continue to engage with third-party contractors and suppliers or to comply with regulatory obligations relating to our business;
- an inability to raise sufficient capital to commence, conduct, or complete pre-clinical testing and clinical trials;
- difficulties in finding a partner with the resources to support large and expensive clinical development and commercialization costs;
- findings in nonclinical trials;

- difficulties obtaining regulatory approval to commence a clinical trial or complying with conditions imposed by a regulatory authority regarding the scope or term of a clinical trial;
- delays in reaching or failing to reach agreement on acceptable terms with prospective contract research organizations, or CROs, and trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- insufficient or inadequate supply or quality of a product candidate or other materials necessary to conduct our clinical trials;
- difficulties obtaining institutional review board, or IRB, approval to conduct a clinical trial at a prospective site;

- challenges recruiting and enrolling patients to participate in clinical trials for a variety of reasons, including the size and nature of patient population, proximity of patients to clinical sites, eligibility criteria for the trial, nature of the trial protocol, the availability of approved effective treatments for the relevant condition and competition from other clinical trial programs for similar indications;
- severe or unexpected drug or biologic-related side effects experienced by patients in a clinical trial; and
- difficulties retaining patients who have enrolled in a clinical trial but may be prone to withdraw due to rigors of the trial, lack of efficacy, side effects, or personal issues, or who are lost to further follow up.

Clinical trials also may be delayed or terminated as a result of ambiguous or negative interim results. In addition, a clinical trial may be suspended or terminated by us, the FDA, the IRBs at the sites where the IRBs are overseeing a trial, or a data safety monitoring board, or DSMB, overseeing the clinical trial at issue, or other regulatory authorities 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 sites by the FDA or other regulatory authorities;
- inspection of manufacturing and drug packaging operations by regulatory authorities;
- unforeseen safety issues or lack of effectiveness; and
- lack of adequate funding to continue the clinical trial.

We cannot assure you that clinical trials will demonstrate the safety or effectiveness of any of our product candidates, or will otherwise satisfy regulatory requirements. Our nonclinical studies or clinical trials may produce negative or inconclusive results, there may be inconsistencies between early clinical trial results and results obtained in later clinical trials, and we may decide, or regulators may require us, to conduct additional nonclinical studies or clinical trials. Moreover, nonclinical and clinical data are often susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in nonclinical studies and clinical trials have nonetheless failed to obtain FDA approval for their products. If we are unable to resolve the FDA's concerns, we will not be able to obtain regulatory approval for these product candidates.

The pre-marketing approval process can be particularly expensive, uncertain and lengthy, and a number of products for which FDA or other governmental regulatory approval has been sought by other companies have never been approved for marketing. In addition to testing and approval procedures, extensive regulations also govern marketing, manufacturing, distribution, labeling, and record-keeping procedures. If we do not comply with applicable regulatory requirements, such violations could result in warning letters, non-approval, suspensions of regulatory approvals or ongoing clinical trials, civil penalties and criminal fines, product seizures and recalls, operating restrictions, injunctions, and criminal prosecution.

We may encounter such delays and rejection of our product candidates by the FDA or other regulatory authority may also adversely affect our business. Such delays or rejection may be encountered due to, among other reasons, government or regulatory delays, lack of efficacy during clinical trials, unforeseen safety issues, or changes in regulatory policy during the period of product development. More stringent regulatory approval processes in product clearance and enforcement activities could result in our experiencing longer approval cycles, more uncertainty, greater risk, and higher expenses. Even if regulatory approval of a product is granted, this approval may entail limitations on uses for which the product may be labeled and promoted. It is possible, for example, that we may not receive FDA approval to market products based on our licensed, patented product candidates for different indications or to market updated products that represent extensions of our basic product candidates. In addition, we may not receive FDA approval to export our products based on our licensed, patented product candidates in the future, and countries to which products are to be exported may not approve them for import.

From time to time, legislative or regulatory proposals are introduced that could alter the review and approval process relating to our product candidates. It is possible that the applicable regulatory authority will issue additional regulations further restricting the sale of our product candidates. Any change in legislation or regulations that govern the review and approval process relating to our future product candidates could make it more difficult and costlier to obtain approval for new products based on our product candidates, or to produce, market, and distribute such products if approved.

We may be unable to obtain regulatory approval for our SARS-CoV-2 vaccine product candidate, or other early-stage product candidates under applicable regulatory requirements. The FDA and foreign regulatory bodies have substantial discretion in the approval process, including the ability to delay, limit or deny approval of product candidates. The delay, limitation or denial of any regulatory approval would adversely impact commercialization, our potential to generate revenue, our business and our operating results.

We are not permitted to market any of our current product candidates in the United States until we receive approval of an NDA or BLA from the FDA. We are also not permitted to market any of our current product candidates in any foreign countries until we receive the requisite approval from the applicable regulatory authorities of such countries. Failure to obtain such regulatory approvals will delay or prevent us from commercializing any of our current or future product candidates.

To gain approval to market a new drug such as a lantibiotic compound, or a new biological product such as our SARS-CoV-2 vaccine product candidate or a lantibiotic product candidate, we must provide the FDA and/or foreign regulatory authorities with, among other things, extensive pre-clinical and clinical data that adequately demonstrates the safety and efficacy of the drug in its intended indication and information to demonstrate the adequacy of the manufacturing methods to assure the drug's identity, strength, quality and purity. The development and approval of new drug product candidates involves a long, expensive and uncertain process, and delay or failure can occur at any stage. A number of companies in the pharmaceutical and biopharmaceutical industries have suffered significant setbacks in clinical trials, including in Phase 3 clinical development, even after promising results in earlier pre-clinical studies or clinical trials. These setbacks have been caused by, among other things, observations during clinical trials regarding safety or efficacy, such as previously unreported adverse events. Success in pre-clinical testing and early clinical trials does not ensure success in later clinical trials, and the results of clinical trials by other parties may not be indicative of the results in trials we may conduct. Further, different results may be achieved depending upon whether the "per protocol", or PP, analysis is used to report data results or whether the "modified intent-to-treat," or MITT, approach is used. Accordingly, regardless of the outcome of any

Phase 2 trials, any Phase 3 trials we may conduct may not be successful.

The FDA and foreign regulatory bodies have substantial discretion in the drug approval process, including the ability to delay, limit or deny approval of product candidates for many reasons. The FDA or the applicable foreign regulatory body may:

- disagree with the design or implementation of one or more clinical trials;
- decline to deem a product candidate safe and effective for its proposed indication, or deem a product candidate's safety or other perceived risks to outweigh its clinical or other benefits;
- find the data from pre-clinical studies and clinical trials does not sufficiently support approval, or the results of clinical trials may not meet the level of statistical or clinical significance required for approval;
- disagree with our interpretation of data from pre-clinical studies or clinical trials performed by us or third parties;
- determine the data collected from clinical trials are insufficient to support the submission or approval of an NDA or other applicable regulatory filing;
- require additional pre-clinical studies or clinical trials;
- identify deficiencies in the formulation, quality control, labeling or specifications of our current or future product candidates;
- grant approval contingent on the performance of costly additional post-approval clinical trials;
- approve our current or any future product candidates for a more limited indication or a narrower patient population than we originally requested or with strong warnings that may affect marketability;
- decline to approve the labeling that we believe is necessary or desirable for the successful commercialization of our product candidates;
- require a Risk Evaluation and Mitigation Strategy, or REMS, with monitoring requirements or distribution limitations. For example, it is possible that the FDA could require distribution controls in the approval, if any, of our product candidates to prevent inadvertent exposure to pregnant women;

- decline to approve of the manufacturing processes, controls or facilities of third-party manufacturers or testing labs with whom we contract; or
- change its approval policies or adopt new regulations in a manner rendering our clinical data or regulatory filings insufficient for approval.

Any delay, limitation or denial of any regulatory approval would adversely impact commercialization, our potential to generate revenue, our business and our operating results.

Delays or difficulties in the enrollment of patients in clinical trials may result in additional costs and delays in our ability to generate significant revenues, and may delay or prevent our receipt of any regulatory approvals necessary to commercialize our planned and future products.

We may not be able to initiate or continue, or complete in a timely fashion clinical trials for NT-CoV2-1 or our other product candidates if we are unable to locate and enroll a sufficient number of eligible patients to participate in these trials as required by the FDA or similar regulatory authorities outside the United States. Many companies are currently or will soon be researching, developing and testing therapeutic and vaccine product candidates specifically for or with potential application to SARS-CoV-2 or COVID-19, which may reduce our ability to conduct clinical trials for our SARS-CoV-2 vaccine product candidate. For example, even if we are able to identify potential patients or eligibility criteria for a NT-CoV2-1 clinical trial, patients who are otherwise eligible for such clinical trials may instead enroll in the clinical trials of our competitors' SARS-CoV-2 product candidates or opt not to enroll due to other competitive vaccines being administered by competitors based upon emergency use authorization.

Patient enrollment is affected by other factors including:

- the severity of the disease under investigation;
- the eligibility criteria for the study in question;
- the perceived risks and benefits of the product candidate under study;
- the efforts to facilitate timely enrollment in clinical trials;
- the patient referral practices of physicians;
- the ability to monitor patients adequately during and after treatment; and
- the proximity and availability of clinical trial sites for prospective patients.

Our inability to enroll a sufficient number of patients for our clinical trials would result in significant delays, could require us to abandon one or more clinical trials altogether and could delay or prevent our receipt of necessary regulatory approvals. Enrollment delays in our clinical trials may result in increased development costs for our product candidates, which would cause the value of our company to decline and impede our ability to obtain additional financing.

Any product candidates that we commercialize will be subject to ongoing and continued regulatory review.

Even after we achieve U.S. regulatory approval for a product candidate, if any, we will be subject to continued regulatory review and compliance obligations. For example, the FDA may impose significant restrictions on the approved indicated uses for which our product candidates may be marketed or on the conditions of approval. A product candidate's approval may contain requirements for potentially costly post-approval studies and surveillance, including Phase 4 clinical trials or a REMS to monitor the safety and efficacy of the product. We will also be subject to ongoing FDA obligations and continued regulatory review with respect to, among other things, the manufacturing, processing, labeling, packaging, distribution, adverse event reporting, storage, advertising, promotion and recordkeeping for our product candidates. These requirements include submissions of safety and other post-marketing information and reports, registration, continued compliance with the FDA's good clinical practice, or GCP, requirements and good laboratory practice requirements, which are regulations and guidelines the FDA would apply to all of our product candidates in clinical and pre-clinical development, along with any clinical trials that we conduct post-approval, and continued compliance with the FDA's cGMP requirements pursuant to which manufacturing facilities are subject to continual review and periodic inspections by the FDA. To the extent that a product candidate is approved for sale in other countries, we may be subject to similar restrictions and requirements imposed by laws and government regulators in those countries.

If we, our product candidates or the manufacturing facilities for our product candidates fail to comply with applicable regulatory requirements, a regulatory agency may:

- impose restrictions on the marketing or manufacturing of the product, suspend or withdraw product approvals or revoke necessary licenses;
- issue warning letters, show cause notices or untitled letters describing alleged violations, which may be publicly available;
- mandate modifications to promotional materials or require us to provide corrective information to healthcare practitioners;
- require us to enter into a consent decree, which can include imposition of various fines, reimbursements for inspection costs, required due dates for specific actions and penalties for noncompliance; commence criminal investigations and prosecutions;
- impose injunctions;
- impose other civil or criminal penalties;
- suspend any ongoing clinical trials;
- delay or refuse to approve pending applications or supplements to approved applications filed by us;
- refuse to permit drugs or active ingredients to be imported or exported to or from the United States;
- suspend or impose restrictions on operations, including costly new manufacturing requirements; or
- seize or detain products or require us to initiate a product recall.

The regulations, policies or guidance of the FDA and other applicable government agencies may change and new or additional statutes or government regulations may prevent or delay regulatory approval of our product candidates or further restrict or regulate post-approval activities. We cannot predict the likelihood, nature or extent of adverse government regulation that may arise from future legislation or administrative action, either in the United States or abroad. If we are not able to achieve and maintain regulatory compliance, we may not be permitted to market our product candidates, which would materially and adversely affect our ability to generate revenue and achieve or maintain profitability.

Our product candidates may cause serious or undesirable side effects or possess other unexpected properties that could delay or prevent their regulatory approval, limit the commercial profile of approved labeling or result in post-approval regulatory action.

Unforeseen side effects from any of our product candidates could arise either during clinical development or, if approved, after marketing such product. Undesirable side effects caused by product candidates could cause us or regulatory authorities to interrupt, modify, delay or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or comparable foreign authorities. Results of clinical trials could reveal a high and unacceptable severity and prevalence of side effects. In such an event, 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 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 trial or result in product liability claims. Any of these occurrences may harm our business, financial condition, operating results and prospects.

Additionally, if we or others identify undesirable side effects, or other previously unknown problems, caused by our product candidates after obtaining U.S. or foreign regulatory approval or other products with the same or related active ingredients, a number of potentially negative consequences could result, including:

- regulatory authorities may withdraw their approval of the product;

- regulatory authorities may require a recall of the product or we may voluntarily recall a product;
- regulatory authorities may require the addition of warnings or contraindications in the product labeling, narrowing of the indication in the product label or issuance of field alerts to physicians and pharmacies;
- we may be required to create a medication guide outlining the risks of such side effects for distribution to patients or institute a REMS;
- we may be subject to limitations as to how we promote the product;
- we may be required to change the way the product is administered or modify the product in some other way;
- the FDA or applicable foreign regulatory authority may require additional clinical trials or costly post-marketing testing and surveillance to monitor the safety or efficacy of the product;
- sales of the product may decrease significantly;
- we could be sued and held liable for harm caused to patients; and
- our brand and reputation may suffer.

Any of the above events could prevent us from achieving or maintaining market acceptance of the affected product candidate and could substantially increase the costs of commercializing our product candidates.

If any of our product candidates are approved for marketing and we are found to have improperly promoted off-label uses, or if physicians misuse our products or use our products off-label, we may become subject to prohibitions on the sale or marketing of our products, product liability claims and significant fines, penalties and sanctions, and our brand and reputation could be harmed.

The FDA and other regulatory agencies strictly regulate the marketing and promotional claims that are made about drug products. In particular, a product may not be promoted for uses or indications that are not approved by the FDA or such other regulatory agencies as reflected in the product's approved labeling. If we are found to have promoted off-label uses of any of our product candidates, we may receive warning or untitled letters and become subject to significant liability, which would materially harm our business. Both federal and state governments have levied large civil and criminal fines against companies for alleged improper promotion and have enjoined several companies from engaging in off-label promotion. If we become the target of such an investigation or prosecution based on our marketing and promotional practices, we could face similar sanctions, which would materially harm our business. In addition, management's attention could be diverted from our business operations, significant legal expenses could be

incurred and our brand and reputation could be damaged. The FDA has also requested that companies enter into consent decrees or permanent injunctions under which specified promotional conduct is changed or curtailed. If we are deemed by the FDA to have engaged in the promotion of our products for off-label use, we could be subject to FDA regulatory or enforcement actions, including the issuance of an untitled letter, a warning letter, injunction, seizure, civil fine or criminal penalties. It is also possible that other federal, state or foreign enforcement authorities might take action if they determine our business activities constitute promotion of an off-label use, which could result in significant penalties, including criminal, civil or administrative penalties, damages, fines, disgorgement, exclusion from participation in government healthcare programs and the curtailment or restructuring of our operations.

We cannot, however, prevent a physician from using our product candidates in ways that fall outside the scope of the approved indications, as he or she may deem appropriate in his or her medical judgment. Physicians may also misuse our product candidates or use improper techniques, which may lead to adverse results, side effects or injury and, potentially, subsequent product liability claims. Furthermore, the use of our product candidates for indications other than those cleared by the FDA and/or other regulatory agencies may not effectively treat such conditions, which could harm our brand and reputation among both physicians and patients.

We may also be subject to healthcare laws, regulation and enforcement and our failure to comply with those laws could adversely affect our business, operations and financial condition.

Certain federal and state healthcare laws and regulations pertaining to fraud and abuse and patients' rights are and will be applicable to our business. We are subject to regulation by both the federal government and the states in which we conduct our business. The laws and regulations that may affect our ability to operate include:

- the federal healthcare program anti-kickback statute, which prohibits, among other things, any person or entity from knowingly and willfully offering, soliciting, receiving or providing any remuneration (including any kickback, bribe or rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce either the referral of an individual or in return for the purchase, lease, or order of any good, facility item or service, for which payment may be made, in whole or in part, under federal healthcare programs such as the Medicare and Medicaid programs;

- federal civil and criminal false claims laws and civil monetary penalty laws, including, for example, the United States False Claims Act, which impose criminal and civil penalties, including civil whistleblower or qui tam actions, against individuals or entities for, among other things, knowingly presenting, or causing to be presented, to the federal government, including the Medicare and Medicaid programs, claims for payment that are false or fraudulent or making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government;

- the federal Health Insurance Portability and Accountability Act of 1996, as amended by the Health Information Technology for Economic and Clinical Health Act, or HIPAA, which prohibits 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 of the money or property owned by, or under the custody or control of, any healthcare benefit program, regardless of the payor (i.e., public or private), knowingly and willfully embezzling or stealing from a health care benefit program, willfully obstructing a criminal investigation of a health care offense and knowingly and willfully falsifying, concealing or covering up by any trick or device a material fact or making any materially false statements in connection with the delivery of, or payment for, healthcare benefits, items or services relating to healthcare matters;

- HIPAA and related implementing regulations, which impose obligations on covered entities, including healthcare providers, health plans, and healthcare clearinghouses, as well as their respective business associates that create, receive, maintain or transmit individually identifiable health information for or on behalf of a covered entity, with respect to safeguarding the privacy, security and transmission of individually identifiable health information;

- the federal physician sunshine requirements under the Patient Protection and Affordable Care Act, or ACA, which require manufacturers of drugs, devices, biologics and medical supplies to report annually to the Centers for Medicare & Medicaid Services information related to payments and other transfers of value provided to physicians and teaching hospitals, and ownership and investment interests held by physicians and their immediate family members, with such information published on a searchable website on an annual basis; and

- state law equivalents of each of the above federal laws, such as anti-kickback and false claims laws, which may apply to items or services reimbursed by any third-party payor, including commercial insurers; state laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the applicable compliance guidance promulgated by the federal government, or otherwise restrict payments that may be provided to healthcare providers and other potential referral sources; state laws that require drug manufacturers to report information related to payments and other transfers of value to healthcare providers or marketing expenditures; and state laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and may not have the same effect, thus complicating compliance efforts.

Because of the breadth of these laws and the narrowness of the statutory exceptions and safe harbors available, it is possible that some of our business activities could be subject to challenge under one or more of such laws. In addition, recent health care reform legislation has strengthened these laws. For example, the recently enacted ACA, among other things, amended the intent requirement of the federal anti-kickback statute and certain criminal healthcare fraud statutes. A person or entity no longer needs to have actual knowledge of the statute or specific intent to violate it. In addition, the ACA provides that the government may assert that a claim including items or services resulting from a violation of the federal anti-kickback statute constitutes a false or fraudulent claim for purposes of the federal civil False Claims Act.

Achieving and sustaining compliance with these laws may prove costly. In addition, any action against us for violation of these laws, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business. If our operations are found to be in violation of any of the laws described above or any other governmental laws or regulations that apply to us, we may be subject to penalties, including administrative, civil and criminal penalties, damages, fines, disgorgement, the exclusion from participation in federal and state healthcare programs, individual imprisonment or the curtailment or restructuring of our operations, any of which could materially and adversely affect our ability to operate our business and our financial results.

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

We are exposed to the risk that our employees, independent contractors, principal investigators, consultants, vendors and CROs may engage in fraudulent or other illegal activity. Misconduct by these persons could include intentional, reckless or negligent conduct or unauthorized activity that violates: laws or regulations, including those laws requiring the reporting of true, complete and accurate information to the FDA or foreign regulatory authorities; manufacturing standards; federal, state and foreign healthcare fraud and abuse laws and data privacy; or laws that require the true, complete and accurate reporting of financial information or data. In particular, sales, marketing and other business arrangements in the healthcare industry are subject to extensive laws intended to prevent fraud, kickbacks, self-dealing and other abusive practices. These laws may restrict or prohibit a wide range of business activities, including research, manufacturing, distribution, pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Activities subject to these laws also involve the improper use of information obtained in the course of clinical trials, or illegal misappropriation of drug product, which could result in regulatory sanctions or other actions or lawsuits stemming from a failure to comply with such laws or regulations, and serious harm to our reputation. In addition, federal procurement laws impose substantial penalties for misconduct in connection with government contracts and require certain contractors to maintain a code of business ethics and conduct. If any such actions are instituted against us, we may have to terminate employees or others involved and the impact of such termination can result in our experiencing delays and additional costs associated with replacing the services being provided. If we are not

successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, including the imposition of civil, criminal and administrative penalties, damages, monetary fines, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, FDA debarment, contractual damages, reputational harm, diminished profits and future earnings, and curtailment of our operations, any of which could adversely affect our ability to operate our business and our operating results.

Even if our current product candidates or any future product candidates obtain regulatory approval, they may fail to achieve the broad degree of health care payers, physician and patient adoption and use necessary for commercial success.

The commercial success of any of our current or future product candidates, if approved, will depend significantly on the broad adoption and use of the resulting product by health care payers, physicians and patients for approved indications, and may not be commercially successful. The degree and rate of physician and patient adoption of our current or future product candidates, if approved, will depend on a number of factors, including:

- the clinical indications for which the product is approved and patient demand for approved products that treat those indications;
- the effectiveness of our product as compared to other available therapies;
- the availability of coverage and adequate reimbursement from managed care plans and other healthcare payors for any of our product candidates that may be approved;
- the cost of treatment with our product candidates in relation to alternative treatments and willingness to pay for the product, if approved, on the part of patients;
- acceptance by physicians, major operators of clinics and patients of the product as a safe and effective treatment;
- physician and patient willingness to adopt a new therapy over other available therapies to treat approved indications;
- overcoming any biases physicians or patients may have toward particular therapies for the treatment of approved indications;
- proper training and administration of our product candidates by physicians and medical staff;
- patient satisfaction with the results and administration of our product candidates and overall treatment experience;
- the willingness of patients to pay for certain of our product candidates relative to other discretionary items, especially during economically challenging times;

- the revenue and profitability that our product candidate may offer a physician as compared to alternative therapies;
- the prevalence and severity of side effects;
- limitations or warnings contained in the FDA-approved labeling for our product candidates;
- any FDA requirement to undertake a REMS;
- the effectiveness of our sales, marketing and distribution efforts;
- adverse publicity about our product candidates or favorable publicity about competitive products; and
- potential product liability claims.

If any of our current or future product candidates are approved for use but fail to achieve the broad degree of physician and patient adoption necessary for commercial success, our operating results and financial condition will be adversely affected, which may delay, prevent or limit our ability to generate revenue and continue our operations.

If we are unable to achieve and maintain coverage and adequate levels of reimbursement for any of our product candidates for which we receive regulatory approval, or any future products we may seek to commercialize, their commercial success may be severely hindered.

As to any of our product candidates that become available by prescription only, our success will depend on the availability of coverage and adequate reimbursement for our product from third-party payors. Patients who are prescribed medicine for the treatment of their conditions generally rely on third-party payors to reimburse all or part of the costs associated with their prescription drugs. The availability of coverage and adequate reimbursement from governmental healthcare programs, such as Medicare and Medicaid, and private third-party payors is critical to new product acceptance. Coverage decisions may depend upon clinical and economic standards that disfavor new drug products when more established or lower cost therapeutic alternatives are already available or subsequently become available. If any of our product candidates fail to demonstrate attractive efficacy profiles, they may not qualify for coverage and reimbursement. Even if we obtain coverage for a given product, the resulting reimbursement payment rates might not be adequate or may require co-payments that patients find unacceptably high. Patients are unlikely to use our prescription-only products unless coverage is provided and reimbursement is adequate to cover a significant portion of the cost of our products.

In addition, the market for certain of our product candidates will depend significantly on access to third-party payors' drug formularies, or lists of medications for which third-party payors provide coverage and reimbursement. The industry competition to be included in such formularies often leads to downward pricing pressures on pharmaceutical companies. Also, third-party payors may refuse to include a particular branded drug in their formularies or otherwise restrict patient access to a branded drug when a less costly generic equivalent or another alternative is available.

Moreover, third-party payors, whether foreign or domestic, or governmental or commercial, are developing increasingly sophisticated methods of controlling healthcare costs. In addition, in the United States, although private third-party payors tend to follow Medicare, no uniform policy of coverage and reimbursement for drug products exists among third-party payors. Therefore, coverage and reimbursement for drug products can differ significantly from payor to payor. 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 obtained.

Further, we believe that future coverage and reimbursement will likely be subject to increased restrictions in both the United States and in international markets. Third-party coverage and reimbursement for any of our product candidates for which we may receive regulatory approval may not be available or adequate in either the United States or international markets, which could harm our business, financial condition, operating results and prospects.

If our products do not receive favorable third-party reimbursement, or if new restrictive legislation is adopted, market acceptance of our products may be limited and we

may not generate significant revenues.

Our ability to commercialize our products will depend in part on the extent to which appropriate reimbursement levels for the cost of our proposed formulations and products and related treatments are obtained by governmental authorities, private health insurers and other organizations, such as Health Maintenance Organizations, or HMOs. Reimbursement from third parties depends greatly on our ability to present data which demonstrate positive outcomes and reduced utilization of other products or services as well as cost data which show that treatment costs using the new product are equal to or less than what is currently covered for other products. If our products do not receive favorable third-party reimbursement and patients are unwilling or unable to pay for our products out-of-pocket, it could limit our revenues and harm our business.

The continuing efforts of government and insurance companies, health maintenance organizations and other payers of healthcare costs to contain or reduce costs of health care may affect our future revenues and profitability, and the future revenues and profitability of our potential customers, suppliers and collaborative partners and the availability of capital. For example, in certain foreign markets, pricing or profitability of prescription pharmaceuticals is subject to government control. In the United States, recent federal and state government initiatives have been directed at lowering the total cost of health care. In March 2010, President Obama signed into law the Patient Protection and Affordable Care Act, a sweeping law intended to broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against fraud and abuse, add new transparency requirements for healthcare and health insurance industries, impose new taxes and fees on the health industry and impose additional health policy reforms. Federal and state legislatures will likely continue to focus on health care reform, controlling the cost of prescription pharmaceuticals and on the reform of the Medicare and Medicaid systems. While we cannot predict whether any such legislative or regulatory proposals will be adopted, the announcement or adoption of such proposals could materially harm our business, financial condition and results of operations.

Risks Related to Coronavirus Disease (COVID-19)

Our business is subject to risks arising from public health crises, epidemic or pandemic diseases, such as the recent global outbreak of the coronavirus disease (COVID-19).

Our business operations expose us to risks associated with public health crises, epidemics and pandemics. An epidemic or pandemic disease outbreak, including the recent COVID-19 outbreak, could cause significant disruption to our business operations or the operations of our third-party manufacturers and CROs upon whom we rely, as well as to our clinical trials, including as a result of significant restrictions or bans on travel into and within the countries in which our manufacturers produce our product candidates or where we conduct our pre-clinical testing or our future clinical trials. Such disruption could impede, delay, limit or prevent our employees and CROs from continuing research and development activities, the production, delivery or release of our product candidates to our clinical trial sites, as well as clinical trial investigators, patients or other critical staff from traveling to or otherwise continuing to participate in our clinical trials, and delay data collection and analysis and other related activities, any of which could impede, delay, limit or prevent completion of our ongoing pre-clinical testing or our future clinical trials pre-clinical or commencement of new clinical trials, and ultimately lead to the delay or denial of regulatory approval of our product candidates, which would seriously harm our operations and financial condition and increase our costs and expenses.

The COVID-19 outbreak could also potentially affect the business of the FDA, EMA or other health authorities, which could result in delays in meetings related to planned or completed clinical trials and ultimately of reviews and approvals of our product candidates. The COVID-19 outbreak and mitigation measures also have had and may continue to have an adverse impact on global economic conditions which could have an adverse effect on our business and financial condition, including impairing our ability to raise capital when needed. The extent to which the COVID-19 outbreak impacts our results will depend on future developments that are highly uncertain and cannot be predicted, including new information that may emerge concerning the severity of the virus and the actions to contain its impact. The severity of the coronavirus disease could also make access to our existing supply chain difficult or impossible and could materially impact our business. Any one or a combination of the aforementioned events could have an adverse effect on our business.

Our ability to conduct clinical trials may be impeded, delayed, limited or prevented entirely due to the spread of COVID-19, the imposition of government restrictions and the concurrent disruptions to ordinary business activities globally.

As the U.S. and foreign governments and nongovernmental organizations continue to respond to the COVID-19 public health crisis, our ability to conduct clinical trials may impeded, delayed, limited or prevented entirely by a number of factors, including, but not limited to, the following:

- delays or difficulties in enrolling patients in our clinical trials;
- delays or difficulties in clinical site initiation, including difficulties in recruiting clinical site investigators and clinical site staff;

- diversion of healthcare resources away from the conduct of clinical trials, including the diversion of hospitals serving as our clinical trial sites and hospital staff supporting the conduct of our clinical trials;
- interruption of key clinical trial activities, such as clinical trial site monitoring, due to limitations on travel imposed or recommended by federal or state governments, employers and others;
- limitations in employee resources that would otherwise be focused on the conduct of our clinical trials, including because of sickness of employees or their families or the desire of employees to avoid contact with large groups of people;
- delays in receiving approval from local regulatory authorities to initiate our planned clinical trials;
- delays in clinical sites receiving the supplies and materials needed to conduct our clinical trials;
- interruption in global shipping that may affect the transport of clinical trial materials;
- changes in local regulations as part of a response to the COVID-19 coronavirus outbreak which may require us to change the ways in which our clinical trials are conducted, which may result in unexpected costs, or to discontinue the clinical trials altogether;
- delays in necessary interactions with local regulators, ethics committees and other important agencies and contractors due to limitations in employee resources or forced furlough of government employees; and
- refusal of the FDA to accept data from clinical trials in affected geographies outside the United States.

The global outbreak of the COVID-19 coronavirus continues to rapidly evolve. The extent to which the COVID-19 coronavirus may impact our business and clinical trials will depend on future developments, which are highly uncertain and cannot be predicted with confidence, such as the ultimate geographic spread and density of the disease, the duration of the outbreak, travel restrictions and social distancing 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.

Our business involves international components, and we are exposed to various global and local risks related to the coronavirus disease 2019 (COVID-19) that could have a material adverse effect on our financial condition and results of operations.

Our business may involve international components such as clinical trial enrollment. Consequently, we may be exposed to, or our third-party contractors, suppliers or manufacturers may be exposed to, certain global events beyond our control, including war, public health crises, epidemics, pandemics, trade disputes, geopolitical conflicts and other international events, including, for example, the global impact of COVID-19 and the various responses taken by foreign authorities, such as government-imposed quarantines and other public health safety measures.

The extent to which the coronavirus impacts our results will depend on future developments, which are highly uncertain and cannot be predicted, including new information which may emerge concerning the severity of the coronavirus and the actions to contain the coronavirus or treat its impact, among others. Moreover, the coronavirus outbreak has indeterminable adverse effects on general commercial activity and the world economy, and our business and results of operations could be adversely affected to the extent that this coronavirus or any other epidemic harms the global economy generally. The international components of our business may be directly subject to, and the domestic components may be indirectly impacted by, a variety of risks, including:

- foreign currency exchange rate fluctuations;
- greater difficulty in staffing and managing foreign operations;
- greater risk of uncollectible accounts;
- longer collection cycles;
- logistical and communications challenges;

- potential adverse changes in laws and regulatory practices, including export license requirements, trade barriers, tariffs and tax laws;
- changes in labor conditions;
- burdens and costs of compliance with a variety of foreign laws;
- political and economic instability;
- increases in duties and taxation;
- foreign tax laws and potential increased costs associated with overlapping tax structures;
- greater difficulty in protecting intellectual property;
- the risk of third-party disputes over ownership of intellectual property and infringement of third-party intellectual property by our products; and
- general economic and political conditions in these foreign markets.

International markets are also affected by economic pressure to contain reimbursement levels and healthcare costs. Profitability from international operations may be limited by risks and uncertainties related to regional economic conditions, regulatory and reimbursement approvals, competing products, infrastructure development, intellectual property rights protection and our ability to implement our overall business strategy. We expect these risks will increase as we seek to expand operations into new geographic markets. We may not succeed in developing and implementing effective policies and strategies in each location where we conduct business. Any failure to do so may harm our business, results of operations and financial condition.

Macroeconomic pressures in the markets in which we operate, including, but not limited to, the effectives of the coronavirus disease (COVID-19) may alter the ways in which we conduct our business operations and manage our financial capacities.

To varying degrees, the ways in which we conduct our business operations and manage our financial capacities are influenced by macroeconomic conditions that affect companies directly involved in or providing services related to the drug and biological product development. For example, real GDP growth, business and investor confidence, the COVID-19 pandemic, inflation, employment levels, oil prices, interest rates, tax rates, availability of consumer and business financing, housing market conditions, foreign currency exchange rate fluctuations, costs for items such as fuel and food and other macroeconomic trends can adversely affect not only our decisions and ability to engage in research and development and clinical trials, but also those of our management, employees, third-party contractors, manufacturers and suppliers, competitors, shareholders and regulatory authorities. In addition, geopolitical issues around the world and how our markets are positioned can also impact the macroeconomic conditions and could have a material adverse impact on our financial results.

Economic uncertainty may adversely affect our access to capital, cost of capital and ability to execute our business plan as scheduled.

Generally, worldwide economic conditions remain uncertain. Access to capital markets is critical to our ability to operate. Traditionally, biotechnology companies have funded their research and development expenditures through raising capital in the equity markets. Declines and uncertainties in these markets in the past have severely restricted raising new capital and have affected companies' ability to continue to expand or fund existing research and development efforts. We require significant capital for research and development for our vaccine candidates and clinical trials. The general economic and capital market conditions, both in the U.S. and worldwide, have been volatile in the past and at times have adversely affected our access to capital and increased the cost of capital. There is no certainty that the capital and credit markets will be available to raise additional capital on favorable terms. If economic conditions become worse, our future cost of equity or debt capital and access to the capital markets could be adversely affected. In addition, if we are unable to access the capital markets on favorable terms, our ability to execute our business plan as scheduled would be compromised. Moreover, we rely and intend to rely on third-parties, including clinical research organizations, contract manufacturing organizations and other important vendors and consultants. Global economic conditions may result in a disruption or delay in the performance of our third-party contractors and suppliers. If such third-parties are unable to adequately satisfy their contractual commitments to us in a timely manner, our business could be adversely affected.

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

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

Disruptions at the FDA and other agencies may also slow the time necessary for new drugs to be reviewed and/or approved by necessary government agencies, which would adversely affect our business. For example, over the last several years, the U.S. government has shut down several times and certain regulatory agencies, such as the FDA and the SEC, have had to furlough critical FDA, SEC and other government employees and stop critical activities. Moreover, at this time, we cannot predict the extent to which the COVID-19 pandemic outbreak will impact the resources of such government agencies, including, in particular, the public health resources available to the FDA. If a prolonged government shutdown occurs, it could significantly impact the ability of the FDA to timely review and process our regulatory submissions, which could have a material adverse effect on our business. Further, in our operations as a public company, future government shutdowns could impact our ability to access the public markets and obtain necessary capital in order to properly capitalize and continue our operations.

Risks Related to Our Common Stock

The issuance of additional equity securities by us in the future would result in dilution to our existing common shareholders.

Our board of directors has authority, without action or vote of our shareholders, to issue all or a part of our authorized but unissued shares, except where shareholder approval is required by law. Any issuance of additional equity securities by us in the future could result in dilution to our existing common shareholders. Such issuances could be made at a price that reflects a discount or a premium to the then-current trading price of our common stock. In addition, our business strategy may include expansion through internal growth by acquiring complementary businesses, acquiring or licensing additional products or brands, or establishing strategic relationships with targeted customers and suppliers. In order to do so, or to finance the cost of our other activities, we may issue additional equity securities that could result in further dilution to our existing common shareholders. These issuances would dilute the percentage ownership interest of our existing common shareholders, which would have the effect of reducing their influence on matters on which our shareholders vote, and might dilute the book value of our common stock. For example, we issued 16,666,668 shares of common stock, short-term warrants to purchase up to 9,583,334 shares of common stock, and long-term warrants to purchase up to 9,583,334 shares of common stock, as part of our March 25, 2019 underwritten public offering. In November and December of 2020, we issued 16,317,567 and 14,444,444 shares of common stock, respectively, in connection with an underwritten public offering and a registered direct offering. In connection with an at-the-market sale of shares of our common stock during first quarter of 2021 we issued an additional 21,398,765 shares of our common stock and issued 2,472,573 shares pursuant to warrant exercises. During the second quarter of 2021, we issued an additional 556,540 shares of our common stock pursuant to option exercises. During the third quarter of 2021, we issued an additional 200,000 shares of our common stock pursuant to option exercises. As a result, our outstanding shares of common stock has increased significantly from 29,433,135 shares as of December 31, 2018 to 116,394,806 as of December 31, 2021.

Our financial results could vary significantly from quarter to quarter and are difficult to predict.

Our operating results could vary significantly from quarter to quarter due to a variety of factors, many of which are outside of our control. As a result, comparing our operating results on a period-to-period basis may not be meaningful. In addition, we may not be able to predict our future revenues or results of operations. We base our current and future expense levels on our internal research and development plans and forecasts, and our operating costs vary to the extent of our research and development and the planning for and conduct of clinical trials. As a result, we may incur significant or unanticipated expenses associated with our research and development efforts of our product candidates under development. In addition to other risk factors discussed in this section, factors that may contribute to the variability of our quarterly results include:

- Our use of available cash resources;
- the timing of release of pre-clinical and clinical trial results and new products and services by our competitors, particularly those that may represent a significant portion of revenues in any given period;

- the popularity of new products, and products released in prior periods;
- changes by our competitors;
- our success in entering new geographic markets;
- decisions by us to incur additional expenses, such as commencing a clinical trial or increases in research and development;
- the level of expenses associated with our regulatory applications or compliance and clinical trials; and
- the timing of compensation expense associated with equity compensation grants.

As a result of these and other factors, our quarterly and annual operating results could be materially adversely affected. Moreover, our operating results may not meet the expectations of research analysts or investors, in which case the price of our common stock could decrease significantly.

Our Series A and Series B preferred stock, if not converted into common stock, has a distribution and liquidation preference senior to our common stock in liquidation which could negatively affect the value of our common stock and impair our ability to raise additional capital.

On November 8, 2017, we issued $3.3 million of Series B Non-Voting, Convertible Preferred Stock (the "Series B Preferred Stock") pursuant to which upon Liquidation each holder of shares of Series B Preferred Stock shall be entitled to receive on par with Series A Convertible Preferred Stock and in preference to the holders of Common Stock, an amount of cash equal to the greater of (i) the product of the number of shares of Series B Preferred Stock then held by such holder, multiplied by the Series B Original Issue Price; and (ii) the amount that would be payable to such holder in the Liquidation in respect of Common Stock issuable upon conversion of such shares of Series B Preferred Stock if all outstanding shares of Series B Preferred Stock were converted into Common Stock immediately prior to the Liquidation.

In May and July of 2017, we issued an aggregate of $3.0 million of Series A Non-Voting, Convertible Preferred Stock (the "Series A Preferred Stock") pursuant to which upon Liquidation each holder of shares of Series A Preferred Stock shall be entitled to receive on par with Series B Convertible Preferred Stock and in preference to the holders of Common Stock, an amount of cash equal to the greater of (i) the product of the number of shares of Series A Preferred Stock then held by such holder, multiplied by the Series B Original Issue Price; and (ii) the amount that would be payable to such holder in the Liquidation in respect of Common Stock issuable upon conversion of such shares of Series A Preferred Stock if all outstanding shares of Series A Preferred Stock were converted into Common Stock immediately prior to the Liquidation.

Our Series A and Series B preferred stock, if not converted into common stock, will also be senior to our common stock in distribution and liquidation if such shares are not converted into common stock, which could negatively affect the value of our common stock and impair our ability to raise additional capital.

The conversion of our Series A Preferred Stock, and Series B Preferred Stock and the exercise of currently outstanding warrants could result in significant dilution to the holders of our common stock.

The holders of our Series A Preferred Stock and Series B Preferred Stock may convert their shares of preferred stock into shares of common stock. As of December 31, 2021, we had outstanding: (i) 9,417,000 shares of Series A Preferred Stock outstanding, which are convertible into 941,701 shares of common stock and (ii) 6,600,000 shares of Series B Preferred Stock, which are convertible into 1,320,002 shares of common stock. In addition to our outstanding shares of preferred stock, as of December 31, 2021, there were currently outstanding warrants to purchase 18,040,572 shares of our common stock. The conversion of our Series A Preferred Stock and Series B Preferred Stock, as well

as the exercise of our outstanding warrants could result in significant dilution to existing common shareholders, adversely affect the market price of our common stock and impair our ability to raise capital through the sale of additional equity securities.

Certain provisions of our articles of incorporation, bylaws, executive employment agreements and stock option plan may prevent a change of control of our company that a shareholder may consider favorable.

Provisions of our articles of incorporation, bylaws, executive employment agreements and stock option plan may discourage, delay or prevent a change of control of our company that a shareholder may consider favorable. These provisions include:

- authorization of the issuance of "blank check" preferred stock that could be issued by our Board of Directors without shareholder approval and that may be substantially dilutive or contain preferences or rights objectionable to an acquirer;
- the ability of our Board of Directors to amend the bylaws without shareholder approval;
- vacancies on our Board may only be filled by the remaining directors and not our shareholders;
- requirements that only our Board, our President or holders of more than 10% of our shares can call a special meeting of shareholders;
- obligations to make certain payments under executive employment agreements in the event of a change of control and termination of employment; and
- immediate vesting of all outstanding stock options.

As a result, these provisions could discourage bids for our common stock at a premium and limit the price that investors are willing to pay in the future for shares of our common stock. However, in our articles of incorporation we expressly elected not to be governed by Sections 607.0901 and 607.0902 of the Florida Business Corporation Act, which are statutory anti-takeover provisions relating to affiliated transactions and control share acquisitions, respectively. As such, we do not have the protection of these statutes in connection with any unwanted takeover attempts which could have the effect of encouraging an attempted change of control without first negotiating with our Board of Directors.

The price and volume of our common stock has been volatile and fluctuates substantially, which could result in substantial losses for shareholders.

The trading price of our common stock has historically been, and may in the future be, subject to wide fluctuations in response to a number of factors, many of which are beyond our control. These factors include:

- announcements of the results of our pending COVID-19 vaccine development program or the competitors vaccine products or product candidates;
- our level of, and expected future use of, working capital;
- the additional sale of common stock by us in capital raising transactions;
- quarter-to-quarter variations in our operating results;
- our perceived funding needs;
- the results of testing, technological innovations, or new commercial products by us or our competitors;
- governmental regulations, rules, and orders;
- general conditions in the health care, biotechnology or biopharmaceutical industries;
- changes in market or trading conditions in light of economic uncertainty due to the COVID-19 pandemic;
- comments, research reports and/or earnings estimates by securities analysts;
- developments concerning patents or other intellectual property rights;
- litigation or public concern about the safety of our products;
- announcements by us or our competitors of significant acquisitions, strategic partnerships, joint ventures or capital commitments;

- additions or departures of directors, officers and key personnel;
- release of transfer restrictions on our outstanding shares of common stock or sales of additional shares of common stock; and
- potential litigation initiated against us.

Our stock price has been, and in the future may be, subject to substantial volatility. For example, our stock traded within a range of a high volume of 234,000,400 and a low volume of 441,700 per share for the period of January 1, 2021, through December 31, 2021. As a result of this volatility, our stockholders could incur substantial losses.

The stock market in general, and the market for biopharmaceutical companies in particular, has experienced extreme volatility that has often been unrelated to the operating performance of particular companies. As a result of this volatility, you may not be able to sell your common stock at or above your initial purchase price. Broad market factors may seriously harm the market price of our common stock, regardless of our operating performance.

If our quarterly or annual results fall below the expectations of investors or securities analysts, the price of our common stock could decline substantially. Furthermore, any quarterly or annual fluctuations in our results may, in turn, cause the price of our stock to fluctuate substantially. We believe that period-to-period comparisons of our results are not necessarily meaningful and should not be relied upon as an indication of our future performance.

In addition, public statements by us, government agencies, the media or others relating to the coronavirus outbreak (including regarding efforts to develop a coronavirus vaccine

or existing vaccines in the market) have in the past resulted, and may in the future result, in significant fluctuations in our stock price. Given the global focus on the coronavirus outbreak, any information in the public arena on this topic, whether or not accurate, could have an outsized impact (either positive or negative) on our stock price. Information related to our development, manufacturing and distribution efforts with respect to NT-CoV2-1, or information regarding such efforts by competitors with respect to their vaccines, may also impact our stock price.

Our stock price is likely to continue to be volatile and subject to significant volume fluctuations in response to market and other factors, including the other factors discussed in n future periodic reports; variations in our quarterly operating results from our expectations or those of securities analysts or investors; downward revisions in securities analysts' estimates; and announcement by us or our competitors of significant acquisitions, strategic partnerships, joint ventures or capital commitments.

We may be subject to securities litigation, which is expensive and could divert management attention.

The market price of our common stock has been in the past and may continue to be volatile. In the past, other publicly-traded companies that have experienced volatility in the market price of their stock have been subject to securities class action litigation. We may be the target of securities law-related litigation in the future, and such litigation against us could result in substantial costs and divert management's attention from other business concerns, which could seriously harm our business, financial condition and results of operations and prospects.

Future sales or issuances of our common stock in the public markets, or the perception of such sales, could depress the trading price of our common stock.

The market price of our common stock could decline as a result of sales of substantial amounts of our common stock in the public market, or the perception that these sales could occur in the future based on our expected need to raise additional capital to conduct our business. In addition, these factors could make it more difficult for us to raise funds through future offerings of common stock. We may sell large quantities of our common stock at any time pursuant to our existing sales agency agreement for at-the-market offerings or in one or more separate offerings. We cannot predict the effect that future sales of common stock or other equity-related securities would have on the market price of our common stock. We have recently issued a significant number of shares of common stock and the number of outstanding shares has increased from 29,433,135 shares as of December 31, 2018 to 116,394,806, shares as of December 31, 2021. In addition, there were 16,017,000 shares of our Preferred stock outstanding which are convertible into 2,261,703 shares of our common stock and, as of December 31, 2021, warrants to purchase an additional 18,040,572 shares of our common stock issuable upon exercise of warrants to investors, inclusive of the warrants to purchase 9,200,000 shares of our common stock issued in connection with our acquisition of Noachis Terra which are currently. There were also 6,724,402 shares issuable upon exercise of options outstanding and an additional 10,532,808 shares available for option grants under our new 2021 Equity Incentive Plan which includes shares from our prior plan.

The issuance of shares of our common stock under our 2021 Equity Incentive Plan is expected to be covered by Form S-8 registration statements we expect to file with the Securities and Exchange Commission, or SEC, and upon exercise of the options, such shares may be resold into the market. We have also issued shares of common stock and warrants in connection with previous private placements. Such shares are available for resale as well as certain of the shares of common stock issuable upon exercise of the warrants. We have also issued shares of our common stock in the private placement and financing transaction, which are deemed to be "restricted securities," as that term is defined in Rule 144 promulgated under the Securities Act of 1933, as amended, or Securities Act, and such shares may be resold pursuant to the provisions of Rule 144. In general, pursuant to Rule 144, after satisfying a six-month holding period: (i) affiliated shareholders, or shareholders whose shares are aggregated, may, under certain circumstances, sell within any three-month period a number of securities which does not exceed the greater of 1% of the then-outstanding shares of common stock or the average weekly trading volume of the class during the four calendar weeks prior to such sale and (ii) non-affiliated shareholders may sell without such limitations, in each case provided we are current in our public reporting obligations. Rule 144 also permits the sale of securities by non-affiliates that have satisfied a one-year holding period without any limitation or restriction. We are unable to estimate the number of shares that may be sold because this will depend on the market price for our common stock, the personal or business circumstances of sellers and other factors.

The requirements of being a public company may strain our resources, divert management's attention and affect our ability to attract and retain qualified members for our Board of Directors.

As a public company, we are already subject to the reporting requirements of the Securities Exchange Act of 1934, as amended, or the Exchange Act, and the Sarbanes-Oxley Act. The requirements of these rules and regulations may increase our legal, accounting and financial compliance costs; may make some activities more difficult, time-consuming and costly; and may also place undue strain on our personnel, systems and resources. Our management and other personnel need to devote a substantial amount of time to comply with these requirements. Moreover, these rules and regulations increase our legal and financial compliance costs and make some activities more time-consuming and costlier. These rules and regulations could also make it more difficult for us to attract and retain qualified persons to serve on our Board of Directors and Board committees or as executive officers.

As a public company we are also required to assess our internal control over financial reporting under Section 404 of the Sarbanes-Oxley Act and file periodic reports with the SEC. If we are unable to comply with these requirements in a timely manner, or if material weaknesses or significant deficiencies persist, the market price of our stock could decline and we could be subject to sanctions or regulatory investigations, which could harm our business. We must perform an assessment of our internal control over financial reporting to allow management to report on the effectiveness of our internal control over financial reporting, as required by Section 404 of the Sarbanes-Oxley Act. Our compliance with Section 404 of the Sarbanes-Oxley Act requires that we incur substantial accounting expense and expend significant management efforts. If we are unable to comply with the requirements of Section 404 of the Sarbanes-Oxley Act or the SEC reporting requirements in a timely manner, or if we note or identify deficiencies in our internal control over financial reporting that are deemed to be material weaknesses, the market price of our stock could decline and we could be subject to sanctions or investigations by the SEC or other regulatory authorities, which would require additional financial and management resources. As a smaller reporting company, we do not have to have our independent registered public accounting firm report on the effectiveness of our internal control over financial reporting. If in the future we no longer meet the requirements of a smaller reporting company, our independent registered public accounting firm will have to report on our internal controls over financial reporting. There can be no assurance that our independent registered public accounting firm will not identify material weaknesses which could have an adverse effect on our stock price.

If we fail to maintain an effective system of internal controls, we may not be able to accurately report our financial results or prevent fraud which could subject us to regulatory sanctions, harm our business and operating results and cause the trading price of our stock to decline.

Effective internal controls required under Section 404 of the Sarbanes-Oxley Act of 2002, or Sarbanes-Oxley Act, are necessary for us to provide reliable financial reports and effectively prevent fraud. If we cannot provide reliable financial reports or prevent fraud, our business, reputation and operating results could be harmed. We have discovered, and may in the future discover, areas of our internal controls that need improvement. We cannot be certain that the measures we have taken or intend to take will ensure that we maintain adequate controls over our financial processes and reporting in the future. Any failure to implement required new or improved controls or difficulties encountered in their implementation could subject us to regulatory sanctions, harm our business and operating results or cause us to fail to meet our reporting obligations. Inferior internal controls could also harm our reputation and cause investors to lose confidence in our reported financial information, which could have a negative impact on the trading price of our stock.

We cannot assure you that we will continue to be listed on the NYSE American.

Our common stock commenced trading on the NYSE American (formerly the NYSE MKT) on April 10, 2013, and we are subject to certain NYSE American continued listing

requirements and standards. We may also incur costs that we have not previously incurred for expenses for compliance with the rules and requirements of the NYSE American. We cannot provide any assurance that we will be able to continue to satisfy the requirements of the NYSE American's continued listing standards. A delisting of our common stock could negatively affect the price and liquidity of our common stock and could impair our ability to raise capital in the future.

We will continue to incur significant costs as a result of and devote substantial management time to operating as a public company listed on the NYSE American.

As a public company listed on the NYSE American, we incurred and will continue to incur significant legal, accounting and other expenses that we did not incur before when trading on the OTCQB Marketplace. For example, we are subject to the rules and regulations required by the NYSE American, including changes in corporate governance practices and minimum listing requirements. These requirements have increased our legal and financial compliance costs and have and will continue to render some activities more time-consuming and costlier. In addition, our management and other personnel have diverted and will continue to divert attention from operational and other business matters to devote substantial time to these listing requirements and failure to meet these requirements could lead to an adverse effect on the listing of our common stock on the NYSE American.

If securities or industry analysts publish research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

The trading market for our common stock depends in part upon the research and reports that securities or industry analysts publish about us or our business from time to time. If one or more of the analysts who seek to cover us downgrades our stock or publishes inaccurate or unfavorable research about our business, our stock price would likely decline. If one or more of these analysts ceases coverage, once commenced, or fails to publish reports on us regularly, demand for our stock could decrease, which could cause our stock price and trading volume to decline.

We may issue debt or debt securities convertible into equity securities, any of which may be senior to our common stock as to distributions and in liquidation, which could negatively affect the value of our common stock.

In the future, we may attempt to increase our capital resources by entering into debt or debt-like financing that is unsecured or secured by up to all of our assets, or by issuing additional debt or equity securities, which could include issuances of secured or unsecured commercial paper, medium-term notes, senior notes, subordinated notes, guarantees, preferred stock, hybrid securities, or securities convertible into or exchangeable for equity securities. In the event of our liquidation, our lenders and holders of our debt and securities would receive distributions of our available assets before distributions to the holders of our common stock. Because our decision to incur debt and issue securities in future offerings may be influenced by market conditions and other factors beyond our control, we cannot predict or estimate the amount, timing or nature of our future offerings or debt financings. Further, market conditions could require us to accept less favorable terms for the issuance of our securities in the future.

We are a "smaller reporting company" and, as a result of the reduced disclosure and governance requirements applicable to smaller reporting companies, our common stock may be less attractive to investors.

We are a "smaller reporting company," meaning that we are not an investment company, an asset-backed issuer, or a majority-owned subsidiary of a parent company that is not a "smaller reporting company," have a public float of less than $250 million and have annual revenues of less than $100 million during the most recently completed fiscal year. As a "smaller reporting company," we are subject to lesser disclosure obligations in our SEC filings compared to other issuers. Specifically, "smaller reporting companies" are able to provide simplified executive compensation disclosures in their filings, are exempt from the provisions of Section 404(b) of the Sarbanes-Oxley Act requiring that independent registered public accounting firms provide an attestation report on the effectiveness of internal control over financial reporting and have certain other decreased disclosure obligations in their SEC filings, including, among other things, only being required to provide two years of audited financial statements in annual reports. Decreased disclosures in our SEC filings due to our status a "smaller reporting company" may make it harder for investors to analyze our operating results and financial prospects.

We have never paid cash dividends on our capital stock, and we do not anticipate paying any cash dividends in the foreseeable future.

We have never paid cash dividends on our capital stock. We currently intend to retain any future earnings to finance the operation and expansion of our business, and we do not expect to declare or pay any cash dividends in the foreseeable future. Consequently, stockholders must rely on sales of their common stock after price appreciation, which may never occur, as the only way to realize any future gains on their investment.

ITEM 1B. UNRESOLVED STAFF COMMENTS.

None

ITEM 2. PROPERTIES.

We lease approximately 2,207 square feet for our corporate offices located at 4902 Eisenhower Boulevard, Suite 125, Tampa, Florida 33634. Lease payments range from $4,138 per month to $4,392 per month inclusive of insurance, taxes and utilities. The lease costs for the year ended December 31, 2021 were approximately $63,000 which includes insurance, taxes and utilities. In November of 2019, the Company entered into an amendment for the office space in Tampa to extend the term for an additional three years beginning in March of 2020. Under the amended lease agreement, the rental payments are expected to range from $4,524 per month to $4,800 per month.

In addition to our Tampa location, we continue to lease our research facility located at 13700 Progress Boulevard, Alachua, Florida 32615. The facility is approximately 5,300 square feet of which approximately 60% is laboratory space and the remainder is office space and common areas. The lease costs for the year ended December 31, 2021 were approximately $165,000 which includes insurance, taxes and utilities. Lease payments are capped during the term. In June of 2019, the Company entered into an amendment to our lease for the Alachua facility to provide for a term of five years beginning at the end of the existing lease term in December of 2019. Under the amended lease agreement, the rental payments range from $12,870 per month to $13,338 per month.

ITEM 3. LEGAL PROCEEDINGS.

We are not a party to any material legal proceedings.

ITEM 4. MINE SAFETY DISCLOSURES.

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED SHAREHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES.

Our common stock is quoted on the NYSE American under the ticker symbol "OGEN". The last price of our common stock as reported on the NYSE American on March 8, 2022 was $0.34 per share. As of March 8, 2022, there were approximately 29 stockholders of record of our common stock. This number does not include beneficial owners from whom shares are held by nominees in street name such as banks and brokerage firms.

Dividends

To date, we have neither declared nor paid any dividends on our common stock nor do we anticipate that such dividends will be paid in the foreseeable future. Rather, we intend to retain any earnings to finance the growth and development of our business. Any payment of cash dividends on our common stock in the future will be dependent, among other things, upon our earnings, financial condition, capital requirements and other factors which the board of directors deems relevant. In addition, restrictive covenants contained in any financing agreements entered into in the future may preclude us from paying any dividends.

Unregistered Sale Of Equity Securities And Use Of Proceeds

None.

Stock Repurchases in the Fourth Quarter

There were no purchases of our common stock during the three months ended December 31, 2021.

ITEM 6. [RESERVED.]

Not applicable.

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

The following information should be read in conjunction with the Consolidated Financial Statements, including the notes thereto, included elsewhere in this Form 10-K. This discussion contains certain forward-looking statements that involve risks and uncertainties. Our actual results and the timing of certain events could differ materially from those discussed in these forward-looking statements as a result of certain factors, including, but not limited to, those set forth herein and elsewhere in this Form 10-K.

Overview

Oragenics, Inc. is a development-stage company dedicated to fighting infectious diseases including coronaviruses and multidrug-resistant organisms. Its lead product is an intranasal immunization vaccine candidate to prevent COVID-19 and variants of the SARS-CoV-2 virus. The NT-CoV2-1 program leverages coronavirus spike protein research licensed from the National Institute of Health and the National Research Council of Canada with a focus on reducing viral transmission and offering a more patient-friendly intranasal administration. Our lantibiotics program features a novel class of antibiotics against bacteria that have developed resistance to commercial antibiotics.
Our SARS-CoV-2 Vaccine Product Candidate - NT-CoV2-1

Following our May 2020 acquisition of one hundred percent (100%) of the total issued and outstanding common stock of Noachis Terra, Inc. ("Noachis Terra") we are focused on the development and commercialization of a vaccine product candidate to provide long-lasting immunity from the novel Severe Acute Respiratory Syndrome coronavirus ("SARS-CoV-2"), which causes the coronavirus disease 2019 ("COVID-19"). Noachis Terra is a party to a worldwide, nonexclusive intellectual property and biological materials license agreement with the National Institute of Allergy and Infectious Diseases ("NIAID"), an institute within the National Institutes of Health ("NIH"), relating to certain research, patent applications and biological materials involving pre-fusion stabilized coronavirus spike proteins and their use in the development and commercialization of a vaccine to provide specific, long lasting immunity from SARS-CoV-2. Since the acquisition we have conducted testing in animal models, including SARS-CoV-2 challenge studies in hamsters, using specific formulations for intramuscular administration (our Terra CoV-2 vaccine candidate) and intranasal administration (our NT-CoV2-1 vaccine candidate), both based on the NIAID pre-fusion stabilized spike protein antigens. Following consideration of a number of factors, including but not limited to the competitive landscape, we determined to bring the intranasal vaccine candidate NT-CoV2-1, into further development due to the greater differentiation versus current COVID-19 vaccines and the potential benefits of intranasal over intramuscular administration. We believe these benefits could include a higher reduction of transmission of SARS-CoV-2 and would offer a needle-free delivery option. We therefore are currently focusing our development efforts on our more highly differentiated NT-CoV2-1 vaccine candidate.

Coronaviruses are a family of viruses that can lead to upper-respiratory infections in humans. Recent clinical reports also suggest that the SARS-CoV-2 virus can affect other body-systems, including the nervous, cardiovascular, gastrointestinal and renal systems. Among the recent iterations of coronaviruses to move from animal to human carriers is SARS-CoV-2 (often referred to as COVID-19), which, beginning in Wuhan, China, in late 2019, caused a global pandemic due to its rapid spread and the relatively high mortality rate (as compared to the seasonal influenza). In late January of 2022, the World Health Organization's estimates indicate the number of worldwide COVID-19 infections have exceeded 365 million and the number of deaths directly attributed to COVID-19 have exceeded 5.6 million. Pfizer/-BioNTech received FDA approval for their COVID-19 vaccines in August of 2021 and the Moderna vaccine in January 2022. The Janssen vaccine is currently available in the United States under Emergency Use Authorizations ("EUA") by the FDA. We believe given the size of the worldwide pandemic that even with additional vaccines projected to be available in the months ahead, there will be demand for the highly differentiated NT-CoV2-1 vaccine, once development is successfully completed. We intend to combine the research, patent applications and biological materials covered by our NIAID license with our existing clinical research and manufacturing capabilities to respond rapidly to this ongoing, global, public health crisis. We believe our NT-CoV2-1 vaccine holds the possibility of playing an important role in addressing this crisis.

Coronaviruses, such as SARS-CoV-2, possess signature protein spikes on their outer capsule. The NIAID license covers patents and data on a vaccine candidate that were created based on a stabilized pre-fusion spike trimeric protein. By stabilizing the spike protein in the pre-fusion state, the number of immunogenic centers is increased thereby allowing for a greater likelihood of successful antibody binding, resulting in an improved immunogenic response. The genetic code, acquired from the NIH, for the stabilized pre-fusion spike protein was provided to Aragen Bioscience, Inc. ("Aragen") for the purpose of insertion of the spike protein gene sequence into a Chinese Hamster Ovary ("CHO") cell line. Aragen is a leading contract research organization focused on accelerating pre-clinical biologics product development, has extensive experience building CHO cell lines for recombinant proteins, such as monoclonal antibodies. Aragen has successfully inserted the NIH pre-fusion spike protein gene sequence into a CHO cell line and is currently developing both the analytical tests and identifying preliminary cell line growth conditions to optimize the spike protein titers. Currently, "mini-pool" production and analytical development is underway. The process to transfer to full-scale manufacture has begun.

The NIH's pre-clinical study shows that this spike protein, adjuvanted with the mouse specific TLR-4-agonist Sigma Adjuvant System ("SAS", a TLR-4 agonist) that induces T cell activation), generates neutralizing antibody titers in both a pseudovirus neutralization assay and a plaque reduction neutralization titer (PRNT) assay. Recently released information indicated that pretreatment of mice with the NIH-created COVID-19 spike protein in combination with the SAA adjuvant completely inhibited viral growth in the nasal cavities and lungs of infected animals compared to unvaccinated control animals. In October 2020, we received feedback to our Type B Pre-IND Meeting Request from the FDA. The response indicated that the FDA broadly supported our planned approach to the pre-clinical program that would support the clinical development of the Terra CoV-2 vaccine. Due to our focus on our intranasal vaccine product we expect to meet with the FDA in connection with our IND filing.

We also entered into a material transfer agreement with Biodextris Inc. for the use of three intranasal mucosal adjuvants in our Terra CoV-2 and NT-CoV2-1 vaccine candidates.

BDX100, BDX300 and BDX301 are proteosome-based adjuvants comprised of proteins and lipopolysaccharides with improved attributes including enhanced immune response, manufacturing efficiency and the benefits of intranasal vaccine administration. The agreement allows for the future collaboration regarding the intranasal delivery of vaccine during clinical development with the opportunity to enter into a commercial agreement upon regulatory approval of the intranasal vaccine.

The NT-CoV2-1 vaccine containing Inspirevax's intranasal mucosal adjuvant BDX301 has been studied in pre-clinical animal studies, including hamster viral challenge studies and mouse immunogenicity studies. A rabbit toxicology study has been initiated and is required for regulatory approval prior to the Phase 1 clinical study. We believe the NT-CoV2-1 vaccine has the potential to lead to a higher reduction of transmission of SARS-CoV-2 and offers a needle-free delivery option. This vaccine could also permit cost effective storage and distribution at refrigerated temperatures, which should facilitate distribution.

On July 26, 2021, we entered into a licensing agreement with the NRC that enables us to pursue the rapid development of next-generation vaccines against the SARS-CoV-2 virus and its variants. The license was subsequently extended to include the Omicron variant. In addition, we broadened the non-exclusive field of use to include all diseases caused by coronaviruses and any genetic variants thereof. The NRC technologies, in combination with the U.S. NIH elements found in our NT-CoV2-1 vaccine candidates, provide us with a platform that can generate cell lines for high-yield production of spike protein antigens for existing and emerging variants of concern. This platform should allow production of cell lines within six to eight weeks of spike gene sequence availability, compared with six to nine months for traditional production of such cell lines. The NRC technologies, developed with support from the NRC's Pandemic Response Challenge Program, are expected to expedite the evaluation of SARS-CoV-2 antigen candidates in pre-clinical and clinical studies.

We began pre-clinical studies in June of 2021 through our collaboration and material transfer agreement with the NRC. We initiated an immunogenicity study in mice to evaluate several adjuvant candidates. On August 30, 2021, we announced the successful completion of these mouse immunogenicity studies that supported further development using either the intramuscular or intranasal routes of administration. A hamster challenge study was initiated in September of 2021 to assess inhibition of viral replication using adjuvants specific for intramuscular and intranasal administration. In December of 2021, we announced that both formulations generated robust immune responses and reduced the SARS-CoV-2 viral loads to undetectable levels in the nasal passages and lungs five days following a viral challenge. By contrast, hamsters in the control groups that had received saline or adjuvants alone had no detectable immune response and substantial viral loads. The vaccines delivered by intranasal and intramuscular routes generated immune responses as measured by multiple assays.

Through assessment of a variety of factors including evolving variants and available vaccines in use, we have determined to focus our development efforts on the intranasal delivery of our vaccine product candidate, NT-CoV2-1, which is more highly differentiated than the currently available and late-stage COVID-19 vaccines. As a result, we expect to file an IND application with the FDA in the third quarter of 2022 and immediately upon receipt of approval from the FDA to commence a Phase 1 clinical study with NT-CoV2-1, the protocol for which is currently under development.

We expect to use our currently available cash resources to continue to advance the development of NT-CoV2-1 through IND-enabling studies, including immunogenicity, viral challenge studies, toxicology studies, and the Phase 1 trial with further clinical development being contingent upon the receipt of additional funding, including non-dilutive government grant funding which we continue to pursue or partnering or out-licensing opportunities.

Our Antibiotic Product Candidate - Oragenics Derived Compound (ODC-x)

Members of our scientific team discovered that a certain bacterial strain of*Streptococcus mutans,* produces Mutacin 1140 (MU1140), a molecule belonging to the novel class of antibiotics known as lantibiotics. Lantibiotics, such as MU1140, are highly modified peptide antibiotics made by a small group of Gram-positive bacterial species. Over 60 lantibiotics have been discovered, to date. We believe lantibiotics are generally recognized by the scientific community to be potent antibiotic agents.

In nonclinical testing, MU1140 has shown activity against all Gram-positive bacteria against which it has been tested, including those responsible for a number of healthcare associated infections, or HAIs. A high percentage of hospital-acquired infections are caused by highly antibiotic-resistant bacteria such as methicillin-resistant Staphylococcus aureus (MRSA) or multidrug-resistant Gram-negative bacteria. We believe the need for novel antibiotics is increasing as a result of the growing resistance of target pathogens to existing FDA approved antibiotics on the market.

Lantibiotics have been difficult to investigate for their clinical usefulness as therapeutic agents in the treatment of infectious diseases due to a general inability to produce or synthesize sufficient quantities of pure amounts of these molecules. Traditional fermentation methods can only produce minute amounts of the lantibiotic.

In June 2012, we entered into a worldwide exclusive channel collaboration agreement with Precigen, Inc (formerly known as Intrexon Corporation), ILH Holdings, Inc. (n/k/a Eleszto Genetika, Inc. ("EGI"), for the development and commercialization of the native strain of MU1140 and related homologs to use its advanced transgene and cell engineering platforms. In September of 2021, we and EGI, mutually terminated the amended and restated worldwide exclusive channel collaboration agreement dated March 1, 2021 (the "Lantibiotic ECC") pursuant to which we were pursuing the development of OG716 as a lead product candidate for the treatment of *C. diff*. As a result of the mutual termination of the Lantibiotic ECC, we ceased pre-clinical development of our product candidate OG716 and other compounds covered by the Lantibiotic ECC, all licenses provided pursuant to the Lantibiotic ECC between the parties were terminated and there are no continuing obligations between the parties, except as to confidentiality. We made no payments to EGI in connection with the mutual termination. Each party retained all right and title to their own respective intellectual property. The termination of the Lantibiotic ECC was to enable us to focus on our continuing independent research and development efforts relative to lantibiotics in order to identify new compounds to pursue.

The timing of the filing of an IND regarding any future lantibiotic candidate is subject to our having sufficient available human, material and financing capital, which includes research subjects, both animal and human, given all of our anticipated needs and expected requirements in connection with our ongoing research and development initiatives. We expect to continue to advance our lantibiotics program to an IND filing based on the availability of both human and financial capital. Based upon the current funding we expect to continue to focus on the identification of new potential product lantibiotic candidates, efficient and cost-effective improvements in the manufacturing processes and pre-clinical studies required to support a first in human Phase 1 clinical study.

We recently announced that we were awarded a small business innovation research grant in the amount of $250,000 ("Computer-aided Design for Improved Lantibiotics", R41GM136034) for the Company's continued research and development of lantibiotics, including its collaborative program with the Biomolecular Sciences Institute at Florida International University (FIU). The grant provides the Company with funding to develop novel lantibiotics for the treatment of ESKAPE pathogens (defined as *Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter spp.*).

Product Candidates.

Through our wholly-owned subsidiary, Noachis Terra, we began the research and development stage for our new Terra CoV-2 and NT-CoV2-1 vaccine product candidate. We hold a nonexclusive, worldwide intellectual property license agreement for certain research, patent applications and biological materials relating to the use of pre-fusion coronavirus spike proteins for the development and commercialization of a vaccine against SARS-CoV-2.

Additionally, we are developing semi-synthetic lantibiotic analogs that may be effective against systemic Gram-positive multidrug infections, and analogs that may be effective in treating Gram-negative infections. We seek to protect our product candidates through patents and patent applications pursuant to the terms of our license agreements.

Product/Candidate	Description	Application	Status
NT-CoV2-1	Intranasal vaccine candidate (plasmid + adjuvant) to provide long lasting immunity against SARS-CoV-2	Broad, community-based vaccine immunity against SARS-CoV-2	Pre-clinical
Terra CoV-2	Intramuscular vaccine candidate (plasmid + adjuvant) to provide long lasting immunity against SARS-CoV-2	Broad, community-based vaccine immunity against SARS-CoV-2	Pre-clinical
Antibiotics	Semi-synthetic analogs of MU1140: Member of lantibiotic class of antibiotics	Healthcare-associated infections	Pre-clinical

Recent Developments

On February 25, 2022 we held our annual meeting of shareholders for 2020 at which time our shareholders approved: (i) the adoption of an amendment to our Amended and Restated Articles of Incorporation to provide for a reduced quorum requirement of one-third (1/3) of shares entitled to vote represented in person or by a proxy, in order to constitute a meeting of shareholders; (ii) the adoption of an amendment to our Amended and Restated Articles of Incorporation which increased the number of authorized shares of our Common Stock from 200,000,000 shares of Common Stock to 250,000,000 shares of Common Stock; and (iii) the adoption of our new 2021 Equity Incentive Plan.

On February 3, 2022 we amended our NRC license agreement to expand the non-exclusive field of use to include all diseases caused by coronaviruses and any genetic variant thereof.

Our Business Development Strategy

Success in the biopharmaceutical and product development industry relies on the continuous development of novel product candidates. The large majority of product candidates do not make it past all clinical trials which forces companies to look externally for innovation.

Accordingly, we expect from, time to time, to seek strategic opportunities through various forms of business development, which can include strategic alliances, licensing deals, joint ventures, collaborations, equity or debt-based investments, dispositions, mergers and acquisitions. We view these business development activities as a necessary component of our strategies, and we seek to enhance shareholder value by evaluating business development opportunities both within and complementary to our current business as well as new and separate from the development of our existing product candidates due to the experience we are acquiring.

Financial Overview

Grant Revenue

The Company was awarded a small business innovation research grant during the third quarter of 2021in the amount of $250,000 (“Computer-aided Design for Improved Lantibiotics” R41GM136034) for the Company’s continued research and development of lantibiotics, including its collaborative program with the Biomolecular Sciences Institute at FIU. The Company recognizes grant revenue as reimbursable grant costs are incurred up to the pre-approved award limits within the budget period. The costs associated with these reimbursements are reflected as a component of research and development expenses in the accompanying consolidated statement of operations.

Research and Development Expenses

Research and development consist of expenses incurred in connection with the discovery and development of our product candidates. These expenses consist primarily of employee-related expenses, which include salaries and benefits and attending science conferences; expenses incurred under our license agreements with third parties and under other agreements with contract research organizations, investigative sites and consultants that conduct our clinical trials and a substantial portion of our nonclinical studies; the cost of acquiring and manufacturing clinical trial materials; facilities, depreciation and other allocated expenses, which include direct and allocated expenses for rent and maintenance of facilities and equipment, and depreciation of fixed assets; license fees, for and milestone payments related to, in-licensed products and technology; stock-based compensation expense; and costs associated with nonclinical activities and regulatory approvals. We expense research and development costs as incurred.

Our research and development expenses can be divided into (i) clinical research, and (ii) nonclinical research and development activities and (iii) manufacturing process development and analytical testing procedure development. Clinical research costs consist of clinical trials, manufacturing services, regulatory activities and related personnel costs, and other costs such as rent, utilities, depreciation and stock-based compensation. Nonclinical research and development costs consist of our research activities, nonclinical studies, related personnel costs and laboratory supplies, and other costs such as rent, utilities, depreciation and stock-based compensation and research expenses we incur associated with the development of our product candidates. While we are currently focused on advancing our product development programs, our future research and development expenses will depend on the clinical success of our product candidates, as well as ongoing assessments of each product candidate’s commercial potential. In addition, we cannot forecast with any degree of certainty which product candidates may be subject to future collaborations, when such arrangements will be secured, if at all, and to what degree such arrangements would affect our development plans, research expenses and capital requirements.

Our research and development expenses were $10,586,144 and $22,107,563 for the years ended December 31, 2021 and 2020, respectively.

Our current product development strategy contemplates an expected increase in our research and development expenses in the future as we continue the advancement of our product development programs for our vaccine and lantibiotic product candidates, with greater near-term emphasis on our vaccine product candidate. The lengthy process of completing clinical trials; seeking regulatory approval for our product candidates; and expanding the potential claims we are able to make, requires expenditure of substantial resources. Any failure or delay in completing clinical trials, or in obtaining regulatory approvals, could cause a delay in generating product revenues and cause our research and development expenses to increase and, in turn, have a material adverse effect on our operations. Our current product candidates are not expected to be commercially available until we are able to obtain regulatory approval from the FDA.

Our plan is to budget and manage expenditures in research and development such that they are undertaken in a cost-effective manner yet still advance the research and development efforts. While we have some control under our Lantibiotic program and the License Agreements as to the planning and timing of our research and development and therefore the timing of when expenditures may be incurred for various phases of agreed upon projects, actual expenditures can vary from period to period. Subject to available capital, we expect overall research and development expenses to increase as a result of our vaccine product candidate and as our financial resources permit. Our research and development projects are currently expected to be taken to the point where they can be licensed or partnered with larger pharmaceutical companies.

General and Administrative Expenses

General and administrative expenses consist principally of salaries and related costs for personnel in executive, finance, business development, marketing, information technology, legal and human resources functions. Other general and administrative expenses include facility costs not otherwise included in research and development expenses, patent filing, and professional fees for legal, consulting, auditing and tax services.
We anticipate that our general and administrative expenses may remain flat, but be subject to variability for, among others, the following reasons:

- to support our research and development activities, which, subject to available capital, we expect to expand as we continue the development of our product candidates;

- the efforts we undertake from, time to time, to raise additional capital; and

- the increased payroll, and stock-based compensation, expanded infrastructure and consulting, legal, accounting and investor relations costs associated with being a public company.

Other Income (Expense)

Other income (expense) includes local business taxes, as well as interest income and expense. Interest income consists of interest earned on our cash and cash equivalents. The primary objective of our investment policy is capital preservation. Interest expense consists primarily of interest and costs associated with our indebtedness.

Income Taxes

At December 31, 2021, the Company has federal and state tax net operating loss carryforwards of $145,260,353. Federal and state tax net operating loss carryforwards generated prior to December 31, 2017 will expire through 2037 and are not subject to taxable income limitations. Federal tax net operating loss carryforwards generated subsequent to December 31, 2017, do not expire but are subject to taxable income limitation pursuant to the Tax Cuts and Jobs Act that was enacted on December 22, 2017. State of Pennsylvania tax net operating loss carryforwards will expire through 2036. The Company also has federal research and development tax credit carryforwards of $4,027,180. The federal tax credit carryforward will expire beginning in 2021 and continuing through 2041 unless previously utilized.

Utilization of net operating loss carryforwards and research and development credit carryforwards may be subject to a substantial annual limitation due to ownership change limitations that may have occurred or, could occur in the future in accordance with Section 382 of the Internal Revenue Code of 1986 ("IRC Section 382") and with Section 383 of the Internal Revenue Code of 1986, as well as similar state provisions. These ownership changes may limit the amount of net operating loss carryforwards and research and development credit carryforwards that can be utilized annually to offset future taxable income and taxes, respectively. In general, an ownership change, as defined by IRC Section 382, results from transactions increasing the ownership of certain stockholders or public groups in the stock of a corporation by more than 50 percentage points over a three-year period. The Company has completed several financings since its inception, as well as the recent acquisition of Noachis Terra, which may result in a change in ownership as defined by IRC Section 382, or could result in a change in control in the future. In each period since our inception, we have recorded a 100% valuation allowance for the full amount of our deferred tax asset, as the realization of the deferred tax asset is uncertain. As a result, we have not recorded any federal tax benefit in our statements of operations.

On December 22, 2017, the Jobs Act was enacted, which reforms corporate tax legislation in the United States and related laws. Any change in the Company's reasonable estimates of the impact of the Jobs Act will be included in the reporting period in which the change is identified in accordance with SAB Topic 5 EE.

At December 31, 2021 and 2020, we recorded a 100% valuation allowance against our deferred tax assets of approximately $37,452,000 and $36,580,000, respectively, as our management believes it is uncertain that they will be fully realized. If we determine in the future that we will be able to realize all or a portion of our net operating loss carryforwards, an adjustment to our net operating loss carryforwards would increase net income in the period in which we make such a determination.

Critical Accounting Estimates and Policies

Our discussion and analysis of our financial condition and results of operations are based upon our financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States ("US GAAP"). The preparation of financial statements in accordance with US GAAP requires us to make estimates and assumptions that affect reported amounts and related disclosures. There are certain critical estimates that we believe require significant judgment in the preparation of our financial statements. We consider an accounting estimate to be critical if:

- It requires us to make an assumption because information was not available at the time or it included matters that were highly uncertain at the time, we were making the estimate; and

- Changes in the estimate or different estimates that we could have selected may have had a material impact on our financial condition or results of operations.

The principal areas of estimation reflected in the consolidated financial statements are stock-based compensation, and valuation of warrants.

Stock-Based Payment Arrangements

Generally, all forms of stock-based payments, including stock option grants and warrants are measured at their fair value on the awards' grant date typically using a Black-Scholes pricing model. Stock-based compensation awards issued to non-employees for services rendered are recorded at the fair value of the stock-based payment. The expense resulting from stock-based payments are recorded in research and development expense or general and administrative expense in the statement of operations, depending on the nature of the services provided. Stock-based payment expense is recorded over the requisite service period in which the grantee provides services to us. To the extent the stock option grants or warrants do not vest at the grant date they are subject to forfeiture.

Stock-Based Compensation

U.S. Generally Accepted Accounting Principles ("US GAAP") requires all share-based payments to employees, including grants of employee stock options, to be recognized in the financial statements based on their fair values as of the grant date. Stock-based compensation expense is recorded over the requisite service period in which the grantee provides services to us, to the extent the options do not vest at the grant date and are subject to forfeiture. For performance-based awards that do not include market-based conditions, we record share-based compensation expense only when the performance-based milestone is deemed probable of achievement. We utilize both quantitative and qualitative criteria to judge whether milestones are probable of achievement. For awards with market-based performance conditions, we recognize the grant-date fair value of the award over the derived service period regardless of whether the underlying performance condition is met. We account for forfeitures of stock-based awards as a component of compensation expense as the forfeitures occur.

Warrants

The Company used the Black Scholes Option Pricing Model in calculating the relative fair value of any warrants that have been issued.

New Accounting Pronouncements

There are no additional accounting pronouncements issued or effective during the twelve months ended December 31, 2021 that have had or are expected to have an impact on our financial statements.

Recently Adopted Accounting Pronouncements

Income Taxes

In December 2019, the FASB issued ASU No. 2019-12, "Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes ("ASU 2019-12"), which is intended to simplify various aspects related to accounting for income taxes. ASU 2019-12 removes certain exceptions to the general principles in Topic 740 and also clarifies and amends existing guidance to improve consistent application. This guidance is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2020, with early adoption permitted. The Company's adoption of the provisions of ASU No. 2019-12, did not have an impact on its consolidated financial statements and related disclosures.

Results of Operations:

	Year Ended December 31,			
	2021	2020	Increase/Decrease	Percentage
Grant revenue	$ 86,987	$ —	$ 86,987	100.00%
Operating expenses:				
Research, and development	10,586,144	22,107,563	(11,521,419)	-52.12%
General and administrative	5,271,861	4,533,893	737,968	16.28%
Total operating expenses	15,858,005	26,641,456	(10,783,451)	-40.48%
Loss from continuing operations	(15,771,018)	(26,641,456)	10,870,438	-40.80%
Other income (expense):				
Interest income	75,847	89,294	(13,447)	-15.06%
Interest expense	(15,756)	(10,685)	(5,071)	47.46%
Local business tax	(1,357)	(2,400)	1,043	-43.46%
Other income	670	1,795	(1,125)	-62.67%
Forgiveness of Paycheck Protection Program loan and accrued interest	-	132,753	(132,753)	N/A
Total other income (expense), net	59,404	210,757	(151,353)	-71.81%
Loss from continuing operations before income taxes	(15,711,614)	(26,430,699)	10,719,085	-40.56%
Income tax benefit	—	—	—	0.00%
Net loss from continuing operations	$ (15,711,614)	$ (26,430,699)	$ 10,719,085	-40.56%

For the Years Ended December 31, 2021 and 2020

Grant Revenue. We recorded grant revenue of $86,987 for the year ended December 31, 2021 compared to $-0- for the year ended December 31, 2020; an increase of $86,987, or 100.0%. This increase was attributable to the award of a small business innovation research grant.

Research and Development. Research and development expenses were $10,586,144 for the year ended December 31, 2021 compared to $22,107,563 for the year ended December 31, 2020; a decrease of $11,521,419, or 52.1%. This decrease was primarily due to the acquisition of Noachis Terra, Inc. in 2020 which was accounted for as in process R&D expenses and decreases in costs associated with our clinical trial work related to our oral mucositis product candidate under our ECC, reduction in costs associated with contingent consideration, salaries and salary related costs, and our lantibiotic ECC, of $9,955,699, $5,259,901, $678,517, $200,021 and $175,425, respectively. These decreases were partially offset by an increase in costs associated with the advancement of our Terra CoV-2 and NT-CoV2-1 vaccine programs of $4,790,276.

General and Administrative. General and administrative expenses were $5,271,861 for the year ended December 31, 2021 compared to $4,533,893 for the year ended December 31, 2020; an increase of $737,968, or 16.3%. This increase was primarily due to increases in non-employee stock-based compensation, filing fees, board fees, and insurance costs of $439,188, $402,587, $215,749, and $205,523, respectively. These increases were partially offset by decreases in salary and salary related costs and consulting costs of $446,773, and $69,778, respectively.

Other Income (Expense). Other income (expense) was $59,404 for the year ended December 31, 2021 compared to $210,757 for the year ended December 31, 2020; a net change of $151,353. The net change was primarily attributable to the forgiveness of the Payroll Protection Plan loan and accrued interest of $132,753 which occurred in 2020, a decrease in interest income, and an increase in interest expense of $132,753, $13,447, and $5,071, respectively.

Liquidity and Capital Resources

Since our inception, we have funded our operations primarily through the sale of equity securities in our initial public offering, the sale of equity securities and warrants in private and public offerings, debt financing, warrant exercises and grants. As of December 31, 2021, we had an accumulated deficit of $(171,274,128) and we have yet to achieve profitability. We incurred net losses of $(15,711,614) and $(26,430,699) for the years ended December 31, 2021 and 2020, respectively. We expect to incur significant and increasing operating losses for the foreseeable future as we seek to advance our product candidates through nonclinical testing and clinical trials to ultimately obtain regulatory approval and eventual commercialization. We will need to raise additional capital to fund our operations. We anticipate that our cash resources as of December 31, 2021, will be sufficient to fund our operations as presently structured through the end of 2022. There can be no assurance that additional capital will be available to us on acceptable terms, if at all. Adequate additional funding may not be available to us on acceptable terms, or at all. We expect that research and development expenses will increase along with general and administrative costs, as we grow and operate our business. The following table sets forth the primary sources and uses of cash for each of the periods indicated:

	Years ended December 31,	
	2021	2020
Net cash used in operating activities	$ (13,470,212)	$ (16,952,864)
Net cash used by investing activities	(43,876)	—
Net cash provided by financing activities	23,140,216	16,324,445
Net decrease in cash and cash equivalents	$ 9,626,128	$ (628,419)

During the years ended December 31, 2021 and 2020, our operating cash flows from operations used cash of $(13,470,212) and $(16,952,864), respectively. The use of cash in all periods primarily resulted from our net losses adjusted for non-cash items and changes in operating assets and liabilities. We had working capital surplus of $26,262,129 and $16,640,534 as of December 31, 2021 and 2020, respectively.

Additional details of our financing activities for the periods reflected in this report are provided below:

Financings

The May 2017 Series A Preferred Stock Financing

On May 10, 2017 we entered into a securities purchase agreement with three accredited investors, to purchase up to $3,000,000 of Series A Convertible Preferred Stock (the "Series A Preferred Stock Financing"). The sale of the Preferred Stock took place in two separate closings and at the first closing which occurred on May 10, 2017, we received gross proceeds of approximately $1,302,000. The second closing occurred on July 25, 2017 and we received gross proceeds of approximately $1,698,000, which was the balance of the Preferred Stock Financing. The full $3,000,000 of Preferred Stock, and after giving effect to the reverse stock split, is convertible into one million two hundred thousand shares of our Common Stock, based on a fixed conversion price of $2.50 per share on an as-converted basis. In addition, and after giving effect to the reverse stock split, we issued warrants to purchase an aggregate of 462,106 shares of Common Stock at the first closing and we issued an aggregate of 602,414 shares of Common Stock at the second closing. The warrants have a term of seven years from the date of issuance are non-exercisable until 6 months after issuance, have an exercise price of $3.10 per share. Proceeds from the Series A Preferred Stock Financing (including the exercise of any warrants for cash) was used for general corporate purposes, including working capital.

On July 27, 2017, we entered into an agreement to amend the warrants issued in connection with the Series A Preferred Stock Financing to provide notification and objection requirements with respect to the change of control provisions. The change of control provisions in the warrants had previously caused the warrants to be treated as a derivative liability as opposed to being treated as equity on our balance sheet. The warrants have been replaced by amended and restated warrants containing such notification and objection requirements (the "Amended and Restated Common Stock Purchase Warrants") so that the Amended and Restated Common Stock Purchase Warrants are now treated as equity on our balance sheet. All other terms of the original warrants remain unchanged by the Amended and Restated Common Stock Purchase Warrants.

In connection with the Series A Preferred Financing, we filed a Certificate of Designations of Preferences, Rights and Limitations of Series A Preferred Stock with the Secretary of State of the State of Florida, effective May 10, 2017. The number of shares of Preferred Stock designated as Series A Preferred Stock was 12,000,000.

In connection with the issuance and sale of the Series A Preferred Stock and common stock warrants that were issued commensurate with the issuance of the Series A Preferred Stock, we granted certain demand registration rights and piggyback registration rights with respect to the shares of our Common Stock issuable upon conversion of the Preferred Stock and exercise of the Warrants, pursuant to a Registration Rights Agreement.

Except as otherwise required by law, the Series A Preferred Stock have no voting rights. However, as long as any shares of Series A Preferred Stock are outstanding, we shall not, without the affirmative vote of the holders of a majority of the then outstanding shares of the Series A Preferred Stock, (a) alter or change adversely the powers, preferences or rights given to the Series A Preferred Stock or alter or amend the Certificate of Designation, (b) amend its articles of incorporation or other charter documents in any manner that adversely affects any rights of the holders of Series A Preferred Stock, (c) increase the number of authorized shares of Series A Preferred Stock, or (d) enter into any agreement with respect to any of the foregoing. Upon any liquidation, dissolution or winding-up by us, whether voluntary or involuntary that is not a Fundamental Transaction (as defined in the Certificate of Designation), the holders of Series A Preferred Stock shall be entitled to receive out of the assets, the greater of (i) the product of the number of shares of Series A Preferred Stock then held by such holder, multiplied by the Original Issue Price; and (ii) the amount that would be payable to such holder in the Liquidation in respect of Common Stock issuable upon conversion of such shares of Series A Preferred Stock if all outstanding shares of Series A Preferred Stock were converted into Common Stock immediately prior to the Liquidation. The Series A Preferred Stock is classified as permanent equity.

The November 2017 Series B Preferred Stock Financing

On November 8, 2017, we completed a private placement of $3,300,000 of Series B Non-Voting, Convertible Preferred Stock (the "Series B Convertible Preferred Stock") pursuant to a Securities Purchase Agreement with four existing shareholders who are accredited investors including an entity affiliated with a director of the Company (the "Series B Preferred Stock Financing").

The full $3,300,000 of Series B Convertible Preferred Stock is convertible, after giving effect to the reverse stock split into one million three hundred and twenty thousand shares of our Common Stock, based on a conversion of one share of Series B Preferred Stock into two shares of Common Stock. The purchase price per share of the Series B Preferred Stock is represented by $2.50 per share of the Common Stock on an as converted basis. In addition, and after giving effect to the reverse stock split, we issued to the investors in the private placement accompanying common stock purchase warrants to purchase an aggregate of 1,064,518 shares of Common Stock. The warrants have a term of seven years from the date of issuance, and are non-exercisable until six (6) months after issuance, and after giving effect to the reverse stock split, have an exercise price of $3.10 per share.

In connection with the Series B Preferred Financing, we filed a Certificate of Designation and Rights of Series B Convertible Preferred Stock with the Secretary of State of the State of Florida, effective November 8, 2017. The number of shares of Preferred Stock designated as Series B Preferred Stock was 6,600,000.

Except as otherwise required by law, the Series B Preferred Stock have no voting rights. However, as long as any shares of Series B Preferred Stock are outstanding, we shall not, without the affirmative vote of the holders of a majority of the then outstanding shares of the Series B Preferred Stock, (a) alter or change adversely the powers, preferences or rights given to the Series B Preferred Stock or alter or amend the Certificate of Designation, (b) amend its articles of incorporation or other charter documents in any manner that adversely affects any rights of the holders of Series B Preferred Stock, (c) increase the number of authorized shares of Series B Preferred Stock, or (d) enter into any agreement with respect to any of the foregoing.

The Series B Preferred Stock shall rank (i) on par with the Common Stock and Series A Preferred Stock and junior to Series C Preferred Stock as to dividend rights and (ii) junior to Series C Preferred Stock, on par with Series A Preferred Stock and senior to the Common Stock as to distribution of assets upon liquidation, dissolution or winding-up by us, whether voluntary or involuntary.

Upon any liquidation, dissolution or winding-up by us, whether voluntary or involuntary, the holders of Series B Preferred Stock shall be entitled to receive out of the assets, after payment to the holders of Series C Preferred Stock but on par with the holders of Series A Preferred Stock and in preference to the holders of the Common Stock, an amount of cash equal to the greater of (i) the product of the number of shares of Series B Preferred Stock then held by such holder, multiplied by the Original Issue Price; and (ii) the amount that would be payable to such holder in the Liquidation in respect of Common Stock issuable upon conversion of such shares of Series B Preferred Stock if all outstanding shares of Series B Preferred Stock were converted into Common Stock immediately prior to the Liquidation. The Series B Preferred Stock is classified as permanent equity.

The Series C Preferred Stock Issuance and Subsequent Redemption

Concurrently with the Series B Preferred Stock Financing, we exchanged the amount owed on an unsecured non-convertible promissory note including accrued interest and trade payables owed by us to the noteholder (collectively the "Debt") in the aggregate amount of approximately $3,400,000 for equity in the form of 100 shares of Series C, Non-Voting, Non-Convertible Preferred Stock (the "Series C Preferred Stock") with a stated value equal to the amount of the Debt. In connection therewith, we filed a Certificate of Designation and Rights of Series C Non-Convertible Preferred Stock with the Secretary of State of the State of Florida, to be effective November 8, 2017. The number of shares of Preferred Stock designated as Series C Preferred Stock is 1,000.

In connection with the Precigen Debt Conversion Agreement, we filed a Certificate of Designation and Rights of Series C Non-Convertible Preferred Stock with the Secretary of State of the State of Florida, to be effective November 8, 2017. The number of shares of Preferred Stock designated as Series C Preferred Stock was 1,000.

On January 25, 2018 we paid a dividend on our Series C Preferred Stock of 1.733 shares of additional Series C Preferred Stock, on January 31, 2019 we paid a dividend on our Series C Preferred Stock of 12.208 shares of additional Series C Preferred Stock and on January 27, 2020 we paid a dividend on our Series C Preferred Stock of 19.542 shares of additional Series C Preferred Stock.

On February 11, 2021, we provided a notice of redemption, to the holder of the Company's Series C Preferred Stock to redeem all outstanding Series C Preferred Stock (which included the dividend of 26.697 shares paid on January 28, 2021 and any accrued dividends due through the redemption date of March 13, 2021). The Series C Preferred Stock redemption amount of approximately $5.6 million was paid on March 15, 2021 and all outstanding shares of Series C Preferred Stock were cancelled.

The April 6, 2018 Registered Direct Offering and Private Placement

On April 6, 2018, we entered into a securities purchase agreement with certain investors pursuant to which issued an aggregate of 900,000 shares of our common stock, par value $0.001 per share, at $2.00 per share. In a concurrent private placement, we issued to the investors who participated in the registered offering, warrants exercisable for one share of common stock for each share purchased in the registered offering for an aggregate of warrants to acquire 900,000 shares of common stock at an exercise price of $2.00 per share. Each warrant is exercisable beginning on the six-month anniversary of the date of its issuance and expires five years from the date of issuance.

The July 17, 2018 Underwritten Public Offering

On July 17, 2018, we closed an underwritten public offering of units for gross proceeds of approximately $13.8 million, which includes the full exercise of the underwriter's over-allotment option to purchase additional shares and warrants, prior to deducting underwriting discounts and commissions and offering expenses payable by us.

The offering was comprised of Class A Units, priced at a public offering price of $1.00 per unit, with each unit consisting of one share of common stock and a seven-year warrant to purchase one share of common stock with an exercise price of $1.00 per share (each, a "Warrant" and collectively, the "Warrants"), and Class B Units, priced at a public offering price of $1.00 per unit, with each unit comprised of one share of series D preferred stock (the "Series D Preferred Stock"), which is convertible into one share of common stock, and a Warrant. The conversion price of the Series D Preferred Stock issued in the transaction as well as the exercise price of the Warrants are fixed and do not contain any variable pricing features or any price based anti-dilutive features. The Series D Preferred Stock issued in this transaction included a beneficial ownership blocker but has no dividend rights (except to the extent that dividends are also paid on the common stock), liquidation preference or other preferences over common stock, and, with certain exceptions, has no voting rights. The securities comprising the units were immediately separable and have been issued separately.

At the closing of our underwritten public offering, a total of 4,436,000 shares of common stock, 9,364,000 shares of Series D Preferred Stock convertible into 9,364,000 shares of common stock, and warrants to acquire 13,800,000 shares of common stock were issued inclusive of the underwriter's exercise of their over-allotment option to purchase 1,800,000 shares of common stock and warrants to acquire 1,800,000 shares of common stock at $1.00 per share.

Since the closing of our underwritten public offering all of the shares of Series D Preferred Stock that were issued have been converted into shares of our common stock in accordance with the terms for conversion and of the warrants issued an aggregate of 10,265,500 Warrants were exercised for cash. In 2018, 9,505,500 shares of Company common stock were issued as a result of the exercise of such Warrants and in 2020, an additional 760,000 shares of Company common stock were issued as a result of the exercise of such Warrants and in 2021 360,000 shares of Company common stock were issued as a result of the exercise of such Warrants. Total proceeds from the exercise of the Warrants are $10,625,500.

The March 25, 2019 Underwritten Public Offering

On March 25, 2019, we announced the closing of an underwritten public offering for gross proceeds of approximately $12.5 million, which included the partial exercise of the underwriter's over-allotment option to purchase additional shares and warrants, prior to deducting underwriting discounts and commissions and offering expenses. The offering was comprised of 16,666,668 shares of common stock, short-term warrants to purchase up to 8,333,334 shares of common stock, and long-term warrants to purchase up to 8,333,334 shares of common stock, at a price to the public of $0.75 per share and accompanying warrants.

In connection with the public offering, we granted the underwriter a 30-day option to purchase up to 2,500,000 additional shares of common stock and/or short-term warrants to purchase 1,250,000 shares of common stock and long-term warrants to purchase 1,250,000 shares of common stock the public offering price, less underwriting discounts and commissions. The underwriter exercised its option to purchase the short-term warrants to purchase 1,250,000 shares of common stock and long-term warrants to purchase 1,250,000 shares of common stock effective as of the closing.

Each short-term warrant had an exercise price of $0.75 per share of common stock, is immediately exercisable, and expired on the earlier of (1) the eighteen-month anniversary of the date of issuance and (2) twenty-one trading days following our release of top-line data related to our Phase 2 double blind, placebo controlled clinical trial of AG013. As a result of our announcement of top-line data on the Phase 2 clinical trial of AG013 on April 15, 2020, the short-term Warrants were subject to expiration on May 14, 2020. On May 14, 2020 9,545,334 of the Company's short-term warrants expired unexercised (exclusive of 38,000 shares previously exercised).

Each long-term warrant has an exercise price of $0.90 per share of common stock, is immediately exercisable and expires five years following the date of issuance.

In 2020, 38,000 shares of Company common stock were issued as a result of the exercise of such short-term warrants and an additional 4,882,114 shares of Company common stock were issued as a result of the exercise of such long-term warrants and in 2021 2,112,573 shares of Company common stock were issued as a result of the exercise of such long-term warrants. Total proceeds from the exercise of the short-term and long-term warrants are $6,323,740.

November 2020 Public Offering.

On November 24, 2020, we closed an underwritten public offering for gross proceeds of approximately $6.0 million, which included the full exercise of the underwriter's over-allotment option to purchase additional shares, prior to deducting underwriting discounts and commissions and offering expenses. The offering was comprised of 14,189,189 shares of common stock at a price to the public of $0.37 per share. We granted the underwriter a 45-day option to purchase up to 2,128,378 additional shares of our common stock at the public offering price, less underwriting discounts and commissions. The underwriter exercised its option in full to purchase 2,128,378 additional shares of common stock, which the indicated gross proceeds reflect. We intend to use the net proceeds of the offering primarily to continue funding our pre-clinical development of our SARS-CoV-2 vaccine candidates, Terra CoV-2 and NT-CoV2-1 and our lantibiotics program and for general corporate purposes, including research and development activities, capital expenditures and working capital. Dr. Frederick Telling who is a Director of the Company, participated in the offering through the purchase of 100,000 shares of the Company's common stock. Dr. Telling's participation was approved by the Company's Audit Committee.

December 2020 Registered Direct Offering.

On December 29, 2020, we closed a registered direct offering for gross proceeds of approximately $6.5 million, prior to deducting underwriting discounts and commissions and offering expenses. The offering was comprised of 14,444,444 shares of common stock at a price to the public of $0.45 per share. We intend to use the net proceeds of the offering primarily to continue funding our pre-clinical development of our SARS-CoV-2 vaccine candidates, Terra CoV-2 and NT-CoV2-1 and our lantibiotics program and for general corporate purposes, including research and development activities, capital expenditures and working capital.

At-the-Market Program **("ATM Program")**

On February 1, 2021, we entered into a Sales Agreement (the "Sales Agreement") with A.G.P./Alliance Global Partners, as sales agent (the "Sales Agent"), pursuant to which we may offer and sell through or to the Sales Agent shares of our Common Stock. During the three months ended March 31, 2021, we issued an aggregate of 21,398,765 shares of Common Stock and received gross proceeds of an aggregate of approximately $27.8 million under our ATM Program. Any Shares offered and sold in the ATM Program were issued pursuant to our universal shelf registration statement on Form S-3 (the "Shelf Registration Statement"). The ATM Program will terminate upon (a) the election of the Agent upon the occurrence of certain adverse events, (b) 10 days' advance notice from one party to the other, or (c) the sale of the balance available under our existing Shelf Registration Statement of approximately $9.6 million. Under the terms of the Sales Agreement, the Sales Agent is entitled to a commission at a fixed rate of 3.0% of the gross proceeds from each sale of shares under the Sales Agreement.

Other Financings

We enter into short term financing arrangements for the payment of our annual insurance premiums for our directors and officers and employment practices insurance.

Directors' and Officers' Insurance

On July 24, 2021, the Company entered into a short-term note payable for $600,169 bearing interest at 5.34% to finance a portion of the directors' and officers' liability insurance and employment practices liability insurance premiums. Principal and interest payments on this note began August 24, 2021 and are made evenly based on a straight-line amortization over a 10-month period with the final payment being due on May 24, 2022.

On August 24, 2020 we entered into a short-term note payable for $413,784 bearing interest at 5.39% to finance a portion of the directors' and officers' liability insurance and employment practices liability insurance premiums. Principal and interest payments on this note began August 24, 2020 and are made evenly based on a straight-line amortization over an 11-month period with the final payment being made on June 28, 2021.

Future Capital Requirements

Our capital requirements for 2022 will depend on numerous factors, including the success of our commercialization efforts and of our research and development, the resources we devote to develop and support our technologies and our success in pursuing strategic licensing and funded product development relationships with external partners. Subject to our ability to raise additional capital including through possible joint ventures and/or partnerships, we expect to incur substantial expenditures to further commercialize or develop our technologies including continued increases in costs related to research, nonclinical testing and clinical trials, as well as costs associated with our capital raising efforts and being a public company. We will require substantial funds to conduct research and development and nonclinical and Phase 1 and Phase 2 clinical testing of our licensed, patented technologies and to develop sublicensing relationships for the Phase 2 and 3 clinical testing and manufacture and marketing of any products that are approved for commercial sale. Our plans include seeking both equity and debt financing, alliances or other partnership agreements with entities interested in our technologies, or other business transactions that would generate sufficient resources to ensure continuation of our operations and research and development programs.

Our current available cash and cash equivalents, provide us with limited liquidity. We believe our existing cash and cash equivalents, will allow us to fund our operating plan through the fourth quarter of 2022. We expect to continue to seek additional funding for our operations. Any such required additional capital may not be available on reasonable terms, if at all. If we were unable to obtain additional financing, we may be required to reduce the scope of, delay or eliminate some or all of our planned clinical testing, research and development and commercialization activities, which could harm our business. The sale of additional equity or debt securities may result in additional dilution to our shareholders. If we raise additional funds through the issuance of debt securities or preferred stock, these securities could have rights senior to those of our common stock and could contain covenants that would restrict our operations. We also will require additional capital beyond our currently forecasted amounts. For example, as we continue to work on the development of our product candidates and enter into third party agreements in connection therewith, we will require additional capital.

Because of the numerous risks and uncertainties associated with research, development and commercialization of our product candidates, we are unable to estimate the exact amounts of our working capital requirements. Our future funding requirements will depend on many factors, including, but not limited to:

- conduct pre-clinical research for our NT-CoV2-1 vaccine product candidate, file an IND with the FDA and, if approved, engage in Phase 1 clinical trials;
- identifying and securing clinical sites for the conduct of human trials for our product candidates;
- the determination to redeem all or any portion of our outstanding Series C Preferred Stock;
- the number and characteristics of the product candidates we pursue;
- the scope, progress, results and costs of researching and developing our product candidates, and conducting nonclinical and clinical trials including the research and development expenditures we expect to make in connection with agreements with third parties we put in place to advance our research and development efforts;
- the timing of, and the costs involved in, obtaining regulatory approvals for our product candidates;
- our ability to maintain current research and development licensing agreements and to establish new strategic partnerships, licensing or other arrangements and the financial terms of such agreements;
- our ability to achieve our milestones under our ECC agreement and licensing arrangements and the payment obligations we may have;
- the costs involved in preparing, filing, prosecuting, maintaining, defending and enforcing patent claims, including litigation costs and the outcome of such litigation; and
- the timing, receipt and amount of sales of, or royalties on, our products and future products, if any.

We have based our estimates on assumptions that may prove to be wrong. We may need to obtain additional funds sooner or in greater amounts than we currently anticipate. Potential sources of financing include strategic relationships, public or private sales of our shares or debt and other sources. We may seek to access the public or private equity markets when conditions are favorable due to our long-term capital requirements. We do not have any committed sources of financing at this time, and it is uncertain whether additional funding will be available when we need it on terms that will be acceptable to us, or at all. If we raise funds by selling additional shares of common stock or other securities convertible into common stock, the ownership interest of our existing stockholders will be diluted. If we are not able to obtain financing when needed, we may be

unable to carry out our business plan. As a result, we may have to significantly limit our operations and our business, financial condition and results of operations would be materially harmed.

Off-Balance Sheet Arrangements

We have no off-balance sheet arrangements.

Tax Loss and Credit Carryforwards

At December 31, 2021, the Company has federal and state tax net operating loss carryforwards of $145,260,353. Federal and state tax net operating loss carryforwards generated prior to December 31, 2017 will expire through 2037 and are not subject to taxable income limitations. Federal tax net operating loss carryforwards generated subsequent to December 31, 2017, do not expire but are subject to taxable income limitation pursuant to the Tax Cuts and Jobs Act that was enacted on December 22, 2017. State of Pennsylvania tax net operating loss carryforwards will expire through 2036. The Company also has federal research and development tax credit carryforwards of $4,027,180. The federal tax credit carryforward will expire beginning in 2021 and continuing through 2041 unless previously utilized.

Utilization of net operating loss carryforwards and research and development credit carryforwards may be subject to a substantial annual limitation due to ownership change limitations that may have occurred or, could occur in the future in accordance with Section 382 of the Internal Revenue Code of 1986 ("IRC Section 382") and with Section 383 of the Internal Revenue Code of 1986, as well as similar state provisions. These ownership changes may limit the amount of net operating loss carryforwards and research and development credit carryforwards that can be utilized annually to offset future taxable income and taxes, respectively. In general, an ownership change, as defined by IRC Section 382, results from transactions increasing the ownership of certain stockholders or public groups in the stock of a corporation by more than 50 percentage points over a three-year period. The Company has completed several financings since its inception which may result in a change in ownership as defined by IRC Section 382, or could result in a change in control in the future.

On December 22, 2017, the Jobs Act was enacted, which reforms corporate tax legislation in the United States and related laws. Any change in the Company's reasonable estimates of the impact of the Jobs Act will be included in the reporting period in which the change is identified in accordance with SAB Topic 5 EE.

At December 31, 2021 and 2020, we recorded a 100% valuation allowance against our deferred tax assets of approximately $37,452,000 and $36,580,000, respectively, as our management believes it is uncertain that they will be fully realized. If we determine in the future that we will be able to realize all or a portion of our net operating loss carryforwards, an adjustment to our net operating loss carryforwards would increase net income in the period in which we make such a determination.

Inflation

Inflation affects the cost of raw materials, goods and services that we use. In recent years, inflation has been modest but has recently increased. High energy costs and fluctuations in commodity prices can affect the cost of all raw materials and components. Although we cannot precisely determine the effects of inflation on our business, it is management's belief that the effects on operating results will not be significant. We do not believe that inflation has had a material impact on our results of operations for the periods presented, except with respect to payroll-related costs and other costs arising from or related to government-imposed regulations.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK.

Not applicable.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA.

The Financial Statements are incorporated herein by reference to pages F-1 to F-23 at the end of this report and the supplementary data is not applicable.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE.

Not Applicable.

ITEM 9A. CONTROLS AND PROCEDURES.

Disclosure Controls and Procedures

Management's evaluation of the effectiveness of the Company's disclosure controls and procedures as defined in Rules 13a-15(e) and 15d-15(e) of the Securities Exchange Act was performed under the supervision and participation of our senior management, including our Interim Principal Executive Officer and Chief Financial Officer. The purpose of disclosure controls and procedures is to ensure that information required to be disclosed in the reports filed or submitted under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, and that such information is accumulated and communicated to management, including our Interim Principal Executive Officer and Chief Financial Officer, to allow timely decisions regarding required disclosures. Based upon that evaluation, our Interim Principal Executive Officer and Chief Financial Officer concluded that, as of the end of such period, our disclosure controls and procedures were effective as of December 31, 2021 in ensuring that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported with the time periods specified in the Securities and Exchange Commission's rules and forms. Management believes that, existing controls were effective and operating properly as designed. During 2021, management believes that the Company maintained a consistent and verifiable financial reporting organization and internal control procedures.

Changes in Internal Controls over Financial Reporting

Our management, with the participation of our Interim Principal Executive Officer and Chief Financial Officer, has concluded there were no other significant changes in our internal controls over financial reporting that occurred during our last fiscal quarter that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

As a result of the COVID-19 pandemic, certain employees began working remotely in March 2020. Notwithstanding these changes to the working environment, we have not identified any material changes in our internal control over financial reporting. We will continue to monitor and assess the COVID-19 situation to determine any potential impact on the design and operating effectiveness of our internal controls over financial reporting.

Limitations on the Effectiveness of Controls

Our management, including our Interim Principal Executive Officer and Chief Financial Officer, does not expect that our Disclosure Controls and internal controls will prevent all errors and all fraud. A control system, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control

system are met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within the Company have been detected. These inherent limitations include the realities that judgments in decision-making can be faulty, and that breakdowns can occur because of a simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people, or by management or board override of the control.

The design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with the policies or procedures may deteriorate. Because of the inherent limitations in a cost-effective control system, misstatements due to error or fraud may occur and not be detected.

Chief Executive Officer and Chief Financial Officer Certification

Appearing after the Signatures section of this report there is a Certification of the Interim Principal Executive Officer and the Chief Financial Officer. The Certification is required in accordance with Section 302 of the Sarbanes-Oxley Act of 2002 (the Section 302 Certifications). This Item of this report, which you are currently reading is the information concerning the evaluation referred to in the Section 302 Certification and this information should be read in conjunction with the Section 302 Certification for a more complete understanding of the topics presented.

Management's Report on Internal Control over Financial Reporting

The management of Oragenics, Inc. is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in the Securities Exchange Act Rule 13a-15(f). The Company's internal control over financial reporting is a process designed to provide reasonable assurance to the Company's management and board of directors regarding the reliability of financial reporting and the preparation of the financial statements for external purposes in accordance with accounting principles generally accepted in the United States of America.

The Company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the Company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with accounting principles generally accepted in the United States of America, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the Company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal controls over financial reporting may not prevent or detect misstatements. All internal control systems, no matter how well designed, have inherent limitations, including the possibility of human error and the circumvention of overriding controls. Accordingly, even effective internal control over financial reporting can provide only reasonable assurance with respect to financial statement preparation. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Our management, under the supervision of the Interim Principal Executive Officer and the Chief Financial Officer, assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2021. In making this assessment, it used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) in *Internal Control-Integrated Framework (1992)* as updated in May of 2013, (the "2013 COSO Framework"). We integrated the changes prescribed by the 2013 COSO Framework into our internal controls over financial reporting during the year ending December 31, 2015. We also used SEC guidance on conducting such assessments. Based on our assessment, we believe that, as of December 31, 2021, the Company's internal control over financial reporting was effective.

This annual report does not include an attestation report of our registered public accounting firm regarding internal control over financial reporting. Management's report was not subject to attestation by our registered public accounting firm pursuant to temporary rules of the Securities and Exchange Commission that permit us to provide only management's report in this annual report.

ITEM 9B. OTHER INFORMATION.

None

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISTICTIONS THAT PREVENT INSPECTIONS.

Not Applicable

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE.

Directors and Executive Officers

The following table sets forth the names, ages and titles of the Company's Directors, executive officers, key employees and the position they each hold with the Company.

Name	Age	Position
Dr. Frederick W. Telling, Ph.D.	70	Chairman and Director
Robert C. Koski	63	Director
Charles L. Pope	70	Director
Dr. Alan W. Dunton, M.D.	67	Director
Kimberly M. Murphy	59	Director
Michael Sullivan	65	Interim Principal Executive Officer and Chief Financial Officer, Secretary and Treasurer
Dr. Martin Handfield	51	Senior Vice President Discovery Research

Directors of the Company

Dr. Frederick W. Telling. Dr. Telling was elected Chairman of the Board of Directors on February 4, 2011 and was appointed as Executive Chairman on May 2, 2021 following the resignation of Dr. Joslyn, the Company's former President and Chief Executive Officer. Dr. Telling has served as a Director since June 2010. Dr. Telling retired from Pfizer Inc. in June 2007 after 30 years of service. At Pfizer Dr. Telling served as its Corporate Vice President and Vice President of Corporate Strategic Planning and Policy. Dr. Telling also serves on the boards of various civic and non-profit organizations. Dr. Telling holds a B.A. degree in History and Economics from Hamilton College

and a MA degree in Industrial and Labor Relations and a PhD in Economics and Public Policy from Cornell University.

Dr. Telling brings to our Board an extensive array of business and industry experience as well as experience as a director of public companies.

Charles L. Pope. Mr. Pope has served as a Director since June 2010. Mr. Pope served as the Chief Financial Officer of Palm Bancorp, Inc. from June 2009 to June 2012. From September 2007 through June 2009, Mr. Pope served as the Chief Financial Officer of Aerosonic Inc., a manufacturer of aviation products. Mr. Pope served as the Chief Financial Officer of Reptron Inc., a manufacturer of electronic products, from March 2005 through June 2007. From March 2002 to March 2005, Mr. Pope served as Chief Financial Officer of SRI/Surgical Express, Inc. From February 2001 to March 2002, Mr. Pope served as Chief Financial Officer of Innovaro, Inc. (formerly UTEK Corporation NYSE American: INV) a public company. Mr. Pope currently serves as a director for Trxade Health, Inc. (NASDAQ: MEDS). Mr. Pope served as a director of Innovaro, Inc. from March 2010 to August 2012. Mr. Pope also served as a director of Inuvo, Inc. from July 2008 through July 2018. Prior to this time, Mr. Pope served as a Partner in the Audit and Financial Advisory Consulting Divisions of PricewaterhouseCoopers LLP, and he was also a Partner in the Accounting and SEC Directorate in PricewaterhouseCoopers LLP's New York City office. Mr. Pope holds a B.S. degree in Economics and Accounting from Auburn University and is a Certified Public Accountant in Florida.

Mr. Pope brings to our Board over three decades of experience in the finance and accounting fields. In addition, Mr. Pope also has experience serving as a director of public companies.

Dr. Alan W. Dunton. Dr. Dunton has served as a Director of Oragenics, Inc. since April 2011. He is the principal owner of Danerius, LLC, a biotechnology consulting company which he founded in 2006. In addition to Oragenics, he is currently a Director of the public biotechnology company, Palatin, Inc. (AMEX: PTN), CorMedix (NASDAQ: CRMD) and Recce Pharmaceuticals (ASX: RCE). Dr. Dunton has held significant senior positions in major pharmaceutical companies. Most recent was from November 2015 through March 2018 as the Senior Vice President of Research, Development and Regulatory Affairs of Purdue Pharma L.P., a private pharmaceutical company. From January 2007 until March 2009, Dr. Dunton served as President and Chief Executive Officer of Panacos Pharmaceuticals, Inc. In 2005, Dr. Dunton served as the Non-Executive Chairman of the Board of Directors of ActivBiotics, Inc., a private biopharmaceutical company. Previously, he was the President and Chief Executive Officer of Metaphore Pharmaceuticals, Inc. from 2003 until 2006, when it merged with ActivBiotics. From 2004 until 2005, Dr. Dunton served as a member of the board of directors of Vicuron Pharmaceuticals until it was acquired by Pfizer, Inc. In 2002, Dr. Dunton served as President, Chief Operating Officer and a director of Emisphere Technologies, Inc., a biopharmaceutical company. From 1994 to 2001, Dr. Dunton was a senior executive in various capacities in the Pharmaceuticals Group of Johnson & Johnson. From 1999 to 2001, Dr. Dunton was President and Managing Director of The Janssen Research Foundation, a Johnson & Johnson company. From 1998 to 1999, he served as Group Vice President of Global Clinical Research and Development of Janssen. Prior to joining Janssen, Dr. Dunton was Vice President of Global Clinical Research and Development at the R.W. Johnson Pharmaceutical Research Institute, also a Johnson & Johnson company. Prior to joining Johnson & Johnson, Dr. Dunton held positions in clinical research and development at Syntex Corporation, CIBA-GEIGY Corporation and Hoffmann La Roche Inc. Dr. Dunton holds a MD degree from New York University School of Medicine, where he completed his residency in internal medicine. He also was a Fellow in Clinical Pharmacology at the New York Hospital/Cornell University Medical Center.

Dr. Dunton brings to our Board a significant depth of experience in the pharmaceutical industry that will be invaluable to the Company as we continue to develop biotechnology assets.

Robert C. Koski. Mr. Koski has served as a Director since June 2009. Mr. Koski has practiced as an attorney with the Koski Firm, a sole proprietorship located in Atlanta, Georgia since 1992, where his practice includes litigation and tax law. Mr. Koski has also served as a partner in the Koski Family Limited Partnership, which beneficially owns an interest in the Company, and as a director of the Koski Family Foundation since December 1996. Mr. Koski holds a B.A. degree in Philosophy and English from Colgate University, a JD from Emory School of Law and an LLM degree in Taxation and Litigation from Emory University.

Mr. Koski brings to our Board over two decades of experience in the legal field as a practicing attorney. In addition to his legal experience, Mr. Koski's educational background provides a foundation for leadership and consensus-building.

Kimberly M. Murphy. Ms. Murphy has served as a director since May 2020. Before joining the Company, Ms. Murphy served as Vice President of the Influenza Franchise and Global Vaccine Commercialization Leader at GlaxoSmithKline plc (NYSE: GSK) ("GSK"), where she led the global influenza vaccines business, global pandemic preparedness across vaccines and antivirals, lifecycle management, business development, and global P&L management. Ms. Murphy currently serves as a director of Blue Water Vaccines, Inc. (NASDAQ: BWV) and as a director (chairperson) of Clarus Therapeutics Holdings Inc. (NASDAQ: CRXT). Ms. Murphy also served as Vice President and Global Marketing Head for the shingles vaccine, SHINGRIX. From June 2014 to May 2015, Ms. Murphy was Vice President and Lead for the North America Vaccines Integration Planning Team, responsible for the integration planning of GSK's acquisition of Novartis AG's vaccine division. From October 2012 to June 2014, Ms. Murphy served as Vice President of U.S. Vaccines Customer Strategy and from March 2011 to October 2012, she served as the Senior Director of U.S. Influenza Portfolio Strategy. Prior to joining GSK in March 2011, Ms. Murphy worked for Novartis Vaccines and Diagnostics Inc., a division of Novartis AG (NYSE: NVS), as the head of the U.S. Meningococcal Franchise. Before working for Novartis, Ms. Murphy enjoyed a distinguished career at Merck & Co., Inc. (NYSE: MRK). Ms. Murphy has previously served in board and advisory roles for a privately-held vaccine development company, the Biotechnology Industry Organization, the Biodefense Advisory Council, and the Saint Joseph's University Pharmaceutical & Healthcare Marketing MBA Program. Ms. Murphy holds a B.A. degree in English from Old Dominion University and a M.B.A. degree in Marketing from Saint Joseph's University. Ms. Murphy has also completed the Marketing Excellence Program at the Wharton School of the University of Pennsylvania.

Ms. Murphy brings to the Company's Board a wealth of experience in the commercialization and marketing of development-stage vaccine candidates, particularly those created by public companies. Ms. Murphy's skill will be vital to the Company's development of a vaccine candidate for SARS-CoV-2.

Executive Management

Michael Sullivan. Mr. Sullivan has served as our Interim Principal Executive Officer from October 30, 2014 until June 5, 2016 and is currently serving as our Interim Principal Executive Officer since May 2, 2021 and as our Chief Financial Officer, Secretary and Treasurer since February 6, 2012. Mr. Sullivan has held senior level financial positions for several publicly and privately held businesses including Utek Corporation, eANGLER, and HSN Direct International Limited. Most recently, he was the Group Financial Officer for the Investigative Services and Litigation Consulting Services segment of First Advantage Corporation a firm specializing in talent acquisition solutions where he streamlined the employee recruitment process. Mr. Sullivan is a Florida Certified Public Accountant. He graduated from the Florida State University with a Bachelor of Science in Accounting and a Master of Business Administration.

Key Employee

Dr. Martin Handfield. Dr. Handfield is, the Company's Senior Vice President of Discovery Research and previously has served as our Director of Research and Development. Dr. Handfield has served the Company since January 2009. Prior to joining our Company, Dr. Handfield held a position as Tenured Associate Professor at the Center for Molecular Microbiology and the Department of Oral Biology at the University of Florida College of Dentistry, where he co-invented IVIAT and co-founded *ivi* Gene Corp. and Epicure Corp. to commercialize this and related technologies. Dr. Handfield holds a B.S. degree in Biochemistry, and a MS degree and PhD in Microbiology and Immunology from the Université Laval College of Medicine in Canada, and did postdoctoral training at the University of Florida.

Our executive officers serve at the pleasure of our Board of Directors until their successors are elected or qualified and subject, in certain cases to employment agreements we

have entered into with our officers. Mr. Sullivan, our Chief Financial Officer and Dr. Handfield, our Senior Vice President of Discovery Research, each have employment agreements with us. See "Executive Compensation—Employment Contracts and Change in Control Arrangements."

Board of Directors and Committees

Our property, affairs and business are under the general management of our Board of Directors as provided by the laws of the State of Florida and our Bylaws.

The Board of Directors conducts its business through meetings of the full Board and through committees of the Board. The Board of Directors has appointed standing Audit, Compensation and Nominating and Governance Committees of the Board of Directors.

The Board periodically reviews the size of the Board and recommends any changes it determines to be appropriate given our needs. Under our Bylaws, the number of members on the Board may be increased or decreased by resolution of the Board.

Independence of Directors

Our common stock is listed on a national securities exchange, the NYSE American. Accordingly, in determining whether our Directors are independent, we are required to comply with the rules of the NYSE American. We also expect to continue to comply with securities and other laws and regulations regarding the independence of directors, including those adopted under Section 301 of the Sarbanes-Oxley Act and Rule 10A-3 under the Securities and Exchange Act of 1934 with respect to the independence of Audit Committee members. The NYSE American listing standards define an "independent director" generally as a person, other than an officer of a company, who does not, in the view of the company's Board of Directors, have a relationship with the company that would interfere with the director's exercise of independent judgment. The Board has affirmatively determined that each of the following directors, constituting a majority of the Board, is independent within the meaning of the NYSE American listing standards:

Dr. Frederick W. Telling
Charles L. Pope
Dr. Alan Dunton
Robert Koski
Kimberly W. Murphy

Such independence definition includes a series of objective tests, including that the director is not an executive officer employee of the company and has not engaged in various types of business dealings with the company. In addition, as further required by the NYSE American listing standards, the Board has made a subjective determination as to each independent director that no relationships exist which, in the opinion of the Board, would interfere with the exercise of independent judgment in carrying out the responsibilities of a director.

Audit Committee Financial Expert

The Audit Committee members currently consist of Mr. Charles Pope, Mr. Robert Koski and Dr. Alan Dunton with Mr. Pope serving as Chairman. The Board has affirmatively determined that each such person met the independence requirements for audit committee purposes based on the more stringent independence standards imposed by applicable NYSE American and SEC rules. In addition, the Board of Directors has determined that Mr. Pope is an "audit committee financial expert" as that term is defined in Item 407(d)(5) of Regulation S-K promulgated under the Securities and Exchange Act of 1934. In March 2004, the Audit Committee adopted a written charter which was modified on April 24, 2007 and on December 29, 2009. The Company believes that its Audit Committee Charter complies with the requirements related to Sarbanes-Oxley and a current copy of the Audit Committee Charter is available on our website http://ir.oragenics.com/governance-docs.

Code of Ethics

We have adopted a code of ethics known as the Company Operating Principles, which is applicable to all of our directors and employees, including our principal executive officer and our principal financial officer. A copy of the Company Operating Principles can be found on our website at www.oragenics.com. Any future amendments to, or waivers from, the Company Operating Principles will be posted on our website.

Section 16(a) Beneficial Ownership Reporting Compliance

Section 16(a) of the Securities Exchange Act of 1934 requires the Company's officers and Directors and any persons who beneficially own more than ten percent of the Company's Common Stock to file reports of ownership and changes in ownership of such securities with the Securities and Exchange Commission Officers, Directors and beneficial owners of more than ten percent of the Common Stock are required by applicable regulations to furnish the Company with copies of all Section 16(a) forms they file. Based solely on its review of copies of forms furnished to the Company and written representations from the executive officers and directors, the Company believes, all persons subject to the reporting requirements with regard to the Common Stock complied with the applicable filing requirements during 2021.

ITEM 11. EXECUTIVE COMPENSATION.

Compensation Discussion and Analysis

This section explains the objectives of our named executive officer compensation program, the compensation decisions we made with respect to compensation for our fiscal year ended December 31, 2021, and the factors we considered in making those decisions, and focuses on the compensation of officers who are listed below as our "named executive officers":

- Michael Sullivan, our Interim Principal Executive Officer, Chief Financial Officer, and
- Martin Handfield, our Senior Vice President of Discovery Research.
- Dr. Alan Joslyn, former President and Chief Executive Officer*

*Dr. Joslyn resigned from the Company on May 2, 2021 and entered into a separation and release agreement with us.

The Compensation Committee of our Board of Directors is responsible for establishing and evaluating our policies governing the compensation of our executive officers, including its named executive officers. The Compensation Committee reviews and proposes recommendations to the Board of Directors regarding the compensation to be paid to the Chief Executive Officer. In addition, the Compensation Committee reviews and approves the compensation to be paid to all other executive officers. The Compensation Committee ensures that the total compensation paid to our executive officers is fair, reasonable and competitive. The Compensation Committee has, in the past, at times included the other members of our Board of Directors in its deliberations regarding the salaries of our named executive officers.

At our 2020 Annual Meeting of Shareholders, on an advisory basis, a majority of the shareholders who voted on this matter, approved the compensation of our named executive

officers as disclosed in our Proxy Statement. The Compensation Committee believes the views of our shareholders are an important consideration when making decisions regarding our compensation program and will continue to take the views of our shareholders into consideration when assessing our compensation program and making decisions related to the structure and amount of pay.

Business Highlights

This past year was significant for the Company as we further developed our immunization product candidate to combat the novel coronavirus pandemic. Our compensation program in continues to reflect the challenges associated with designing a compensation program at the beginning of the year that addresses pre-clinical work towards the development of a vaccine. Despite such challenges, the Compensation Committee remains committed to a philosophy which strongly aligns pay with demonstrated performance, and is confident that the decisions made are reflective of this overarching philosophy.

Compensation Objective

Our named executive compensation programs are designed to achieve the following objectives:

- Attract, motivate and reward named executive officers whose knowledge, skills, performance and business relationships are critical to our success;
- Align the interests of our named executive officers and stockholders by motivating named executive officers to ultimately increase stockholder value as well as facilitate retention;
- Motivate our named executive officers to manage our business to meet our short term and long-range goals and reward accomplishment of these goals;
- Provide a competitive compensation package which includes some pay for performance factors.

Compensation Determination Process

We conduct an annual review of named executive officer compensation, generally in December or January. At the Compensation Committee's direction, our Chief Executive Officer or Interim Principal Executive Officer prepares an executive compensation review for each named executive officer, other than himself, which may include recommendations for:

- a proposed year-end bonus, if any, based on the achievement of individual and/or corporate objectives;
- a proposed increase, if any, in base salary and target annual incentive opportunity for the upcoming year; and
- an award, if any, of stock options or stock awards for the year under review.

As part of the compensation review, our Compensation Committee also considers changes to a named executive officer's employment agreement, compensation arrangements, responsibilities or severance arrangements.

In accordance with NYSE American requirements, the Compensation Committee also meets in an executive session without the Chief Executive Officer or Interim Principal Executive Officer to consider and make recommendations to our Board of Directors regarding the Chief Executive Officer's or Interim Principal Executive Officer's compensation, including base salary, cash bonus and year-end annual stock options. The Compensation Committee also grants year-end stock options to other named executive officers based on, among other factors, recommendations by our Chief Executive Officer or Interim Principal Executive Officer.

In conjunction with the year-end annual compensation review, or as soon as practicable after the fiscal year-end, our Chief Executive Officer or Interim Principal Executive Officer recommends to the Compensation Committee the corporate objectives and other criteria to be utilized for purposes of determining cash bonuses (i) for each named executive officer for the upcoming year (in accordance with that named executive officer's employment agreement), and (ii) for all other employees as a group. The Compensation Committee in its discretion may revise our Chief Executive Officer's or Interim Principal Executive Officer's recommendations or make its own recommendations to our Board of Directors, which may in turn suggest further revisions. At the end of the year, the Compensation Committee, in consultation with our Chief Executive Officer or Interim Principal Executive Officer, reviews performance and determines the extent to which any established goals were achieved.

Setting Compensation for Named Executive Officers - Compensation Committee, Board of Directors and Chief Executive Officer or Interim Principal Executive Officer

The Compensation Committee of our Board of Directors has the primary responsibility for determining compensation of our named executive officers. Our Compensation Committee recommends the compensation of our Chief Executive Officer or Interim Principal Executive Officer and determines all compensation matters for our named executive officers, including base salary, bonuses, and equity compensation. Our Board of Directors, after considering the recommendations of the Compensation Committee, makes the final determination with respect to the compensation of our Chief Executive Officer or Interim Principal Executive Officer. Utilizing input from our Chief Executive Officer or Interim Principal Executive Officer, the Compensation Committee makes an independent decision on compensation for each other named executive officers, although our Compensation Committee has, on occasion, submitted its compensation determinations for named executive officers to our full Board of Directors for its approval.

Role of Compensation Consultant

Our Compensation Committee is authorized to engage a compensation consultant or other advisors to review our executive officers' compensation, including a benchmarking analysis against the compensation of executive officers at comparable companies, to ensure that our compensation is market competitive, with the goal of retaining and adequately motivating our senior management. In March 2019 and January of 2020, our Compensation Committee retained Korn Ferry as a compensation consultant ("Korn Ferry") to assess our current compensation programs and provide recommendations for continued improved alignment of the programs with our compensation philosophy and goals and to review and make recommendations regarding our executive and director compensation for 2019 and 2020.

Our Compensation Committee regularly evaluates the performance of its compensation consultant, considers alternative compensation consultants, and has the final authority to engage and terminate such services. The Compensation Committee has assessed the independence of Korn Ferry pursuant to SEC rules and the applicable listing standards of the NYSE American and concluded that no conflict of interest exists that would prevent Korn Ferry from serving as an independent consultant to our Compensation Committee.

During 2019 and 2020, Korn Ferry attended meetings of our Compensation Committee (both with and without management present) and provided the following services:

- consulting with the Compensation Committee chair and other members between committee meetings;
- establishing a compensation comparator peer group for use when making compensation decisions;
- providing competitive market data based on the compensation peer group for our executive officer positions and evaluating how the compensation we pay our executive officers compares both to our performance and to how the companies in our compensation peer group compensate their executives;

- reviewing and analyzing the base salary levels, annual cash bonus opportunities, and equity incentive compensation opportunities of our executive officers;
- assessing executive compensation trends within our industry, and updating on corporate governance and regulatory issues and developments;
- reviewing market equity compensation practices, including burn rate and overhang, and advising on the mix of equity award types; and
- providing competitive market data based on the compensation peer group for the non-employee members of our Board and evaluating the compensation we pay to our non-employee directors.

During 2021 our Compensation Committee chair consulted informally with Korn Ferry representatives.

Benchmarking in the Context of Our Other Executive Compensation Principles

Our Compensation Committee reviews the compensation of similarly-situated executive officers at companies that we consider to be our peers, taking into consideration the experience, position and functional role, level of responsibility and uniqueness of applicable skills of both our executive officers and those of our peers, and the demand and competitiveness for attracting and retaining an individual with each executive officer's specific expertise and experience. While this analysis is helpful in determining market-competitive compensation for senior management, it is only one factor in determining our executive officers' compensation, and our Compensation Committee exercises its judgment in determining the nature and extent of its use.

For purposes of comparing our executive compensation against the competitive market, our Compensation Committee reviews and considers the compensation levels and practices of a group of comparable biotechnology companies. The companies in this compensation peer group for 2019 and 2020 were selected by our Compensation Committee in Mach 2019 and reviewed in January 2020, in consultation with Korn Ferry, on the basis of their similarity to us in terms of size, market capitalization, stage of development, research and development spend, industry sector, business strategy, and number of employees.

To analyze the compensation practices of the companies in our compensation peer group, Korn Ferry gathered data from public filings (primarily proxy statements) and from other sources. This market data was then used as a reference point for our Compensation Committee to assess our current compensation levels in the course of its deliberations on forms and amounts of compensation. Given our objective of attracting, retaining, motivating, and rewarding a highly-skilled team of executive officers and other employees, we aim to deliver a total compensation package that is within a competitive range around the median as compared to peers, with an emphasis on equity incentive compensation so as to more effectively tie our named executive officers and employees' interests to those of our shareholders. In light of this, when undertaking its competitive analysis, our Compensation Committee reviews data pertaining to the 25th, 50th and 75th percentiles for base salary, total cash compensation (base salary plus annual bonus) and equity compensation. This competitive analysis is one factor, among others, taken into account by our Compensation Committee in assessing current compensation levels and recommending changes to compensation or additional awards of equity. Our Compensation Committee expects to review our compensation peer as it believes necessary to make adjustments to its composition, taking into account changes in both our business and the businesses of the companies in the peer group. Due to the small number of employees and executive officers we have, among other factors, our Compensation Committee did not undertake an update to the peer group in 2021.

Our Compensation Committee believes that, given the competitiveness of our industry and our culture, our base compensation, annual cash bonuses and equity programs are flexible enough to reward the achievement of clearly defined corporate goals and are sufficient to retain our existing executive officers and to hire new executive officers with the appropriate qualifications and experience.

Elements of Named Executive Compensation

For 2021, the principal components of compensation for our named executive officers consisted of:

- Annual base salary;
- Annual bonus incentives; and
- Equity Incentive Awards/Option Awards.

Annual Base Salary

We provide our named executive officers with base salary to compensate them for services rendered during the year. Generally, the base salaries reflect the experience, skills, knowledge and responsibilities required of each executive officer, and reflect our executive officers' overall performance and contributions to our business.

During its review of base salaries for executives, the Compensation Committee primarily considers:

- the negotiated terms of each named executive officer's employment agreement, if any;
- an internal review of the named executive officer's compensation, both individually and relative to other named executive officers; and
- base salaries paid by comparable companies in the biopharmaceutical industry that have a similar business and financial profile.

Salary levels are considered annually as part of the company's performance review process. Merit-based increases to salaries are based on management's assessment of the individual's performance, the recommendations made by the Chief Executive Officer to the Compensation Committee, and the comparative compensation at peer companies. The factors used in determining increases in base salary include individual performance, changes in role and/or responsibility and changes in the competitive market environment. The Compensation Committee periodically reviews the base salary for each executive officer.

Annual Incentive Bonuses

We provide an opportunity for each of our named executive officers to receive an annual incentive bonus based on the satisfaction of individual and company objectives established by our Board of Directors, or if no objectives are established at the discretion of the Committee. These incentives are paid in cash. For any given year, these objectives may include individualized goals or company-wide goals that relate to operational, strategic or financial factors such as progress in developing our product candidates, achieving certain manufacturing, intellectual property, clinical and regulatory objectives, and raising certain levels of capital.

2021 Bonus Plan

The Company established performance-based bonus targets for its named executive officers in 2021 (the "2021 Bonus Plan"). The percentages were weighted for purposes of determining bonuses, if any, for the Company's executive officers with respect to 2021 performance. Under such cash bonus program, Mr. Sullivan, and Dr. Handfield were eligible for cash bonuses of up to 35% and 25% of their respective base salaries, or $80,483, and $51,345 respectively, (each a "Bonus Target").

The bonuses payable to Mr. Sullivan were to be based upon the achievement of the following objectives:

(i) Up to 45% of the Bonus Target for financial performance objectives including the Company's raising capital, budgeting and finance planning;

(ii) Up to 35% of the Bonus Target for initiatives regarding the Company's performance; and

(iii) Up to 20% of the Bonus Target for financial plan as part of strategic development plan.

The bonuses payable to Dr. Handfield are to be based upon the achievement of the following objectives:

(i) Up to 30% of the Bonus Target for objectives related to lantibiotic intellectual property and development plans;

(ii) Up to 50% of the Bonus Target for objectives related to lantibiotic research and development testing; and

(iii) Up to 20% of the Bonus Target for the objectives related to lantibiotic manufacturing developments.

The executive officers' actual bonuses for fiscal year 2021 were eligible to exceed 100% of their 2021 Bonus Target percentage in the event performance exceeds the predetermined goals and/or upon the achievement of other specified goals, including stretch goals. Payment of bonuses to the Company's executive officers under the 2021 Bonus Program and the actual amount of such bonus, if any, are at the discretion of the Compensation Committee.

For our former Chief Executive Officer Dr. Joslyn, the bonuses payable were based upon the achievement of the following objectives: (i) Up to 50% of the Bonus Target for financial performance objectives relating to the Company's preferred stock, raising capital and the Company's performance; (ii) Up to 45% of the Bonus Target for objectives related to a vaccine development strategic plan and clinical trials; and (iii) Up to 5% of the Bonus Target for objectives related to the Company's Lantibiotic portfolio. A portion of such bonuses for performance that had been achieved prior to Dr. Joslyn's resignation was paid to Dr. Joslyn pursuant to his separation agreement with us.

Equity Incentive Compensation

We believe that successful long-term corporate performance is more likely to be achieved with a corporate culture that encourages a long-term focus by our named executive officers and other employees through the use of equity awards, the value of which depends on our stock performance. We established our 2012 Equity Incentive Plan, as amended to provide all of our employees, including our named executive officers, with incentives to help align our employees' interests with the interests of our stockholders and to enable them to participate in the long-term appreciation of our stockholder value. Additionally, equity awards provide an important retention tool for all employees, as the awards generally are subject to vesting over an extended period of time based on continued service with us.

We typically grant equity awards in connection with hiring a new employee. In addition, equity awards may also be granted for performance annually at, or soon after, the end of each year, depending on position, performance and tenure at the Company.

The determination of whether to grant stock options, as well as the size of such grants, to our named executive officers involves assessments by the Compensation Committee and our Board of Directors and, with respect to named executive officers other than himself, our Chief Executive Officer. Generally, annual equity awards are driven by our desire to retain and motivate our named executive officers, and we consider individual performance and contributions during the preceding year to the extent the Compensation Committee and our Board of Directors believe such factors are relevant. As with base salary and cash bonuses, in evaluating and determining stock option grants to our named executive officers, the Compensation Committee and our Board of Directors also considers publicly available data prepared by Korn Ferry at the request of the Compensation Committee from other similar clinical stage companies identified by the Compensation Committee.

We currently grant stock options or stock awards to new employees when they join our Company based upon their position with us and their relevant prior experience. The range of options that can be granted to employees is prescribed in a schedule based on employee's title and position. The awards granted by the Compensation Committee generally vest over time during the ten-year option term (although some previously granted awards vest immediately), or upon the achievement of certain milestones. Unless otherwise agreed to by us with respect to a termination without "cause" or for "good reason," vesting and exercise rights generally cease upon termination of employment, except in the case of death (subject to a one-year limitation), disability or retirement. Prior to the exercise of an option, the holder has no rights as a stockholder with respect to the shares subject to such option, including voting rights or the right to receive dividends or dividend equivalents. In addition to the initial option grants, our Compensation Committee may grant additional options to retain our employees and reward, or provide incentive for, the achievement of corporate goals and strong individual performance. Our Board of Directors has not granted our Chief Executive Officer the discretion to grant options to non-executive employees upon joining our Company, or to make grants during each annual non-executive employee review cycle.

It is our policy to award stock options at an exercise price equal to the closing price on the NYSE American Market of our common stock on the date of the grant. For purposes of determining the exercise price of stock options, the grant date is deemed to be the later of the first day of employment for newly hired employees, or the date on which the Compensation Committee approves the stock option grant.

We have no program, practice or plan to grant stock options, in coordination with the release of material nonpublic information. We also have not timed the release of material nonpublic information for the purpose of affecting the value of stock options or other compensation, and we have no plan to do so. We do, however, have a policy regarding the adjustment or recovery of stock option awards in connection with the restatement of our financial statements, as our stock option awards have not been tied to the achievement of specific financial statement goals.

Other Compensation

Other aspects of compensation applicable to our named executive officers consist of the following:

Retirement Benefits. We maintain a Simple Individual Retirement Arrangement plan in which all full-time employees, including our named executive officers, are eligible to participate. We provide this plan to help its employees save some amount of their cash compensation for retirement in a tax efficient manner. We do not provide an option for its employees to invest in our stock under the 401k plan. We match 100% of the employee's contribution up to a maximum of 3% of the employee's compensation.

Health and Welfare Benefits. All full-time employees, including our named executive officers, may participate in our health and welfare benefit programs, including medical, dental and vision care coverage as may be provided and applicable to all employees.

Perquisites. We do not provide perquisites or other personal benefits to our named executive officers other than those that we provide to our employees.

Employment Agreements. During 2021, we had employment agreements in effect with Mr. Michael Sullivan, and Dr. Martin Handfield and with our former Chief Executive Officer. We entered into employment agreements with these officers to ensure that they would perform their respective roles with us for an extended period of time. In addition, we also considered the critical nature of each of their positions and our need to retain them when we committed to these agreements. In May 2021, we entered into a separation and release agreement with our former Chief Executive Officer, Dr. Joslyn in connection with his resignation. See "Employment Contracts and Change in Control Arrangements."

2021 Named Executive Officer Compensation Decisions

We believe that the total compensation paid to our named executive officers for the fiscal year ended December 31, 2021 achieved the overall objectives of our executive compensation program. In accordance with our overall objectives, we believe executive compensation for 2021 was competitive with other similarly-sized companies. The Compensation Committee took the following key compensation actions in 2021:

Base Salaries

During 2021, we made the following changes in the annual base salaries of our named executive officers.

Name	Annual Salary For 2020	Increase	Annual Salary For 2021
Michael Sullivan	$ 229,500	$ 20,500	$ 250,000
Dr. Martin Handfield	$ 205,380	$ 17,820	$ 223,200

Determination of Cash Bonus-2021

We made performance-based cash bonus awards pursuant to the terms of the 2021 Bonus Plan to Mr. Sullivan and Dr. Handfield of $70,000, and $39,060, respectively, based upon their performance during 2021. These performance-based cash bonus awards were made in January of 2022. As part of Dr. Joslyn's separation, severance and release agreement, we made a performance-based cash bonus award of $55,126 based upon achieved performance goals during 2021 prior to his resignation. This performance-based cash bonus award was paid over an eight-month period ending December 31, 2021.

***Determination of Equity Awards*:**

We made stock option grants to Dr. Joslyn, Mr. Sullivan, and Dr. Handfield, under the Company's 2012 Equity Incentive Plan. Dr. Joslyn, Mr. Sullivan, and Dr. Handfield, received grants which are subject to time-based vesting in equal annual installments over a three-year period on the first, second and third anniversaries of the date of grant, to purchase 400,000, 250,000 and 220,000 shares of Company common stock, respectively, at an exercise price of $1.20 per share, the closing price of the Company's common stock on the grant date, February 18, 2021. In addition, Mr. Sullivan, and Dr. Handfield, received grants which are subject to time-based vesting in equal annual installments over a three-year period on the first, second and third anniversaries of the date of grant, to purchase 150,000 and 75,000 shares of Company common stock, respectively, at an exercise price of $0.49 per share, the closing price of the Company's common stock on the grant date, December 16, 2021.

The stock option awards are subject to the standard terms and conditions of the Company's form of stock option agreement which includes, as applicable, earlier vesting upon a change in control of the Company.

Other Policies and Considerations - Employment Contracts and Change in Control Arrangements

Employment Agreements—Mr. Sullivan, Interim Principal Executive Officer and Chief Financial Officer and Dr. Handfield, Senior Vice President of Discovery Research

We have entered into employment agreements with our Chief Financial Officer, Mr. Michael Sullivan and Dr. Martin Handfield, our Senior Vice-President of Research and Development (the "Employment Agreements"). The annual base salaries provided in the Employment Agreements are payable in installments consistent with our normal payroll practices. Mr. Sullivan and Dr. Handfield are also eligible under the Employment Agreements to receive annual bonuses during the term at the discretion of the Compensation Committee and the Board of Directors with Mr. Sullivan's employment agreement providing for such a discretionary bonus of up to 35% of his base salary and with Dr. Handfield's employment agreement providing for a discretionary bonus component, which the Compensation Committee has set as up to 25% of his base salary.

The Employment Agreements are terminable at any time by either party and if the executive officer is involuntarily terminated by us, he shall receive his base salary and vacation pay each accrued through the date of termination, and any nonforfeitable benefits earned and payable to him under the terms of the employee handbook (which applies to all employees) and benefits available under any applicable incentive plan in which the executive participates. In addition, if the executive officer's separation from employment is not voluntary and without cause, we would be obligated to pay the executive officer six months of his annual base salary as severance and the executive shall be entitled to out placement services. If the executive officer is terminated for cause, he shall be entitled to receive his base salary and accrued vacation due through the date of termination and any nonforfeitable benefits already earned and payable to the executive under the terms of the employee handbook or other applicable incentive plans maintained by us. Cause is defined in the Employment Agreements as any action that is illegal, immoral, or improper that reflects on the Company, the employee, or the ability of either to function optimally. If the executive officer voluntarily resigns, he shall be entitled to this base salary and accrued vacation due through the date of termination (including any mutually agreed upon notice period) and any nonforfeitable benefits already earned and payable to the executive officer employee under the terms of the employee handbook or other incentive plans maintained by us.

If the executive officer dies during the term of employment with us, his estate shall be paid his salary as it would have accrued over a period of thirty days after the executive officer's death. We shall also extend the executive officer's right to exercise vested stock options for six months. In the event the executive officer becomes disabled (as defined in the then applicable short and long-term disability insurance policies) we shall pay to the executive officer his salary as it would have accrued over a period of 30 days after the executive became so disabled and we shall extend the executive officer's right to exercise vested stock options for six months.

The Employment Agreements also each include non-disclosure and Company ownership of invention provisions, as well as a provision providing for the Company to defend and indemnify the executive if the executive is named as a defendant in any lawsuit regarding any action taken within the scope of employment. In the event of a change in control, any stock options or other awards granted (other than performance awards) under our equity incentive plans shall become immediately vested in full and, in the case of stock options, exercisable in full. If the change in control results in an involuntary separation from employment of the executive officer within 180 days following a change in control, the executive officer would be entitled to (i) receive six months of salary and the extension of his benefits (excluding vacation time and paid time off) and (ii) exercise vested options for six months from the date of separation. Under the Employment Agreements, "involuntary separation of employment" means (i) termination without cause, (ii) any reduction in responsibilities of office altering the status of the executive officer as an employee, or (iii) the duplication of the executive officer's position by an equivalent executive in an acquiring entity.

On February 20, 2015, we entered into an amended and restated employment agreement, effective January 1, 2015, with Mr. Sullivan. The terms of Mr. Sullivan's amended and restated employment agreement were substantially similar to those of the previous agreement disclosed above except for:

1. The percentage of base salary eligible for bonus awards was set as previously disclosed for Mr. Sullivan at up to 35% of base salary.

2. A provision was added in Mr. Sullivan's agreement to provide for the clawback of bonuses pursuant to the Board's adoption of a clawback policy. In the A&R Employment Agreement Mr. Sullivan acknowledges and agrees that any incentive-based compensation paid to him will be subject to clawback or repayment to the extent such clawback or repayment is required by the terms of the Company's recoupment, clawback or similar policy as may be in effect from time to time, or as required by law.

3. A provision was added whereby Mr. Sullivan would be required to release the Company as a condition to receiving any severance benefit provided by his A&R Employment Agreement with the form of release added and attached as an exhibit to his A&R Employment Agreement.

4. The definition of a change of control in the prior agreement was revised to align it with the definition of a change in control set forth in the Company's 2012 Incentive Plan as follows:

   (i) Any "person" (as such term is used in Sections 13(d) and 14(d) of the Securities Exchange Act of 1934, as amended (the "Exchange Act")) becomes the "beneficial owner" (as defined in Rule 13d 3 of the Exchange Act), directly or indirectly, of securities of the Company representing fifty percent (50%) or more of the total voting power represented by the Company's then outstanding voting securities;

   (ii) The consummation of the sale or disposition by the Company of all or substantially all of the Company's assets;

   (iii) A change in the composition of the Board occurring within a two-year period, as a result of which fewer than a majority of the directors are Incumbent Directors. "Incumbent Directors" means directors who either (A) are Directors as of the effective date of this Agreement, or (B) are elected, or nominated for election, to the Board with the affirmative votes of at least a majority of the Directors at the time of such election or nomination (but will not include an individual whose election or nomination is in connection with an actual or threatened proxy contest relating to the election of directors to the Company); or

   (iv) The consummation of a merger or consolidation of the Company with any other corporation, other than a merger or consolidation which would result in the voting securities of the Company outstanding immediately prior thereto continuing to represent (either by remaining outstanding or by being converted into voting securities of the surviving entity or its parent) at least fifty percent (50%) of the total voting power represented by the voting securities of the Company or such surviving entity or its parent outstanding immediately after such merger or consolidation.

Employment Agreement—Dr. Joslyn Former President and Chief Executive Officer

Dr. Joslyn resigned as our President and Chief Executive Officer effective May 2, 2021. In connection with Dr. Joslyn's resignation, we entered into a separation, severance and release agreement with Dr. Joslyn which provided for the payment of severance consistent with the terms of his employment agreement with us in the amount of $183,750 over six months in accordance with the Company's normal payroll practices in addition to his accrued vacation and certain out-placement services. Dr. Joslyn's employment agreement was terminated in connection with the separation and release agreement. Dr. Joslyn is subject to confidentiality and to covenants not to disclose our confidential information for a period of 12 months from his separation date. If Dr. Joslyn breaches any of these covenants, the Company will be entitled to injunctive relief.

Tax and Accounting Implications

Deductibility of Executive Compensation

The Compensation Committee takes into consideration the tax consequences of compensation to the named executive officers, but tax considerations are not a significant part of our Company's compensation policy.

Accounting for Share-Based Compensation

We account for share-based compensation in accordance with the requirements of FASB ASC Topic 718. This accounting treatment has not significantly affected our executive compensation decisions.

Clawbacks

In order to further align management's interests with those of shareholders and to support the Company's governance practices, the Board of Directors adopted a recoupment policy applicable to annual bonuses and other short-term and long-term incentive compensation based on financial targets ("Incentive Compensation") received by current and former executive officers of the Company and such other senior executives/employees of the Company who may from time to time be deemed subject to the policy by the Board of Directors ("Covered Executive"). The policy provides that if, as a result of a restatement of the Company's financial statements due to the Company's material noncompliance with any financial reporting requirement under the securities laws, a Covered Executive received more Incentive Compensation than the Covered Executive would have received absent the incorrect financial statements, the Company shall recover said excess Incentive Compensation (defined as the excess of (i) the actual amount of Incentive Compensation paid to the Covered Executive over (ii) the Incentive Compensation that would have been paid based on the restated financial results during the three-year period preceding the date on which the Company is required to prepare such restatement). The policy also provides that if the Board of Directors makes a determination in its sole discretion that a Covered Executive engaged in Misconduct (as defined below), the Board of Directors may require reimbursement or forfeiture of all or part of the Incentive Compensation received by the Covered Executive. The Board of Directors may use its judgment in determining the amount to be recovered. Misconduct is defined as (i) conviction of a felony, (ii) material breach of any agreement with the Company, (iii) material breach of any Company policy or code, (iv) act of theft, embezzlement or fraud, (v) misrepresentation or misstatement of financial or performance results, and (vi) any other act or event that the Board of Directors has determined that recoupment is appropriate.

Consideration of Stockholder Advisory Vote on Executive Compensation

The Compensation Committee also expects to consider the results of our stockholder advisory vote on executive compensation. At the Company's previous annual meeting, our shareholders voted in favor of the compensation of our named executive officers: approximately 74.56% of the shares represented in person or by proxy having voted in favor of the program. In light of these results, the Compensation Committee decided to substantially continue the executive compensation program in 2020. The Board of Directors determined that stockholder advisory votes on executive compensation will be submitted to our shareholders annually until the next required advisory vote on the frequency of conducting advisory votes on executive compensation.

Summary Compensation Table

The following table sets forth the aggregate compensation in 2021 and 2020 for services in all capacities paid or accrued by the Company to Mr. Michael Sullivan, and our next most highly compensated officers who earned more than $100,000 in total salary and bonus during the fiscal year ended December 31, 2021 (the "Named Executive Officers").

Name and principal position	Year	Salary	Bonus(1)	Stock Awards (2)	Option Awards (2)	All Other Compensation (3)	Total
Michael O. Sullivan	2021	$238,304	$ 70,000	$ —	$367,000	$ 7,124	$682,428
Interim Principal Executive Officer and Chief Financial Officer	2020	$229,950	$ 60,361	$ —	$235,000	$ 6,899	$532,210
Dr. Martin Handfield	2021	$209,835	$ 39,060	$ —	$295,600	$ 6,295	$550,790
Senior Vice President Discovery Research	2020	$205,380	$ 38,509	$ —	$206,800	$ 6,162	$456,851
Former Officer:							
Dr. Alan Joslyn[4]	2021	$178,917	$ 55,126	$ —	$472,000	$ 218,384	$924,427
President and Chief Executive Officer	2020	$367,500	$ 137,813	$ —	$376,000	$ 21,326	$902,639

(1) For Mr. Sullivan and Dr. Handfield, the amounts in this column for 2021 represent a performance-based cash bonus award made pursuant to the terms of the 2021 Bonus Plan which was earned in 2021 and paid in early January 2022.

(2) The amounts in this column represent the aggregate grant date fair value computed in accordance with Financial Accounting Standards Board Accounting Standards Codification, Topic 718, Compensation—Stock Compensation (ASC 718). On February 18, 2021, Dr. Joslyn, Mr. Sullivan, and Dr. Handfield were awarded stock options, under the Company's 2012 Equity Incentive Plan to purchase 400,000, 250,000 and 220,000 shares of Company common stock, respectively, at an exercise price of $1.20 per share, the closing price of the Company's common stock on the grant date, February 18, 2021. In addition, Mr. Sullivan, and Dr. Handfield, received grants which are subject to time-based vesting in equal annual installments over a three-year period on the first, second and third anniversaries of the date of grant, to purchase 150,000 and 75,000 shares of Company common stock, respectively, at an exercise price of $0.49 per share, the closing price of the Company's common stock on the grant date, December 16, 2021.The stock option awards are subject to the standard terms and conditions of the Company's form of stock option agreement which includes, as applicable, earlier vesting upon a change in control of the Company. Under Securities and Exchange Commission rules relating to executive compensation disclosure, the amounts shown exclude the impact of estimated forfeitures related to service-based vesting conditions. Fair values relating to share grants have been determined under ASC 718 and were calculated using the common stock closing price on the date of grant and multiplying that price by the number of shares subject to the share grant. The equity-based compensation expense relating to the stock grants is recognized over the requisite service period of the grant. For option awards, we utilize the Black-Scholes option pricing model to determine the fair value on the date of the grant multiplied by the number of options subject to the option grants in accordance with ASC 718. The stock-based compensation expense relating to the stock option grants is recognized over the requisite service period of the grant and the amounts included in the Option Awards column do not reflect compensation actually received by the named executive officers. For information on the assumptions used to calculate the fair value of stock option grants, refer to Note 8 - "Stock Compensation Plan" in our financial statements for the year ended December 31, 2021.

(3) Amounts in this column for Mr. Sullivan and Dr. Handfield represent the Company's matching contributions to our Simple IRA retirement plan. The retirement plan requires us to match employee contributions up to the first 3% of compensation earned. For Dr. Joslyn, the amount reflected includes the Company's matching contributions to our Simple IRA retirement plan, $1,135 which represents amounts reimbursed by the Company for Dr. Joslyn's expense in commuting to the Company's headquarters in Tampa, Florida, $183,750 in severance payments (See Note 4), and $29,824 relating to the value of certain previously awarded stock options.

(4) Dr. Joslyn resigned as our President and Chief Executive Officer effective May 2, 2021. In connection with Dr. Joslyn's resignation, we entered into a separation, severance and release agreement with Dr. Joslyn which provided for the payment of severance consistent with the terms of his employment agreement with us in the amount of $183,750 over eight months in accordance with the Company's normal payroll practices, accrued vacation, and a performance-based bonus. Dr. Joslyn's employment agreement was terminated in connection with the separation and release agreement. Amounts paid to Dr. Joslyn under the separation and release agreement are included under all other compensation.

The Compensation Committee believes that our future success depends, in large part, upon our ability to maintain a competitive position in attracting, retaining and motivating key personnel. The Compensation Committee utilizes the 2012 Equity Incentive Plan to provide incentives to employees. We do not have any separate long-term incentive plans that provide compensation intended to serve as incentives for performance other than awards contemplated under, or pursuant to, our 2012 Equity Incentive Plan.

Outstanding Equity Awards

The following table provides information concerning unexercised options outstanding as of December 31, 2021:

Name	Number of securities underlying unexercised options (#) exercisable	Number of securities underlying unexercised options (#) unexercisable	Option exercise price ($)	Option expiration date
Michael O. Sullivan		150,000[1]	0.49	12/16/2031
Interim Principal Executive Officer and Chief Financial Officer		250,000[1]	1.20	2/18/2031
	333,333	166,667[1]	0.48	2/5/2030
	250,000		0.73	9/27/2028
	18,000		1.52	6/22/2028
	17,500		3.70	6/22/2027
	20,000		13.20	3/16/2025
	4,000		8.80	12/8/2024
	2,500		8.60	10/30/2024
	4,500		12.00	2/10/2022
Dr. Martin Handfield		75,000[1]	0.49	12/16/2031
Senior Vice President of Discovery Research		220,000[1]	1.20	2/18/2031
	293,333	146,667[1]	0.48	2/5/2030
	220,000		0.73	9/27/2028
	16,000		1.52	6/22/2028
	14,000		3.70	6/27/2027
	15,000		13.20	3/16/2025
	4,000		8.80	12/8/2024

Dr. Alan Joslyn[(2)]	200,000	0.48	5/4/2022
Former President and Chief Executive Officer	400,000	0.73	5/4/2022
	28,000	1.52	5/4/2022
	14,000	3.70	5/4/2022
	30,000	5.50	5/4/2022

(1) Represents awards that are time vested with each award vesting evenly on an annual basis over three years, subject to earlier vesting upon a change in control as defined in the award agreements.
(2) Pursuant to the terms of the separation, severance and release agreement with Dr. Joslyn that was entered into upon his resignation from the Company, the exercise period for these options was extended to May 4, 2022.

Director Compensation

The Director Compensation program for 2021 consisted of the following:

Non-employee directors

Cash Compensation. The Director compensation program for 2021 provided that all non-employee Directors would receive an annual base fee for service on the Board of $45,000. In addition, the Chairperson of the Board and of our Audit Committee, Compensation Committee and Nominating Committee would also receive annual fees of $40,000, $20,000, $15,000 and $10,000 respectively. All non-employee Directors serving on our Audit Committee, Compensation Committee and Nominating Committee (other than as the Chairperson) would receive an annual fee of $10,000, $7,500, and $5,000, respectively, in connection with such committee service. In addition, from time to time, the Board may establish special committees and in connection therewith determine the cash compensation that would be paid to the directors serving on a special committee at the time of the establishment of such committee. All fees for Board service are generally paid on or before the last business day of each quarter.

The Board is expecting to meet in-person for a minimum of four meetings each year. To the extent, the Board meets in excess of six in-person meetings an additional per meeting fee would also be considered to be paid to each director by the Board for such additional in-person meeting. To the extent the Board determines to establish a special committee or a special committee was previously established and continues to function, the Board would determine the cash compensation payable to each director serving on any such special committee.

Our Compensation Committee and our Board of Directors use market data as one means of evaluating and establishing Board remuneration. In 2019 and 2020, the Compensation Committee engaged Korn Ferry, as a compensation consultant to advise the Compensation Committee. From time to time the Compensation Committee seeks the advice for compensation consultants on matters related to executive compensation, board remuneration and related governance matters.

Equity Compensation-New Director. Equity compensation is issued to Directors upon joining our Board. Non-employee Directors receive a stock option for the purchase of shares of Company's Common Stock equating to $60,000 with an exercise price set as the Closing price of the Company's Common Stock on the day immediately prior to the appointment to the Board, which will immediately vest and be exercisable for ten years, subject to early termination under the terms of the 2012 Equity Incentive Plan. If new directors join the Board before July 1 of the calendar year, they would receive 100% of the value; 50% of such total value if they join between July 1 and October 1; 25% of such total value if they join after October in a calendar year.

Annual Equity Compensation Awards. As part of the Director Compensation Program each non-employee director receives equity awards under the 2012 Incentive Plan. In February 2021 the Board considered and made its annual equity awards to non-employee directors of 160,000 stock options each which were awarded under the Company's 2012 Incentive Plan at an exercise price of $1.20 per share, the closing price on February 18, 2021. The options vested immediately. During December 2021 the Board again considered the annual equity award for the ensuing 2022 year and made an annual equity award to non-employee directors for 2022 of 75,000 stock options each at a price per share of $0.49, the closing price on December 16, 2021. The options vested immediately.

The stock option awards are subject to the standard terms and conditions of the Company's form of stock option agreement which includes earlier vesting upon a change in control of the Company.

Discretionary Awards. As part of the Director Compensation Program, the Board may also make discretionary equity-based awards from time to time under our 2012 Incentive Plan. No discretionary equity-based awards were made in 2021.

Minimum dollar value stock ownership requirements. Each non-employee director receiving the above equity-based awards will be subject to a minimum dollar value stock ownership holding requirement with respect to the awards received as well as all prior equity awards under the 2012 Incentive Plan which requirement is intended to align the ability to sell shares with the performance of the Company's stock price. The non-employee Directors will each be subject to a minimum dollar value stock ownership requirement equal to six times the annual Board retainer ($270,000) which dollar threshold they would be precluded from selling shares of Company stock acquired from the Company under its 2012 Incentive Plan.

Reimbursement of Expenses. Non-employee Directors are also reimbursed for expenses incurred in connection with their attendance at Board or committee meetings and reasonable out-of-pocket business expenses associated with their Board service.

Long-term Incentive Compensation. The Company did not have a Long-Term Incentive Compensation plan in place performance in 2021 for its Non-Employee Directors.

The following table sets forth the compensation of our non-employee Directors in 2021.

Director Compensation Table

Name	Fees earned or paid in cash (1)	Stock Awards	Option awards (2)	All other compensation (3)	Total
Dr. Frederick W. Telling	$ 213,855	—	224,800	—	$ 438,655
Robert C. Koski	$ 50,000	—	224,800	—	$ 274,800
Charles L. Pope	$ 82,500	—	224,800	—	$ 307,300
Dr. Alan W. Dunton	$ 106,832	—	224,800	—	$ 331,632
Kimberley W. Murphy	$ 116,250	—	224,800	—	$ 341,050

(1) Amounts represent cash compensation earned by our Non-employee Directors during 2021 in connection with their Board service including any service on committees or service in connection with special committees established by the Board.

(2) The amounts in this column represent the aggregate grant date fair value computed in accordance with Financial Accounting Standards Board Accounting Standards Codification, Topic 718, Compensation—Stock Compensation (ASC 718). On February 18, 2021 and as part of the Company's non-employee Director Compensation Program, each non-employee Director was awarded stock options, under the Company's 2012 Equity Incentive Plan to purchase 160,000 shares of Company common stock, respectively, at an exercise price of $1.20 per share, the closing price of the Company's common stock on the grant date, February 18, 2021. The options vested immediately. On December 16, 2021 and as part of the Company's non-employee Director Compensation Program, each non-employee Director was awarded stock options, under the Company's 2012 Equity Incentive Plan to purchase 75,000 shares of Company common stock, respectively, at an exercise price of $0.49 per share, the closing price of the Company's common stock on the grant date, December 16, 2021. The options vested immediately. As of the end of the year non-employee directors, Telling, Koski, Pope, Dunton and Murphy have aggregate options to acquire, 717,080, 873,620, 873,620, 873,620 and 373,664, respectively and there are no stock awards outstanding for any non-employee director.

(3) No other compensation was paid to the non-employee Directors except for reimbursement for travel expenses to Board meetings and other Board related meetings.

Employee Directors

The Director Compensation Program provides that employee Directors receive no additional compensation in connection with their board service. There was one employee Director in 2021, Dr. Joslyn, our former President and Chief Executive Officer for portion of the year, and no separate compensation is paid for his service as a director. For a summary of Dr. Joslyn's compensation see the Summary Compensation Table.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS.

The following table sets forth information about beneficial ownership of our Common Stock as of March 8, 2022 (unless otherwise noted) by (i) each shareholder that has indicated in public filings that the shareholder beneficially owns more than five percent of the Common Stock, (ii) each of the Company's directors and named officers and (iii) all directors and officers as a group. Except as otherwise noted, each person listed below, either alone or together with members of the person's family sharing the same household, had, to our knowledge, sole voting and investment power with respect to the shares listed next to the person's name.

Name and address(1)	Number of shares beneficially owned	Percentage of ownership (2)
Directors and officers		
Dr. Frederick W. Telling (3)	1,463,158	1.2%
Robert C. Koski (4)	3,457,964	2.9%
Charles L. Pope (5)	873,620	*
Dr. Alan Dunton (6)	934,881	*
Kimberly Murphy (7)	373,664	*
Michael Sullivan (8)	826,254	*
(All Directors and officers as a group 6 persons)	7,929,541	6.5%
5% shareholder		
Joseph Hernandez (9)	9,200,000	7.4%

* Beneficial ownership percentage is less than 1%.

(1) Except as indicated, the address of the person named in the table is c/o Oragenics, Inc., 4902 Eisenhower Blvd., Suite 125, Tampa, Florida 33634.

(2) In computing the number of shares beneficially owned by a person and the percentage ownership of that person, shares of the Common Stock subject to options or warrants held by that person that are currently exercisable or will become exercisable within 60 days after March 8, 2022 are deemed outstanding, while the shares are not deemed outstanding for purposes of computing percentage ownership of any other person. Except as otherwise indicated, and subject to applicable community property laws, the persons named in the table have sole voting and investment power with respect to all shares of the Common Stock held by them. Applicable percentage ownership is based on 116,394,806 shares of the Common Stock outstanding as of March 8, 2022. The inclusion in the table above of any shares deemed beneficially owned does not constitute an admission of beneficial ownership of those shares.

(3) Includes: (i) 717,080 shares able to be acquired pursuant to stock options, and (ii) 150,000 shares able to be acquired upon the exercise of warrants.

(4) The share amounts include: (i) 1,776,483 shares held by the Koski Family Limited Partnership ("KFLP") of which Mr. Koski is a general partner; (ii) 300,000 shares able to be acquired by the KFLP upon conversion of Series B Convertible Preferred Stock; (iii) 241,936 shares able to be acquired by the KFLP upon exercise of warrants; (iv) 212,839 shares owned directly by Mr. Koski; (v) 53,086 shares owned directly by trusts for which Mr. Koski serves as sole trustee as follows: the Robert Clayton Koski Trust for the benefit of Anthony James Hunter (10,760 shares); The Robert Clayton Koski Trust for the benefit of Hunter Buchanan Koski (10,760 shares); The Robert Clayton Koski Trust for the benefit of Clayton Ward Bennett (10,000 shares); and The Robert Clayton Koski Trust for the benefit of Robert Edward Koski (10,760 shares) and the Robert Clayton Koski Trust for the benefit of Elyse Margaux Koski (10,806 shares); and (vi) 873,620 shares able to be acquired pursuant to stock options. The address of the KFLP is 3525 Turtle Creek Boulevard #19B, Dallas, TX 75219.

(5) Includes: 873,620 shares able to be acquired pursuant to stock options.

(6) Includes: (i) 873,620 shares able to be acquired pursuant to stock options and (ii) 20,000 shares able to be acquired upon the exercise of warrants.

(7) Includes 373,664 shares able to be acquired pursuant to stock options.

(8) Includes: 811,999 shares able to be acquired pursuant to stock options and excludes 400,001 shares subject to options that have not vested.

(9) Based upon information provided by Mr. Hernandez in his Schedule 13D filing with the SEC on January 26, 2021, Mr. Hernandez is the beneficial owner of 9,200,000 shares of Common Stock issuable upon exercise of warrants that became exercisable on May 1, 2021 and are exercisable at an exercise price of $1.25 per share.

Securities Authorized for Issuance under Equity Compensation Plans

The following table sets forth certain information as of December 31, 2021 with respect to the 2012 Equity Incentive Plan as amended (the "2012 Plan"):

Plan Category	Number of Securities to be Issued Upon Exercise of Outstanding Options (A)	Weighted-Average Exercise Price of Outstanding Options (B)	Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (Excluding Securities Reflected in Column (A)) (C)
Equity compensation plans approved by stockholders:			
2012 Equity Incentive Plan	6,724,402	$ 0.95	528,308
Equity compensation plans not approved by stockholders: (1)			
None	—	$ —	—
Total:	6,724,402	$ 0.95	528,308

(1) The Company's Board of Directors approved a new 2021 Equity Incentive Plan (the "2021 Plan") and it was submitted to shareholders for approval in connection with the Company's 2020 annual meeting of shareholders. On February 25, 2022 the shareholders approved the 2021 Plan which is the successor to our 2012 Plan. The 2021 Plan provides the aggregate number of shares of Common Stock that may be issued under the 2021 Plan will not exceed the sum of (i) 10,000,000 new shares, (ii) the number of shares remaining available for the grant of new awards under the 2012 Plan as of immediately prior to the effective date of the 2021 Plan, and (iii) certain shares subject to outstanding awards granted under the 2012 Plan that may become available for issuance under the 2021 Plan, as such shares become available from time to time.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE.

SEC rules require us to disclose any transaction or currently proposed transaction in which we are a participant and in which any related person has or will have a direct or indirect material interest involving an amount that exceeds the lesser of $120,000 or one percent (1%) of the average of the Company's total assets as of the end of last two completed fiscal years. A related person is any executive officer, director, nominee for director, or holder of 5% or more of the Company's common stock, or an immediate family member of any of those persons.

The Audit Committee of the Board of Directors (or, to the extent applicable, our disinterested directors) is responsible for reviewing all transactions between the Company and any officer or Director of the Company or any entity in which an officer of Director has a material interest. Any such transactions must be on terms no less favorable than those that could be obtained on an arms-length basis from independent third parties.

Stock Purchase Agreement-Acquisition of Noachis Terra Inc.

On May 1, 2020, we entered into a Stock Purchase Agreement with Mr. Joseph Hernandez, the sole shareholder of Noachis Terra, pursuant to which we acquired one hundred percent (100%) of the total issued and outstanding common stock of Noachis Terra (the "Transaction"). In exchange, Mr. Hernandez, received the following: (i) cash consideration equal to $1,925,000, of which approximately $500,000 was applied to extinguish Noachis Terra's pre-Transaction liabilities (a portion of which were due to Mr. Hernandez); (ii) 9,200,000 restricted shares of our Common Stock; and (iii) warrants to purchase 9,200,000 shares of our Common Stock, which warrants carry an exercise price of $1.25 per share, a five-year term, and are currently exercisable.

In addition to the above consideration, Mr. Hernandez was entitled to receive contingent consideration based upon the exercise of certain of our outstanding warrants as follows: (i) twenty percent (20%) of the cash proceeds received by the Company upon exercise of the Company's warrants carrying an exercise price of $0.75 and $0.90; and (ii) forty-five percent (45%) of the cash proceeds received by the Company upon exercise of the Company's warrants carrying an exercise price of $1.00, in each case, for so long as the warrants remain outstanding. The warrants with an exercise price of $0.75 expired on May 14, 2020 pursuant to their terms.

Pursuant to the Stock Purchase Agreement, within thirty (30) days of the Transaction's closing, we filed with the Securities and Exchange Commission a registration statement covering the 9,200,000 shares of the Company's Common Stock and the warrants to purchase 9,200,000 shares of the Company's Common Stock, which was filed on May 29, 2020 and declared effective on June 30, 2020.

November 2020 Public Offering

On November 24, 2020, the Company announced the closing of an underwritten public offering for gross proceeds of approximately $6.0 million, which included the full exercise of the underwriter's over-allotment option to purchase additional shares, prior to deducting underwriting discounts and commissions and offering expenses payable by the Company.

The offering was comprised of 14,189,189 shares of common stock at a price to the public of $0.37 per share. The Company granted the underwriter a 45-day option to purchase up to 2,128,378 additional shares of common stock of the Company at the public offering price, less underwriting discounts and commissions. The underwriter exercised its option in full to purchase 2,128,378 additional shares of common stock, which the indicated gross proceeds reflect.

The Company intends to use the net proceeds of the offering primarily to continue funding our pre-clinical development of our SARS-CoV-2 vaccine candidates, Terra CoV-2 and NT-CoV2-1, and our lantibiotics program and for general corporate purposes, including research and development activities, capital expenditures and working capital.

Dr. Frederick Telling who is a Director of the Company, participated in the offering through the purchase of 100,000 shares of the Company's common stock. Dr. Telling's participation was approved by the Company's Audit Committee.

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES.

The following table provides the aggregate fees billed for professional services rendered by the Company's principal accountants, Mayer Hoffman McCann P.C. ("MHM"), in the categories indicated during each of the past two fiscal years ended December 31:

Services Rendered	2021	2020
Audit Fees (1)	$ 142,750	$ 154,250
Audit-Related Fees (2)	—	—
Tax Fees (3)	7,005	6,800
All Other Fees (4)	—	—
	$ 149,755	$ 161,050

(1) *Audit Fees*. This category includes fees for professional services provided in conjunction with the audit of the Company's financial statements and with the audit of management's assessment of internal control over financial reporting and the effectiveness of internal control over financial reporting, review of the Company's quarterly financial statements, assistance and review of documents filed with the Securities and Exchange Commission, consents, and comfort letters and attestation services provided in connection with statutory and other regulatory filings and engagements.
(2) *Audit-Related Fees*. This category includes fees for assurance and related professional services associated with due diligence related to mergers and acquisitions, consultation on accounting standards or transactions, internal control reviews and assistance with internal control reporting requirements, services related to the audit of employee benefit plans, and other attestation services not required by statute or regulation.
(3) *Tax Fees*. This category includes fees for professional services provided related to tax compliance, tax planning and tax advice.
(4) *All Other Fees*. There were no other fees paid to Mayer Hoffman McCann P.C.

Substantially all MHM's personnel, who work under the control of MHM shareholders, are employees of wholly-owned subsidiaries of CBIZ, Inc., which provides personnel and various services to MHM in an alternative practice structure.

Pre-Approval Policy

The Audit Committee approves in advance all audit and non-audit services to be performed by the Company's independent registered public accounting firm. The Audit Committee considers whether the provision of any proposed non-audit services is consistent with the Securities and Exchange Commission rules on auditor independence and has pre-approved certain specified audit and non-audit services to be provided by MHM for up to twelve (12) months from the date of the pre-approval. If there are any additional services to be provided, a request for pre-approval must be submitted by management to the Audit Committee for its consideration.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES.

(a) The documents filed as part of this report are as follows:

1. The financial statements and accompanying report of independent registered public accounting firm are set forth immediately following the signature page of this report on pages F-1 through F-22.

2. All financial statement schedules are omitted because they are inapplicable, not required or the information is included elsewhere in the financial statements or the notes thereto.

3. The exhibits required to be filed by this report or able to be incorporated by reference are listed in the "Exhibit Index" following the financial statements.

(b) Other Exhibits

Exhibits required by Item 601 of Regulation S-K are submitted (or incorporated by reference) and listed in a separate section herein immediately following the F pages under the heading "Exhibit Index" and are incorporated herein by reference by reference. No exhibits in addition to those previously filed or listed in item 15(a) (3) and filed herein.

(c) Not Applicable.

ITEM 16. FORM 10-K SUMMARY

None.

EXHIBIT INDEX

Exhibit number	Exhibit description	Incorporated by Reference				Filed herewith
		Form	File no.	Exhibit	Filing date	
3.1	Amended and Restated Articles of Incorporation as amended prior to December 29, 2017 (including certificates of designation of Series A, B and C Preferred Stock).	8-K	001-32188	3.1	12/29/17	
3.2	Articles of Amendment to Amended and Restated Articles of Incorporation dated effective December 29, 2017.	8-K	001-32188	3.2	12/29/17	
3.3	Articles of Amendment to Amended and Restated Articles of Incorporation effective January 19, 2018.	8-K	001-32188	3.1	1/19/18	
3.4	Articles of Amendment to Amended and Restated Articles of Incorporation.	8-K	001-32188	3.4	6/26/18	
3.5	Articles of Amendment to Amended and Restated Articles of Incorporation	8-K	001-32188	3.5	2/28/22	
3.6	Bylaws	SB-2	333-100568	3.2	10/16/02	
3.7	First Amendment to Bylaws	8-K	001-32188	3.1	6/9/10	
3.8	Second Amendment to Bylaws	8-K	001-32188	3.1	8/24/10	

3.9	Third Amendment to Bylaws	8-K	001-32188	3.9	2/28/22
4.1	Specimen Stock Certificate	10-K	001-32188	4.1	3/29/19
4.2	Amended and Restated Warrant Form	8-K	001-32188	4.1	8/1/17
4.3	Form of Common Stock Warrant	8-K	001-32118	4.1	11/9/17
4.4	Form of Investor Warrant.	8-K	001-32188	4.1	4/10/18
4.5	Form of Warrant to purchase shares of Common Stock.	S-1/A	333-224950	4.2	7/9/18
4.6	Warrant Agency Agreement	8-K	001-32188	4.2	7/17/18
4.7	Form of Series 2 Warrant	8-K	001-32188	4.2	3/25/19
4.8	Warrant dated May 1, 2020	8-K	001-32188	4.1	5/4/20
4.9	Description of the Registrant's Securities Registered Pursuant to Section 12 of the Securities Exchange Act of 1934	10-K	001-32188	4.9	3/24/22

Exhibit number	Exhibit description	Incorporated by Reference				Filed herewith
		Form	File no.	Exhibit	Filing date	
10.1	Lease Agreement between the Company and Hawley-Wiggins LLC dated October 28, 2011 (13700 Progress Blvd, Alachua, FL 32615).	10-K	001-32188	10.20	4/16/12	
10.2	Amendment to Lease Agreement between the Company and Hawley-Wiggins LLC dated July 13, 2014 (13700 Progress Blvd, Alachua, FL 32615).	10-Q	001-32188	10.2	8/7/14	
10.3	Second Amendment to Lease Agreement between the Company and Hawley-Wiggins LLC dated June 7, 2019 (13700 Progress Blvd, Alachua, FL 32615).	10-K	001-32188	10.15	3/4/20	
10.4	Non-exclusive intellectual property and biological materials license agreement with the National Institute of Allergy and Infectious Diseases, an institute within the National Institutes of Health.*	10-Q	001-32188	10.2	8/14/20	
10.5	National Research Council (NRC) Canada Technology License Agreement (dated July 26, 2021) and Amendment One (dated September 2, 2021).*	10-Q	001-32188	10.0	11/15/21	
10.6	NRC Technology License Amendment 2	10-K	001-32188	10.6	3/24/22	
10.7	NRC Technology License Amendment 3	10-K	001-32188	10.7	3/24/22	
10.8	2012 Equity Incentive Plan. +	8-K	001-32188	4.1	10/25/12	
10.9	First Amendment to 2012 Equity Incentive Plan. +	8-K	001-32188	4.2	5/5/17	
10.10	Second Amendment to 2012 Equity Incentive Plan. +	8-K	001-32188	4.3	12/29/17	
10.11	Third Amendment to 2012 Equity Incentive Plan. +	8-K	001-32188	4.4	6/26/18	
10.12	Fourth Amendment to 2012 Equity Incentive Plan. +	8-K	001-32188	4.5	6/21/19	
10.13	Form of Employee Stock Option Agreement. +	10-K	001-32188	10.26	3/26/13	
10.14	Form of Consultant Stock Option Agreement. +	10-K	001-32188	10.27	3/26/13	
10.15	Form of Notice of Grant of Stock Options and Stock Option Award Agreement (Employee). +	8-K	001-32188	10.1	3/18/15	
10.16	Form of Notice of Grant of Stock Options and Stock Option Award Agreement (Directors). +	10-K	001-32188	10.23	3/4/20	
10.17	Form of Director Restricted Stock Award Agreement. +	8-K	001-32188	10.3	3/18/15	
10.18	Amended and Restated Executive Employment Agreement between the Company and Michael Sullivan dated effective January 1, 2015. +	8-K	001-32188	10.1	2/25/15	
10.19	Executive Employment Agreement between the Company and Martin Handfield dated May 11, 2010. +	10-Q	001-32188	10.16	11/14/11	

Exhibit number	Exhibit description	Incorporated by Reference				Filed herewith
		Form	File no.	Exhibit	Filing date	
10.20	2021 Equity Incentive Plan+	8-K	001-3288	10.1	2/28/22	
10.21	Form Stock Option Award Agreement (Directors)+	8-K	001-3288	10.2	2/28/22	
10.22	Form Stock Option Award Agreement (Employees)+	8-K	001-3288	10.3	2/28/22	
10.23	Form Stock Option Award Agreement (Consultants)+	8-K	001-3288	10.4	2/28/22	
21.1	Subsidiaries of Registrant	10-K	001-32188	21.1	3/24/22	
23.1	Consent of Mayer Hoffman McCann P.C., an independent public accounting firm.	10-K	001-32188	23.1	3/24/22	
24.1	Powers of Attorney (included on signature page).	10-K	001-32188	24.1	3/24/22	
31.1	Certification of Principal Executive Officer pursuant to Rule 13a-14 and Rule 15d-14(a), promulgated under the Securities and Exchange Act of 1934, as amended.	10-K	001-32188	31.1	3/24/22	
31.2	Certification of Principal Financial Officer pursuant to Rule 13a-14 and Rule 15d-14(a), promulgated under the Securities and Exchange Act of 1934, as amended.	10-K	001-32188	31.2	3/24/22	
31.3	Certification of Principal Executive Officer pursuant to Rule 13a-14 and Rule 15d-14(a), promulgated under the Securities and Exchange Act of 1934, as amended.					X
31.4	Certification of Principal Financial Officer pursuant to Rule 13a-14 and Rule 15d-14(a), promulgated under the Securities and Exchange Act of 1934, as amended.					X
32.1	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (Chief Executive Officer). **					X
32.2	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (Chief Financial Officer). **					X
101.INS	Inline XBRL Instance Document	10-K	001-32188		3/24/22	
101.SCH	Inline XBRL Taxonomy Extension Schema	10-K	001-32188		3/24/22	
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase	10-K	001-32188		3/24/22	
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase	10-K	001-32188		3/24/22	
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase	10-K	001-32188		3/24/22	
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase	10-K	001-32188		3/24/22	
104	Cover Page Interactive Data File (embedded within the Inline XBRL document)					X

* Confidential treatment has been granted as to certain portions of this exhibit pursuant to Rule 406 of the Securities Act of 1933, as amended, or Rule 24b-2 of the Securities Exchange Act of 1934, as amended.

\+ Executive management contract or compensatory plan or arrangement.

** Furnished herewith and not deemed to be "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and shall not be deemed to be incorporated by reference into any filing under the Securities Act of 1933, as amended, or the Exchange Act (whether made before or after the date of the Form 10-Q), irrespective of any general incorporation language contained in such filing.

SIGNATURES

Pursuant to the requirements of Section 13 and 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this Amendment No. 1 to be signed on its behalf by the undersigned, thereunto duly authorized.

Dated: July 29, 2022

ORAGENICS, INC.

By: */s/ Michael O. Sullivan*
Michael O. Sullivan
Chief Financial Officer

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Report of Independent Registered Public Accounting Firm

To the Board of Directors and
Shareholders of Oragenics, Inc.:

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Oragenics, Inc. ("Company") as of December 31, 2021 and 2020, and the related consolidated statements of operations, changes in shareholders' equity, and cash flows for each of the two years in the period ended December 31, 2021, 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.

Substantial Doubt about the Company's Ability to Continue as a Going Concern

The accompanying financial statements have been prepared assuming Oragenics, Inc. will continue as a going concern. As more fully described in Note 1, the Company has incurred recurring operating losses, negative operating cash flows and has an accumulated deficit. These conditions raise substantial doubt about the Company's ability to continue as a going concern. Management's plans in regard to these matters are also described in Note 1. The financial statements do not include any adjustments to reflect the possible future effects on the recoverability and classification of the assets or the amounts and classification of liabilities that may result from the outcome of this uncertainty.

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.

Critical Audit Matters

Critical audit matters are matters arising from the current period audit of the financial statements that were communicated or required to be communicated to the audit committee and that (i) relate to accounts or disclosures that are material to the financial statements and (ii) involved our especially challenging, subjective, or complex judgements. We determined that there are no critical audit matters.

/s/ Mayer Hoffman McCann P.C.

We have served as the Company's auditor since 2005
St. Petersburg, FL
March 24, 2022

Oragenics, Inc.
Consolidated Balance Sheets
December 31, 2021 and 2020

	December 31, 2021	December 31, 2020
Assets		
Current assets:		

Cash and cash equivalents	$ 27,265,703	$ 17,639,575
Other receivables	6,987	—
Prepaid expenses and other current assets	434,699	343,106
Total current assets	27,707,389	17,982,681
Property and equipment, net	45,708	42,713
Operating lease right-of-use assets	477,882	655,138
Total assets	$ 28,230,979	$ 18,680,532
Liabilities and Shareholders' Equity		
Current liabilities:		
Accounts payable and accrued expenses	$ 947,574	$ 937,020
Short-term notes payable	303,416	228,227
Operating lease liabilities	194,270	176,900
Total current liabilities	1,445,260	1,342,147
Long-term liabilities		
Operating lease liabilities	299,520	493,790
Total long-term liabilities	299,520	493,790
Shareholders' equity:		
Preferred stock, no par value; 50,000,000 shares authorized; 9,417,000 and 9,417,000 Series A shares, 6,600,000 and 6,600,000 Series B shares, -0- and 133.483 Series C shares issued and outstanding at December 31, 2021 and December 31, 2020, respectively	2,656,713	7,174,854
Common stock, $0.001 par value; 200,000,000 shares authorized 116,394,806 and 91,766,928 shares issued and outstanding at December 31, 2021 and December 31, 2020, respectively	116,395	91,767
Additional paid-in capital	194,987,219	164,022,957
Accumulated deficit	(171,274,128)	(154,444,983)
Total shareholders' equity	26,486,199	16,844,595
Total liabilities and shareholders' equity	$ 28,230,979	$ 18,680,532

See accompanying Report of Independent Registered Public Accounting Firm and notes to the consolidated financial statements.

Oragenics, Inc.
Consolidated Statements of Operations
For the Years Ended December 31, 2021 and 2020

	Year Ended December 31,	
	2021	**2020**
Grant revenue	$ 86,987	$ —
Operating expenses:		
Research and development	10,586,144	22,107,563
General and administrative	5,271,861	4,533,893
Total operating expenses	15,858,005	26,641,456
Loss from operations	(15,771,018)	(26,641,456)
Other income (expense):		
Interest income	75,847	89,294
Interest expense	(15,756)	(10,685)
Local business tax	(1,357)	(2,400)
Other income	670	1,795
Forgiveness of Paycheck Protection Program loan and accrued interest	—	132,753
Total other income, net	59,404	210,757
Loss before income taxes	(15,711,614)	(26,430,699)
Income tax benefit	—	—
Net loss	$ (15,711,614)	$ (26,430,699)
Basic and diluted net loss per share	$ (0.14)	$ (0.47)
Shares used to compute basic and diluted net loss per share	112,919,688	56,531,246

See accompanying Report of Independent Registered Public Accounting Firm and notes to the consolidated financial statements.

Oragenics, Inc.
Consolidated Statements of Changes in Shareholders' Equity
For the Years Ended December 31, 2021 and 2020

	Common Stock		Preferred Stock		Additional Paid In	Accumulated	Total Shareholders'
	Shares	**Amount**	**Shares**	**Amount**	**Capital**	**Deficit**	**Equity**
Balances at December 31, 2019	46,124,803	$ 46,125	16,017,113.941	$ 6,513,396	$ 138,024,957	$ (127,352,826)	$ 17,231,652
Compensation expense relating to option issuances	—	—	—	—	1,491,165	—	1,491,165
Issuance of common stock from warrant exercise	5,680,114	5,680	—	—	5,176,723	—	5,182,403
Series C dividend	—	—	19.542	661,458	—	(661,458)	—
Issuance of common stock and warrants for the acquisition of Noachis Terra	9,200,000	9,200	—	—	8,021,499	—	8,030,699

November 2020 public offering of common stock-net of expenses	16,317,567	16,318	—	—	5,383,057	—	5,399,375
December 2020 public offering of common stock-net of expenses	14,444,444	14,444	—	—	5,925,556	—	5,940,000
Net loss	—	—	—	—	—	(26,430,699)	(26,430,699)
Balances at December 31, 2020	91,766,928	$ 91,767	16,017,133.483	$ 7,174,854	$ 164,022,957	$ (154,444,983)	$ 16,844,595
Compensation expense relating to option issuances	—	—	—	—	1,688,022	—	1,688,022
Series C dividend	—	—	33.016	1,117,531	—	(1,117,531)	—
Series C Redemption			(166.499)	(5,635,672)	—	—	(5,635,672)
ATM Offering-net of expenses	21,398,765	21,399	—	—	26,654,993	—	26,676,392
Issuance of common stock from warrant exercise	2,472,573	2,473	—	—	2,258,864	—	2,261,337
Issuance of common stock from option exercise	756,540	756	—	—	362,383	—	363,139
Net loss	—	—	—	—	—	(15,711,614)	(15,711,614)
Balances at December 31, 2021	116,394,806	$ 116,395	16,017,000.000	$ 2,656,713	$ 194,987,219	$ (171,274,128)	$ 26,486,199

See accompanying Report of Independent Registered Public Accounting Firm and notes to the consolidated financial statements.

Oragenics, Inc.
Consolidated Statements of Cash Flows
For the Years Ended December 31, 2021 and 2020

	Year Ended December 31,	
	2021	**2020**
Cash flows from operating activities:		
Net loss	$ (15,711,614)	$ (26,430,699)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	41,237	51,705
Stock-based compensation expense	1,688,022	1,491,165
Stock issued for purchase of Noachis Terra	—	8,030,699
Forgiveness of Paycheck Protection Program loan and accrued interest	—	(132,753)
Changes in operating assets and liabilities:		
Other receivables	(6,987)	—
Prepaid expenses and other current assets	508,576	640,749
Accounts payable and accrued expenses	10,554	(603,730)
Net cash used in operating activities	(13,470,212)	(16,952,864)
Cash flows from investing activities:		
Purchase of property and equipment	(43,876)	—
Net cash used in investing activities	(43,876)	—
Cash flows from financing activities:		
Borrowings under short-term notes payable	—	132,088
Payments on short-term notes payable	(524,980)	(329,421)
Redemption of Series C Preferred stock	(5,635,672)	—
Proceeds from issuance of common stock for stock option exercise	363,139	—
Proceeds from issuance of common stock for warrant exercise	2,261,337	5,182,403
Net proceeds from issuance of common stock	26,676,392	11,339,375
Net cash provided by financing activities	23,140,216	16,324,445
Net increase (decrease) in cash and cash equivalents	9,626,128	(628,419)
Cash and cash equivalents at beginning of the year	17,639,575	18,267,994
Cash and cash equivalents at end of the year	$ 27,265,703	$ 17,639,575
Supplemental disclosure of cash flow information:		
Interest paid	$ 15,756	$ 10,020
Non-cash investing and financing activities:		
Borrowings under short term notes payable for prepaid expense	$ 600,169	$ 413,784
Stock dividend on Series C preferred stock	$ 1,117,531	$ 661,458

See accompanying Report of Independent Registered Public Accounting Firm and notes to the consolidated financial statements.

Oragenics, Inc.
Notes to Consolidated Financial Statements
December 31, 2021 and 2020

1. Basis of Presentation

The Company

Oragenics, Inc. (formerly known as Oragen, Inc.) (the "Company" or "we") was incorporated in November, 1996; however, operating activity did not commence until 1999. We are focused on the creation of the NT-CoV2-1 immunization product candidate to combat the novel coronavirus pandemic and the further development of effective treatments for novel antibiotics against infectious disease.

Basis of Presentation

The accompanying consolidated financial statements of the Company have been prepared in accordance with accounting principles generally accepted in the United States ("US GAAP") including the assumption of a going concern basis which contemplates the realization of assets and the settlement of liabilities and commitments in the normal course

of business.

The Company has incurred recurring losses and negative cash flows from operations since inception. To date the Company has not generated significant revenues from operations. The Company incurred a net loss of $(15,711,614) and used cash of $13,470,212 in its operating activities during the year ended December 31, 2021. As of December 31, 2021, the Company had an accumulated deficit of $(171,274,128) and cash flows from operations were negative throughout 2021.

Historically, the Company's major sources of cash have been comprised of proceeds from various public and private offerings of its common stock, preferred stock, warrant exercises, income earned on grants and interest income. From 2012 through 2021, the Company raised approximately $92 million in gross proceeds ($12.5 million and $27.8 million in fiscal year 2020 and 2021 respectfully) from various public and private offerings of its common stock. The Company expects to incur substantial expenditures to further develop each of its technologies. The Company believes the working capital at December 31, 2021, will be sufficient to meet the business objectives, as presently structured, through the fourth quarter of 2022. As a result, there is substantial doubt regarding the Company's ability to continue as a going concern for 12 months from the issuance of these consolidated financial statements.

The Company's ability to continue operations after its current cash resources are exhausted depends on its ability to obtain additional financing or achieve profitable operations, as to which no assurances can be given. Cash requirements may vary materially from those now planned because of changes in the Company's focus and direction of its research and development programs, competitive and technical advances, or other developments. Additional financing will be required to continue operations after the Company exhausts its current cash resources and to continue its long-term plans for clinical trials and new product development. There can be no assurance that any such financing can be realized by the Company, or if realized, what the terms thereof may be, or that any amount that the Company is able to raise will be adequate to support the Company's working capital requirements until it achieves profitable operations.

The Company intends to seek additional funding through sublicensing arrangements, joint venturing or partnering, sales of rights to technology, government grants and public or private financings and may receive funding through the exercise of outstanding warrants. The Company's future success depends on its ability to raise capital and ultimately generate revenue and attain profitability. The Company cannot be certain that additional capital, whether through selling additional debt or equity securities or obtaining a line of credit or other loan, will be available to it or, if available, will be on terms acceptable to the Company. If the Company issues additional securities to raise funds, these securities may have rights, preferences, or privileges senior to those of its common stock, and the Company's current shareholders may experience dilution. If the Company is unable to obtain funds when needed or on acceptable terms, the Company may be required to curtail its current development programs, cut operating costs and forego future development and other opportunities.

2. Significant Accounting Policies

Basis of Consolidation

The consolidated financial statements include the accounts of Oragenics, Inc. and our wholly-owned subsidiary Noachis Terra, Inc. All intercompany balances and transactions have been eliminated.

New Accounting Standards

From time to time, new accounting pronouncements are issued by the Financial Accounting Standards Board ("FASB") or other standard setting bodies that we adopt as of the specified effective date. Unless otherwise discussed, the Company does not believe that the impact of recently issued standards that are not yet effective will have a material impact on its financial position or results of operations upon adoption.

Income Taxes

In December 2019, the FASB issued ASU No. 2019-12, "Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes ("ASU 2019-12"), which is intended to simplify various aspects related to accounting for income taxes. ASU 2019-12 removes certain exceptions to the general principles in Topic 740 and also clarifies and amends existing guidance to improve consistent application. This guidance is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2020, with early adoption permitted. The Company's adoption of the provisions of ASU No. 2019-12, did not have an impact on its consolidated financial statements and related disclosures.

Use of Estimates

The preparation of consolidated financial statements in conformity with US GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the consolidated financial statements, as well as the reported amounts of expenses during the reporting period. Actual results could differ from those estimates. The principal areas of estimation reflected in the consolidated financial statements are stock-based compensation, and valuation of warrants.

Cash and Cash Equivalents

Cash and cash equivalents consist of all cash balances and highly liquid investments with an original maturity of three months or less. The Company's cash and cash equivalents are deposited in a financial institution and consist of demand deposits and overnight repurchase agreements and at times deposits are in excess of federally insured limits.

Other Receivables

Other receivables are recorded at their net realizable value and consist of amounts due for reimbursable expenses relating to work performed under the terms of the Company's federal grant.

Property and Equipment

Property and equipment is stated at cost less accumulated depreciation and amortization. Depreciation is provided on the straight-line method over the estimated useful lives of the assets (three to seven years). Leasehold improvements are amortized over the shorter of the estimated useful life or the lease term of the related asset (three years).

Business Segments

In accordance with US GAAP, the Company is required to report segment information. As the Company only operates principally in one business segment, no additional reporting is required.

Stock-Based Payment Arrangements

Generally, all forms of stock-based payments, including stock option grants, and warrants are measured at their fair value on the awards' grant date using a Black-Scholes pricing model. Stock-based compensation awards issued to non-employees for services rendered are recorded at the fair value of the stock-based payment. The expense resulting from stock-based payments are recorded in research and development expense or general and administrative expense in the consolidated statement of operations,

depending on the nature of the services provided. Stock-based payment expense is recorded over the requisite service period in which the grantee provides services to us. To the extent the stock option grants or warrants do not vest at the grant date they are subject to forfeiture.

Stock-Based Compensation

US GAAP requires all stock-based payments to employees, including grants of employee stock options, to be recognized in the consolidated financial statements based on their fair values as of the grant date. Stock-based compensation expense is recorded over the requisite service period in which the grantee provides services to us, to the extent the options do not vest at the grant date and are subject to forfeiture. For performance-based awards that do not include market-based conditions, we record share-based compensation expense only when the performance-based milestone is deemed probable of achievement. We utilize both quantitative and qualitative criteria to judge whether milestones are probable of achievement. For awards with market-based performance conditions, we recognize the grant-date fair value of the award over the derived service period regardless of whether the underlying performance condition is met. In connection with adopting ASU 2016-09, the Company made an accounting policy election to account for forfeitures in compensation expense as they occur.

Warrants

The Company used the Black Scholes Option Pricing Model in calculating the relative fair value of any warrants that have been issued.

Impairment of Long-Lived Assets

The Company periodically reviews their long-lived assets for impairment and reduces the carrying value to fair value whenever events or changes in circumstances indicate that the carrying value may not be recoverable. There were no impairment losses recorded during the years ended December 31, 2021, and 2020.

Research and Development Expenses

Research and development consist of expenses incurred in connection with the discovery and development of our product candidates. These expenses consist primarily of employee-related expenses, which include salaries and benefits and attending science conferences; expenses incurred under our license agreements with third parties and under other agreements with contract research organizations, investigative sites and consultants that conduct our clinical trials and a substantial portion of our nonclinical studies; the cost of acquiring and manufacturing clinical trial materials; facilities, depreciation and other allocated expenses, which include direct and allocated expenses for rent and maintenance of facilities and equipment, and depreciation of fixed assets; license fees, for and milestone payments related to, in-licensed products and technology; stock-based compensation expense; and costs associated with nonclinical activities and regulatory approvals. The Company expenses research and development costs as incurred.

Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are recognized for future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards.

Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rate is recognized in operations in the period that includes the enactment date. Deferred tax assets are reduced to estimated amounts expected to be realized by the use of a valuation allowance. Based on our historical operating losses, a valuation allowance has been recognized for all deferred tax assets.

Under US GAAP, the impact of an uncertain income tax position on the income tax return must be recognized at the largest amount that is more-likely-than-not to be sustained upon audit by the relevant taxing authority. An uncertain income tax position will not be recognized if it has less than a 50% likelihood of being sustained. Additionally, US GAAP provides guidance on derecognition, classification, interest and penalties, accounting for interim periods, disclosure and transition.

Concentrations

Financial instruments which potentially subject the Company to concentrations of credit risk consist principally of cash and cash equivalents. The Company maintains cash accounts in commercial banks, which may, at times, exceed federally insured limits. The Company has not experienced any losses in such accounts. The Company believes it is not exposed to any significant credit risk on cash and cash equivalents. As of December 31, 2021, the uninsured portion of this balance was $27,015,703. As of December 31, 2020, the uninsured portion of this balance was $17,389,575.

Grant Revenue

Grant revenues are derived from a small business innovation research grant in the amount of $250,000 (“Computer-aided Design for Improved Lantibiotics” R41GM136034. The Company recognizes grant revenue as reimbursable grant costs are incurred up to the pre-approved award limits within the budget period. The costs associated with these reimbursements are reflected as a component of research and development expenses in the accompanying consolidated statement of operations.

3. Acquisition

On May 1, 2020, the Company entered into a Stock Purchase Agreement with the sole shareholder of Noachis Terra Inc. (“NTI”), pursuant to which the Company acquired one hundred percent (100%) of the total issued and outstanding common stock of NTI (the “Transaction”). In exchange, the shareholder received the following: (i) cash consideration equal to $1,925,000, of which approximately $500,000 was applied to extinguish NTI’s pre-Transaction liabilities (a portion of which were due to the shareholder); (ii) 9,200,000 restricted shares of the Company’s common stock; and (iii) warrants to purchase9,200,000 shares of the Company’s common stock, which warrants carry an exercise price of $1.25 per share, a five-year term, and are exercisable commencing May 1, 2021, the first anniversary of the Transaction’s closing. The Company is also obligated to pay the former sole shareholder of NTI contingent consideration based upon the exercise of certain of the Company’s outstanding warrants as follows: (i) twenty percent (20%) of the cash proceeds received by the Company upon exercise of the Company’s warrants carrying an exercise price of $0.75 and $0.90 and (ii) forty-five percent (45%) of the cash proceeds received by the Company upon exercise of the Company’s warrants carrying an exercise price of $1.00, in each case, for so long as the warrants remain outstanding.

At the closing of the Transaction, the aggregate fair value of purchase consideration was $9,955,699, consisting of $1,925,000 of cash, the Company’s common stock (9,200,000 shares), and warrants to purchase the Company’s common stock, as follows:

	Fair Value
Cash - Initial Cash Payment	$ 1,925,000
Equity - Common Stock	4,627,600

Equity - Warrants		3,403,099
Total fair value of consideration	$	9,955,699

The Company determined that the acquisition should be accounted for as an asset purchase. The asset which was acquired was in-process research and development which does not have any alternative uses and therefore the aggregate fair value of the purchase price was recorded in research and development expenses in 2020.

4. Property and Equipment, net

Property and equipment, net consists of the following as of December 31, 2021 and 2020:

	2021	2020
Furniture and fixtures	$ 20,742	$ 20,742
Laboratory equipment	869,655	944,657
Leasehold improvements	487,871	487,871
Office and computer equipment	294,236	302,825
	1,672,504	1,756,095
Accumulated depreciation and amortization	(1,626,796)	(1,713,382)
Property and equipment, net	$ 45,708	$ 42,713

Depreciation and amortization expense for the years ending December 31, 2021 and 2020 was $41,237 and $51,705 respectively.

5. Accounts Payable and Accrued Expenses

Accounts payable and accrued expenses consist of the following as of December 31, 2021 and 2020:

	2021	2020
Accounts payable trade	$ 854,983	$ 330,379
Bonus	—	247,683
Professional fees	20,880	84,251
Vacation	57,731	158,721
Consulting fees	13,980	115,986
Total accounts payable and accrued expenses	$ 947,574	$ 937,020

6. Short-Term Notes Payable

The Company had the following short-term notes payable as of December 31, 2021 and 2020:

	2021	2020
Directors' and officers' liability insurance financing of $600,169 and $413,784 due in monthly installments of $61,496 and $38,638 including principal and interest at 5.34% and 5.39% through May 24, 2022 and June 28, 2021, respectively	$ 303,416	$ 228,227

The Company also maintains a product liability insurance policy which has been renewed in subsequent periods without premium financing.

7. Shareholders' Equity

Common Stock

Acquisition of Noachis Terra

On May 1, 2020, the Company issued 9,200,000 shares of common stock as partial consideration for its acquisition of Noachis Terra Inc.

November 2020 Public Offering

On November 24, 2020, the Company announced the closing of an underwritten public offering for gross proceeds of approximately $6.0 million, which included the full exercise of the underwriter's over-allotment option to purchase additional shares, prior to deducting underwriting discounts and commissions and offering expenses payable by the Company. The offering was comprised of 14,189,189 shares of common stock at a price to the public of $0.37 per share. The Company granted the underwriter a 45-day option to purchase up to 2,128,378 additional shares of common stock of the Company at the public offering price, less underwriting discounts and commissions. The underwriter exercised its option in full to purchase 2,128,378 additional shares of common stock, which the indicated gross proceeds reflect. The Company intends to use the net proceeds of the offering primarily to continue funding our pre-clinical development of our SARS-CoV-2 vaccine candidates, Terra CoV-2 and NT-CoV2-1, and our lantibiotics program and for general corporate purposes, including research and development activities, capital expenditures and working capital. Dr. Frederick Telling who is a Director of the Company, participated in the offering through the purchase of 100,000 shares of the Company's common stock. Dr. Telling's participation was approved by the Company's Audit Committee.

December 2020 Registered Direct Offering

On December 29, 2020, the Company announced the closing of a registered direct offering for gross proceeds of approximately $6.5 million, prior to deducting placement agent fees and offering expenses payable by the Company. The offering was comprised of 14,444,444 shares of common stock at a price to the public of $0.45 per share. The Company intends to use the net proceeds of the offering primarily to continue funding our pre-clinical development of our SARS-CoV-2 vaccine candidates, Terra CoV-2 and NT-CoV2-1, and our lantibiotics program and for general corporate purposes, including research and development activities, capital expenditures and working capital.

Shares issued under At-The-Market program

During the three months ended March 31, 2021, the Company issued 21,398,765 shares of common stock under its ATM Program which generated gross proceeds of approximately $27.8 million, The Company intends to use the net proceeds of the offering primarily to continue funding its pre-clinical development of its SARS-CoV-2 vaccine candidates, Terra CoV-2 and NT-CoV2-1, and its lantibiotics program and for general corporate purposes, including research and development activities, capital expenditures and working capital.

Other Share Issuances.

During the three month period ending September 30, 2020, the Company issued an additional 5,642,114 shares of common stock as a result of the exercise of certain outstanding warrants as follows: (i) an additional 760,000 warrants of the Company's previously reported remaining outstanding warrants to acquire 4,294,500 shares of Common Stock at an exercise price of $1.00 per share issued in connection with its July 2018 public offering (the "2018 Warrants"), were exercised and (ii) 4,882,114 warrants of the Company's previously reported outstanding warrants to acquire 9,583,334 shares of Common Stock at an exercise price of $0.90 per share issued in connection with its March 2019 public offering (the "2019 Warrants"), were exercised (collectively the "Warrant Exercises"). The Warrant Exercises provided aggregate gross proceeds to the Company of $5,153,902.

During the three months ended March 31, 2021, the Company issued 2,472,573 shares of common stock as the result of the exercise of certain outstanding warrants which generated gross proceeds of approximately $2.3 million.

During the nine months ended September 30, 2021, the Company issued 756,540 shares of common stock in connection with the exercise of stock options which generated gross proceeds of $363,139.

Preferred Stock

Issuance of Series A Convertible Preferred Stock Financing

On May 10, 2017 we entered into a securities purchase agreement with three accredited investors, to purchase up to $3,000,000 of Series A Convertible Preferred Stock (the "Series A Preferred Stock Financing"). The sale of the Preferred Stock took place in two separate closings and at the first closing which occurred on May 10, 2017, we received gross proceeds of approximately $1,302,000. The second closing occurred on July 25, 2017 and we received gross proceeds of approximately $1,698,000, which was the balance of the Preferred Stock Financing. The full $3,000,000 of Preferred Stock, and after giving effect to the reverse stock split and the previous conversion of 2,583,000 shares of Series A Preferred Stock into 258,300 shares of the Company's common stock, is convertible into nine hundred, forty-one thousand, seven hundred and one shares of our common stock, based on a fixed conversion price of $2.50 per share on an as-converted basis. In addition, and after giving effect to the reverse stock split, we issued warrants to purchase an aggregate of 462,106 shares of common stock at the first closing and we issued an aggregate of 602,414 shares of common stock at the second closing. The warrants have a term of seven years from the date of issuance are non-exercisable until 6 months after issuance, have an exercise price of $3.10 per share. Proceeds from the Series A Preferred Stock Financing (including the exercise of any warrants for cash) will be used for general corporate purposes, including working capital.

On July 27, 2017, we entered into an agreement to amend the warrants issued in connection with the Series A Preferred Stock Financing to provide notification and objection requirements with respect to the change of control provisions. The change of control provisions in the warrants had previously caused the warrants to be treated as a derivative liability as opposed to being treated as equity on our balance sheet. The warrants have been replaced by amended and restated warrants containing such notification and objection requirements (the "Amended and Restated Common Stock Purchase Warrants") so that the Amended and Restated Common Stock Purchase Warrants are now treated as equity on our balance sheet. All other terms of the original warrants remain unchanged by the Amended and Restated Common Stock Purchase Warrants.

In connection with the Series A Preferred Financing, we filed a Certificate of Designations of Preferences, Rights and Limitations of Series A Preferred Stock with the Secretary of State of the State of Florida, to be effective May 10, 2017. The number of shares of Preferred Stock designated as Series A Preferred Stock is 12,000,000.

In connection with the issuance and sale of the Series A Preferred Stock and warrants, we granted certain demand registration rights and piggyback registration rights with respect to the shares of our Common Stock issuable upon conversion of the Preferred Stock and exercise of the Warrants, pursuant to a Registration Rights Agreement.

Except as otherwise required by law, the Series A Preferred Stock shall have no voting rights. However, as long as any shares of Series A Preferred Stock are outstanding, we shall not, without the affirmative vote of the holders of a majority of the then outstanding shares of the Series A Preferred Stock, (a) alter or change adversely the powers, preferences or rights given to the Series A Preferred Stock or alter or amend the Certificate of Designation, (b) amend its articles of incorporation or other charter documents in any manner that adversely affects any rights of the holders of Series A Preferred Stock, (c) increase the number of authorized shares of Series A Preferred Stock, or (d) enter into any agreement with respect to any of the foregoing. Upon any liquidation, dissolution or winding-up by us, whether voluntary or involuntary that is not a Fundamental Transaction (as defined in the Certificate of Designation), the holders of Series A Preferred Stock shall be entitled to receive out of the assets, the greater of (i) the product of the number of shares of Series A Preferred Stock then held by such holder, multiplied by the Original Issue Price; and (ii) the amount that would be payable to such holder in the Liquidation in respect of Common Stock issuable upon conversion of such shares of Series A Preferred Stock if all outstanding shares of Series A Preferred Stock were converted into Common Stock immediately prior to the Liquidation. The Series A Preferred Stock is classified as permanent equity.

The Series B Non-Voting, Convertible Preferred Stock Financing

On November 8, 2017, we completed a private placement of $3,300,000 of Series B Non-Voting, Convertible Preferred Stock (the "Series B Convertible Preferred Stock") pursuant to a Securities Purchase Agreement with four existing shareholders who are accredited investors including an entity affiliated with a director of the Company (the "Series B Preferred Stock Financing").

The full $3,300,000 of Series B Convertible Preferred Stock is convertible, after giving effect to the reverse stock split into one million three hundred and twenty thousand and two shares of our Common Stock, based on a conversion of one share of Series B Preferred Stock into two shares of Common Stock. The purchase price per share of the Series B Preferred Stock is represented by $2.50 per share of the Common Stock on an as converted basis. In addition, and after giving effect to the reverse stock split, we issued to the investors in the private placement accompanying common stock purchase warrants to purchase an aggregate of 1,064,518 shares of Common Stock. The warrants have a term of seven years from the date of issuance, and are non-exercisable until six (6) months after issuance, and after giving effect to the reverse stock split, have an exercise price of $3.10 per share.

In connection with the Series B Preferred Financing, we filed a Certificate of Designation and Rights of Series B Convertible Preferred Stock with the Secretary of State of the State of Florida, to be effective November 8, 2017. The number of shares of Preferred Stock designated as Series B Preferred Stock is 6,600,000.

Except as otherwise required by law, the Series B Preferred Stock shall have no voting rights. However, as long as any shares of Series B Preferred Stock are outstanding, we shall not, without the affirmative vote of the holders of a majority of the then outstanding shares of the Series B Preferred Stock, (a) alter or change adversely the powers, preferences or rights given to the Series B Preferred Stock or alter or amend the Certificate of Designation, (b) amend its articles of incorporation or other charter documents in any manner that adversely affects any rights of the holders of Series B Preferred Stock, (c) increase the number of authorized shares of Series B Preferred Stock, or (d) enter into any agreement with respect to any of the foregoing.

The Series B Preferred Stock shall rank (i) on par with the Common Stock and Series A Preferred Stock and junior to Series C Preferred Stock as to dividend rights and (ii) junior to Series C Preferred Stock, on par with Series A Preferred Stock and senior to the Common Stock as to distribution of assets upon liquidation, dissolution or winding-up by us, whether voluntary or involuntary.

Upon any liquidation, dissolution or winding-up by us, whether voluntary or involuntary, the holders of Series B Preferred Stock shall be entitled to receive out of the assets, after payment to the holders of Series C Preferred Stock but on par with the holders of Series A Preferred Stock and in preference to the holders of the Common Stock, an amount of cash equal to the greater of (i) the product of the number of shares of Series B Preferred Stock then held by such holder, multiplied by the Original Issue Price; and (ii) the amount that would be payable to such holder in the Liquidation in respect of Common Stock issuable upon conversion of such shares of Series B Preferred Stock if all outstanding shares of Series B Preferred Stock were converted into Common Stock immediately prior to the Liquidation. The Series B Preferred Stock is classified as permanent equity.

The Series C Non-Voting, Non- Convertible Preferred Stock and Redemption

During the three months ended March 31, 2021, the Company provided a notice of redemption, to the holder of the Company's Series C Preferred Stock to redeem all outstanding Series C Preferred Stock (which included the dividend of 26.697 shares paid on January 28, 2021 and any accrued dividends due through the redemption date of March 13, 2021). The Series C Preferred Stock redemption amount of approximately $5.6 million was paid on March 15, 2021 and all outstanding shares of Series C Preferred Stock were cancelled.

Warrants

The Company's outstanding and exercisable warrants as of December 31, 2021 are presented below:

Exercise Price	Total Warrants Outstanding	Exercisable Warrants Outstanding	Expiration Date
$ 3.10	48,387	48,387	9/19/2022
$ 3.10	462,106	462,106	5/10/2024
$ 3.10	602,414	602,414	7/25/2024
$ 3.10	1,064,518	1,064,518	11/8/2024
$ 2.00	900,000	900,000	4/10/2023
$ 1.00	3,174,500	3,174,500	7/17/2025
$ 0.90	2,588,647	2,588,647	3/25/2024
$ 1.25	9,200,000	9,200,000	5/1/2025
	18,040,572	18,040,572	

All outstanding warrants are classified as equity on the Company's Consolidated Balance Sheets.

8. Stock Compensation Plan

The Company originally adopted the Oragenics, Inc. 2002 Stock Option and Incentive Plan (the "Stock Incentive Plan") in September 2002 which was subsequently amended on several occasions until it was amended and restated as the Company's 2012 Equity Incentive Plan, as amended (the "2012 Incentive Plan"). The aggregate number of shares of the Company's common stock currently authorized pursuant to its Plan, as amended, is 8,250,000 and the Company's Plan, as amended continues to provide that the maximum number of shares that may be subject to stock options and stock appreciation rights granted to any individual in a calendar year is 1,000,000 shares. The Plan also provides that the maximum number of shares that may be subject to awards (other than stock options and stock appreciation rights) intended to qualify as "performance-based compensation" under Section 162(m) of the Internal Revenue Code that may be granted to any individual in one calendar year is 1,000,000 shares (however, the exception for "performance-based compensation" under Code Section 162(m) was repealed in the Tax Cuts and Jobs Act of 2017, unless the awards intended to qualify for such exception were granted before November 2, 2017). As of December 31, 2021, an aggregate of 6,724,402 shares of common stock are covered by outstanding option awards and528,305 shares of common stock are available for future awards under the Plan.

The purpose of the 2012 Incentive Plan is to advance the interests of the Company by affording certain employees and directors of the Company and key consultants and advisors an opportunity to acquire or increase their proprietary interests in the Company. The 2012 Incentive Plan authorizes the grant of stock options (incentive and non-statutory), stock appreciation rights and restricted stock. Options are granted at the fair market value of the Company's stock on the date of grant. Options can generally vest either immediately or over a period of up to three years from their respective grant dates and expire 10 years from the date of grant. As of December 31, 2021, and 2020, the Company had not awarded any stock appreciation rights under the 2012 Incentive Plan.

Recipients of stock awards under our 2012 Incentive Plan become the owner of record of the stock immediately upon grant, which may be subject to certain restrictions. The balance of unvested restricted stock will be forfeited and automatically transferred back to us at no cost upon the termination of the recipient's employment. Upon vesting of restricted stock that is made to recipients who are employees, the recipient has the option to settle minimum withholding taxes by electing to have us withhold otherwise deliverable shares having a fair market value equal to the required tax obligations ("net-settlement"). The net-settlement shares are then immediately cancelled and retired and reduce the shares available for issuance under the Company's 2012 Incentive Plan.

The Company uses the Black-Scholes option pricing model to estimate the fair value of stock-based awards on the date of grant. The assumptions employed in the calculation of the fair value of share-based compensation expense were calculated as follows for all years presented:

- Expected dividend yield — based on the Company's historical dividend yield.
- Expected volatility — based on the Company's historical market price at consistent points in a period equal to the expected life of the options.
- Risk-free interest rate — based on the US Treasury yield curve in effect at the time of grant.
- Expected life of options — based on the Company's historical life of options exercised, giving consideration to the contractual terms of the grants, vesting schedules and expectations of future employee behavior.

The following table summarizes the assumptions used to estimate the fair value of stock options granted during the years ended December 31, 2021 and 2020:

	2021	2020
Expected dividend yield	0%	0%
Weighted-average expected volatility	146-149%	149-150%
Weighted-average risk-free interest rate	1.29-1.48%	0.61-1.66%
Expected life of options	10 years	10 years

Total compensation cost related to stock options was $1,688,022 and $1,491,165 for the years ended December 31, 2021 and 2020, respectively. As of December 31, 2021, there was $401,783 of unrecognized compensation costs related to stock options, which is expected to be recognized over a weighted average period of approximatelytwo years.

The following table represents stock option activity for the year ended December 31, 2021:

	Number of Options	Weighted Average Exercise Price	Weighted Average Contractual Term (In Years)	Aggregate Intrinsic Value
Outstanding at December 31, 2020	5,801,349	$ 0.90	8.52	$ 2,773
Expired	(2,180)	19.13		
Forfeited	(638,227)	1.20		
Granted	2,320,000	1.01		
Exercised	(756,540)	0.48		
Outstanding at December 31, 2021	6,724,402	$ 0.95	7.99	$ 2,773
Exercisable at December 31, 2021	5,702,734	$ 0.97	7.80	$ 2,773

The following table summarizes the weighted average grant date fair value of stock options granted per share, the total intrinsic value of stock options exercised and the grant date fair value of stock options that vested during the years ended December 31, 2021 and 2020:

	2021	2020
Weighted average grant date fair value of stock options granted per share	$ 0.99	$ 0.49
Intrinsic value of stock options exercised	$ 117,211	—
Grant date fair value of stock options that vested	$ 1,775,810	$ 1,212,483

9. License Agreements

NIH License

Through Noachis Terra Inc., the Company is a party to a Patent License and Biological Materials License Agreement (the "License Agreement" or "NIH License"), dated March 23, 2020, with the United States Department of Health and Human Services (the "HHS"), as represented by the National Institute of Allergy and Infectious Diseases ("NIAID"), an Institute within the National Institutes of Health ("NIH"). Under the terms of the License Agreement, the Company holds a nonexclusive, worldwide license to certain specified patent rights (including patent applications, provisional patent applications and Patent Cooperation Treaty ("PCT") patent applications) and biological materials relating to the use of pre-fusion coronavirus spike proteins to exploit products ("Licensed Products") and practice processes ("Licensed Processes") that are covered by the licensed patent rights and biological materials for the purpose of developing and commercializing a vaccine product candidate for SARS-CoV-2.

The License Agreement will expire upon (a) twenty (20) years from the first commercial sale where no licensed patent rights exist or have ceased to exist or (b) the expiration of the last patent contained in the licensed patent rights, unless terminated earlier. None of the applications included in the NIH licensed patent rights have issued yet. The NIH may terminate or modify the license in the event of a material breach, including if the Company does not meet certain milestones by certain dates, or upon certain insolvency events that remain uncured following the date that is 90 days following written notice of such breach or insolvency event. The Company may terminate the license, or any portion thereof, at its sole discretion at any time upon 60 days written notice to the NIH.

NRC License

On July 26, 2021, the Company entered into a non-exclusive Technology License Agreement (the "License Agreement") with the National Research Council of Canada ("NRC") pursuant to which the NRC grants to the Company a license to use NRC's inventions, patents, trade secrets, know-how, copyright, biological material, designs, and/or technical information created by or on behalf of the NRC (the "NRC Technologies") relating to the derivatives of CHO $^{2353\ TM}$ Cell Line listed in the License Agreement (the "Stable Cells") to: (i) make, research, and develop SARS-CoV-2 spike protein manufactured by a Stable Cell (the "Drug Substance") within Canada, Australia, the United Kingdom, the European Union and the United States (U.S.) (collectively the "Territory"); (ii) file regulatory approval, export and sell the final formulation of the Drug Substance ("Products") and (iii) engage contractors to use the Stable Cells to make Drug Substance or Products on behalf of the Company to be used and sold, worldwide, by the Company. The License Agreement was subsequently amended to include the Delta and Omicron variants. In addition, the Company subsequently amended the License Agreement to broaden the non-exclusive field of use to include all diseases caused by coronaviruses and any genetic variants thereof.

As consideration for the grant of the license, the Company will pay to the NRC an annual (low five digits) license fee, with the initial portion of the fee covering the first three years of the license. Additionally, we will pay certain milestone payments (a) upon transfer of each Stable Cell listed in the Agreement and (b) with regard to each of the first three Products, (i) upon submission of the Investigational New Drug application (IND) related thereto, (ii) upon dosing the first patient in a Phase 1 or Phase 2 clinical trial, (iii) upon dosing the first patient in a Phase 3 clinical trial and (iv) upon first regulatory approval. Milestone payments range from the low five digits to high six digits. In addition, Oragenics will pay a low single-digit royalty to the NRC for the sale of Products, based on sales revenue, commencing after the first commercial sale.

Pursuant to the License Agreement, the NRC is required to bear the responsibility and pay the costs to obtain and maintain patents related to the NRC Technologies in the U.S., Canada, Brazil, European Union, Japan, South Korea, Singapore, Australia, China, and India, and the NRC shall use reasonable efforts to obtain and maintain those patents. Additional countries may be requested by us, in which event, the NRC will file and maintain such patents, at our expense.

Pursuant to the License Agreement, we are required to indemnify and hold the NRC and its employees and agents harmless from and against all liability and damages in connection with or arising out of all claims, demands, losses, damages, costs including solicitor and client costs, actions, suits or proceedings brought by any third party that are in any manner based upon, arising out of, related to, occasioned by, or attributable to the manufacturing, distribution, shipment, offering for sale, sale, or use of Products, services based on the NRC Technologies and product liability and infringement of intellectual property rights other than copyright, if any, licensed under the License Agreement.

Unless terminated earlier, the License Agreement will terminate twenty (20) years from the effective date of the License Agreement. Either party may terminate the License Agreement, by giving written notice to the other party, if the other party defaults or is in breach of the License Agreement, provided that if the defaulting party cures the breach within 60 days after the notice is given, the License Agreement shall continue in full force and effect. The NRC may terminate the License Agreement if the Company becomes bankrupt, or insolvent, or has a receiver appointed to continue its operations, or passes a resolution for winding up. The License Agreement contains customary confidentiality obligations.

In addition, in connection with the initiative to develop its vaccine, we also previously entered into a material transfer agreement with the NRC for SARS-CoV-2 trimeric spike protein Wuhan variant and SARS-CoV-2 trimeric spike protein South African variant to move forward with pre-clinical testing.

Exclusive Channel Collaboration Agreement ("Lantibiotic ECC"):

On September 22, 2021, the Company and Eleszto Genetika, Inc. mutually terminated the amended and restated worldwide exclusive channel collaboration agreement dated

March 1, 2021 (the "Lantibiotic ECC") pursuant to which the Company was pursuing the development of OG716 as a lead product candidate for the treatment of *C. diff.*

As a result of the mutual termination of the Lantibiotic ECC, the Company will cease pre-clinical development of its product candidate OG716 and other compounds covered by the Lantibiotic ECC, all licenses provided pursuant to the Lantibiotic ECC between the parties were terminated and there are no continuing obligations between the parties, except as to confidentiality. The Company made no payments to EGI in connection with the mutual termination. Each party retained all right and title to their own respective intellectual property.

The Company is focusing on its continuing independent research and development efforts relative to lantibiotics in order to identify new compounds to pursue.

10. Retirement Plan

The Company has a defined contribution Simple Individual Retirement Arrangement plan, which covers all employees and provides for a Company match of up to 3% of all employee compensation to the plan. Total matching contributions made by the Company for the years ended December 31, 2021 and 2020 were $27,657 and $37,407 respectively.

11. Income Taxes

The components of the provision for income taxes for the years ended December 31, 2021 and 2020 are as follows:

	2021	2020
Current	$ —	$ —
Deferred	870,941	6,482,623
Valuation Allowance	(870,941)	(6,482,623)
Total provision for income taxes	$ —	$ —

At December 31, 2021 and 2020, the Company had temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and their respective income tax bases, as measured by enacted state and federal tax rates, as follows:

	2021	2020
Deferred tax assets (liabilities):		
Net operating loss carryforward	$ 36,340,873	$ 35,740,882
Accrued vacation	19,454	41,361
Non-qualified stock compensation	1,091,576	798,719
Restricted stock	-	-
Total deferred tax assets, net	37,451,903	36,580,962
Less valuation allowance	(37,451,903)	(36,580,962)
Total net deferred taxes	$ —	$ —

The following is a reconciliation of tax computed at the statutory federal rate to the income tax benefit in the statements of operations for the years ended December 31, 2021 and 2020:

	2021	2020
Income tax benefit computed at statutory federal rate of 21% and 21%, respectively	$ (3,299,439)	$ (5,550,447)
State income tax benefits, net of federal expense/benefit	(682,670)	(1,148,414)
Change in valuation allowance	870,941	6,482,623
Non-deductible expenses	2,821,537	740
Other	289,631	215,498
Total	$ —	$ —

In assessing the realizability of deferred tax assets, management considers whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of deferred tax assets is dependent upon the generation of future taxable income during the periods in which those temporary differences become deductible. Management considers the scheduled reversal of deferred tax liabilities, projected future taxable income, and tax planning strategies in making this assessment. Based upon the levels of historical taxable income and projections of future taxable income over which the deferred tax assets are deductible, the Company believes that it is more likely than not that it will not be able to realize the benefits of some of these deductible differences.

Accordingly, a valuation allowance of $37,451,903 and $36,580,962 has been provided in the accompanying consolidated financial statements as of December 31, 2021 and 2020, respectively. The 2021 net change in valuation allowance related to deferred tax assets was an increase of $870,941 primarily relating to net operating loss carryforwards. The 2020 net change in valuation allowance related to deferred tax assets was an increase of $6,482,623 primarily relating to net operating loss carryforwards and a change in the effective tax rate.

At December 31, 2021, the Company has federal and state tax net operating loss carryforwards of $145,260,353. Federal and state tax net operating loss carryforwards generated prior to December 31, 2017 will expire through 2037 and are not subject to taxable income limitations. Federal tax net operating loss carryforwards generated subsequent to December 31, 2017, do not expire but are subject to taxable income limitation pursuant to the Tax Cuts and Jobs Act that was enacted on December 22, 2017. State of Pennsylvania tax net operating loss carryforwards will expire through 2036. The Company also has federal research and development tax credit carryforwards of $4,027,180. The federal tax credit carryforward will expire beginning in 2021 and continuing through 2041 unless previously utilized.

Utilization of net operating loss carryforwards and research and development credit carryforwards may be subject to a substantial annual limitation due to ownership change limitations that may have occurred or, could occur in the future in accordance with Section 382 of the Internal Revenue Code of 1986 ("IRC Section 382") and with Section 383 of the Internal Revenue Code of 1986, as well as similar state provisions. These ownership changes may limit the amount of net operating loss carryforwards and research and development credit carryforwards that can be utilized annually to offset future taxable income and taxes, respectively. In general, an ownership change, as defined by IRC Section 382, results from transactions increasing the ownership of certain stockholders or public groups in the stock of a corporation by more than 50 percentage points over a three-year period. The Company has completed several financings since its inception which may result in a change in ownership as defined by IRC Section 382, or could result in a change in control in the future.

For the years ended December 31, 2021 and 2020, the Company incurred $509,320 and $1,129,848, respectively, of additional unrecognized tax benefits that related to research and development credits. The entire amount of this unrecognized tax benefit, if recognized, would result in an increase to the deferred tax asset valuation allowance, and would not have an impact on the effective tax rate.

The Company files its income tax returns in the U.S. federal jurisdiction and in Florida and Pennsylvania. With few exceptions, the Company is no longer subject to federal or state income tax examinations by tax authorities for years before 2014.

A reconciliation of the beginning and ending amount of unrecognized tax benefits is as follows:

Balance as of December 31, 2019	$	2,804,721
Additions based on tax positions related to the current year		1,129,848
Additions for return-to-provision true-up		108,136
Balance as of December 31, 2020	$	4,042,705
Additions based on tax positions related to the current year		509,320
Reductions for the tax positions of prior years		(524,845)
Balance as of December 31, 2021	$	4,027,180

Included in the balance at December 31, 2021 and 2020, are $4,027,180 and $4,042,705, respectively, of tax positions for which there is uncertainty about the validity of certain credits. The disallowance of the credits would impact the amount of gross deferred tax assets reflected in the accompanying footnotes.

During the years 2021 and 2020 the Company did not recognize any interest and penalties. Due to the potential offset of the Company's operating loss carryforward for any future activity, the amount attributed to interest and penalties would be immaterial.

12. Commitments and Contingencies

Additional Consideration-Noachis Terra Inc.("NTI") Acquisition.

In connection with the Company's acquisition of NTI, the Company is obligated to pay the former sole shareholder of NTI contingent consideration based upon the exercise of certain of the Company's outstanding warrants as follows: (i) twenty percent (20%) of the cash proceeds received by the Company upon exercise of the Company's warrants carrying an exercise price of $0.75 and $0.90 and (ii) forty-five percent (45%) of the cash proceeds received by the Company upon exercise of the Company's warrants carrying an exercise price of $1.00, in each case, for so long as the warrants remain outstanding. The Company's previously issued warrants carrying an exercise price of $0.75 have expired by their terms. As a result, no additional consideration will be due to the former sole shareholder of NTI relating to these warrants.

During the three month period ending September 30, 2020, (i) 760,000 warrants of the Company's previously reported remaining outstanding warrants to acquire 4,294,500 shares of Common Stock at an exercise price of $1.00 per share issued in connection with its July 2018 public offering, were exercised and (ii) 4,882,114 warrants of the Company's previously reported outstanding warrants to acquire 9,583,334 shares of Common Stock at an exercise price of $0.90 per share issued in connection with its March 2019 public offering, were exercised. See Note 7. Shareholders' Equity.

As a result of the warrant exercises in 2020, the Company paid $1,220,781 of additional consideration to the sole former shareholder of NTI. The additional consideration payment is included in research and development expenses.

During the three months ended March 31, 2021, 2,472,573 warrants were exercised as follows: (i) 360,000 shares at an exercise price of $1.00 per share and (ii) 2,112,573 at an exercise price of $0.90 per share. See Note 7. Shareholders' Equity.

As a result of the warrant exercises in 2021, the Company paid $542,263 of additional consideration to the sole former shareholder of NTI. The additional consideration payment is included in research and development expenses.

NIH License

Through NTI, the Company is a party to a Patent License and Biological Materials License Agreement (the "License Agreement" or "NIH License"), dated March 23, 2020, with the United States Department of Health and Human Services (the "HHS"), as represented by the National Institute of Allergy and Infectious Diseases ("NIAID"), an Institute within the National Institutes of Health ("NIH"). Under the terms of the License Agreement, we hold a nonexclusive, worldwide license to certain specified patent rights (including patent applications, provisional patent applications and Patent Cooperation Treaty ("PCT") patent applications) and biological materials relating to the use of pre-fusion coronavirus spike proteins to exploit products ("Licensed Products") and practice processes ("Licensed Processes") that are covered by the licensed patent rights and biological materials for the purpose of developing and commercializing a vaccine product candidate for SARS-CoV-2.

Under the terms of the NIH License Agreement, the NIAID is entitled to receive a non-creditable, nonrefundable upfront license issue royalty of $30,000 and reimbursement of $11,739 for our pro rata share of the NIAID's past and future patent prosecution-related expenses (which amounts have already been paid). Additionally, the NIAID is entitled to receive lump sum nonrefundable minimum annual royalties, which increase in the year after the first commercial sale of any Licensed Products or the practice of any Licensed Processes, as well as lump sum benchmark royalties following our completion of certain commercial development and sales-related benchmarks. The NIH is entitled to receive earned royalties on the annual net sales of Licensed Products and the practice of any Licensed Processes (subject to certain reductions), at certain low- to mid-single digit royalty rates, which rates vary based on the total amount of annual net sales and the geographic market in which those sales occur. We must provide regular written reports to the NIAID on the development status of and royalty payments relating to the Licensed Products and the Licensed Processes.

The License Agreement will expire upon (a) twenty (20) years from the first commercial sale where no licensed patent rights exist or have ceased to exist or (b) the expiration of the last patent contained in the licensed patent rights, unless terminated earlier. None of the applications included in the NIH licensed patent rights have issued yet. The NIH may terminate or modify the license in the event of a material breach, including if the Company does not meet certain milestones by certain dates, or upon certain insolvency events that remain uncured following the date that is 90 days following written notice of such breach or insolvency event. The Company may terminate the license, or any portion thereof, at its sole discretion at any time upon 60 days written notice to the NIH.

NRC License

On July 26, 2021, the Company entered into a non-exclusive Technology License Agreement (the "License Agreement") with the National Research Council of Canada ("NRC") pursuant to which the NRC grants to the Company a license to use NRC's inventions, patents, trade secrets, know-how, copyright, biological material, designs, and/or technical information created by or on behalf of the NRC (the "NRC Technologies") relating to the derivatives of CHO $^{2353\ TM}$ Cell Line listed in the License Agreement (the "Stable Cells") to: (i) make, research, and develop SARS-CoV-2 spike protein manufactured by a Stable Cell (the "Drug Substance") within Canada, Australia, the United Kingdom, the European Union and the United States (U.S.) (collectively the "Territory"); (ii) file regulatory approval, export and sell the final formulation of the Drug Substance ("Products") and (iii) engage contractors to use the Stable Cells to make Drug Substance or Products on behalf of the Company to be used and sold, worldwide, by

the Company. The company announced on December 20, 2021, that the license was extended to include the Omicron variant. On February 3, 2022, the Company broadened the non-exclusive field of use to include all diseases caused by coronaviruses and any genetic variants thereof.

As consideration for the grant of the license, the Company will pay to the NRC an annual (low five digits) license fee, with the initial portion of the fee covering the first three years of the license. Additionally, we will pay certain milestone payments (a) upon transfer of each Stable Cell listed in the Agreement and (b) with regard to each of the first three Products, (i) upon submission of the Investigational New Drug application (IND) related thereto, (ii) upon dosing the first patient in a Phase 1 or Phase 2 clinical trial, (iii) upon dosing the first patient in a Phase 3 clinical trial and (iv) upon first regulatory approval. Milestone payments range from the low five digits to high six digits. In addition, Oragenics will pay a low single-digit royalty to the NRC for the sale of Products, based on sales revenue, commencing after the first commercial sale.

Pursuant to the License Agreement, the NRC is required to bear the responsibility and pay the costs to obtain and maintain patents related to the NRC Technologies in the U.S., Canada, Brazil, European Union, Japan, South Korea, Singapore, Australia, China, and India, and the NRC shall use reasonable efforts to obtain and maintain those patents. Additional countries may be requested by us, in which event, the NRC will file and maintain such patents, at our expense.

Pursuant to the License Agreement, we are required to indemnify and hold the NRC and its employees and agents harmless from and against all liability and damages in connection with or arising out of all claims, demands, losses, damages, costs including solicitor and client costs, actions, suits or proceedings brought by any third party that are in any manner based upon, arising out of, related to, occasioned by, or attributable to the manufacturing, distribution, shipment, offering for sale, sale, or use of Products, services based on the NRC Technologies and product liability and infringement of intellectual property rights other than copyright, if any, licensed under the License Agreement.

Unless terminated earlier, the License Agreement will terminate twenty (20) years from the effective date of the License Agreement. Either party may terminate the License Agreement, by giving written notice to the other party, if the other party defaults or is in breach of the License Agreement, provided that if the defaulting party cures the breach within 60 days after the notice is given, the License Agreement shall continue in full force and effect. The NRC may terminate the License Agreement if the Company becomes bankrupt, or insolvent, or has a receiver appointed to continue its operations, or passes a resolution for winding up. The License Agreement contains customary confidentiality obligations.

Leases

Lab Facility-Alachua. The Company's Alachua facility is being leased from a real estate developer for a term of five years beginning in December 2014. Under the lease agreement, the rental payments range from $9,641 per month to $10,851 per month. In June of 2019, the Company entered into an amendment for the Alachua facility for a term of five years beginning in December of 2019. Under the amended lease agreement, the rental payments range from $12,870 per month to $13,338 per month. Total rental expense for the Alachua facility during the year ended December 31, 2021 was approximately $165,000. The lease may be terminated prior to its stated expiration date upon the payment of nine-months rent.

Corporate Office-Tampa. In November of 2016, the Company entered into an amendment for the leased office space for corporate personnel located in Tampa, FL. The amended lease is for approximately 2,207 square feet. The lease period for the office space is for thirty-six months commencing on March 1, 2017. Lease payments range from $4,138 per month to $4,392 per month inclusive of insurance, taxes and utilities. The lease expires on February 29, 2020. In November of 2019, the Company entered into an amendment for the Tampa facility for a term of three years beginning in March of 2020. Under the amended lease agreement, the rental payments range from $4,524 per month to $4,800 per month. Total rent expense under this lease was approximately $63,000 for the year ended December 31, 2021.

	For the Twelve Months Ended December 31, 2021	For the Twelve Months Ended December 31, 2020
Weighted Average Remaining Lease Term In Years		
Operating leases	2.45	3.46
Weighted Average Discount Rate		
Operating leases	5.70%	5.70%

Maturities of operating lease liabilities are as follows:

Year ended December 31:	
2022	217,379
2023	169,657
2024	146,718
Total	$ 533,754
Less: Imputed interest	(39,964)
Present value of lease liabilities	$ 493,790

The cost component of operating leases is as follows:

	For the Twelve Months Ended December 31, 2021	For the Twelve Months Ended December 31, 2020
Operating lease cost	$ 228,231	$ 226,090
Short-term lease cost	1,036	2,149
Total lease cost	$ 229,267	$ 228,239

Supplemental cash flow information related to operating leases is as follows:

	For the Twelve Months Ended December 31, 2021	For the Twelve Months Ended December 31, 2020

Cash paid for amounts included in the measurement of lease liabilities:				
Operating cash flows from operating leases	$	(227,753)	$	(255,681)

13. Subsequent Events

On February 25, 2022 we held our annual meeting of shareholders for 2020 at which time our shareholders approved: (i) the adoption of an amendment to our Amended and Restated Articles of Incorporation to provide for a reduced quorum requirement of one-third (1/3) of shares entitled to vote represented in person or by a proxy, in order to constitute a meeting of shareholders; (ii) the adoption of an amendment to our Amended and Restated Articles of Incorporation which increased the number of authorized shares of our Common Stock from 200,000,000 shares of Common Stock to 250,000,000 shares of Common Stock; and (iii) the adoption of our new 2021 Equity Incentive Plan which succeeds the Company's 2012 Plan

Exhibit 31.3

CERTIFICATION

I, Kimberly Murphy, certify that:

1. I have reviewed this Amendment No. 1 to the Annual Report on Form 10-K of Oragenics, Inc.; and

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.

Dated this 29th day of July, 2022

By: */s/ Kimberly Murphy*
Kimberly Murphy
Principal Executive Officer

Exhibit 31.4

CERTIFICATION

I, Michael Sullivan, certify that:

1. I have reviewed this Amendment No. 1 to the Annual Report on Form 10-K of Oragenics, Inc.; and

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.

Dated this 29th day of July, 2022

By: */s/ Michael Sullivan*
Michael Sullivan
Principal Financial Officer

Exhibit 32.1

Certification of Principal Executive Officer

Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (18 U.S.C. Section 1350)

In connection with the Annual Report on Form 10-K for the period ended December 31, 2021 (the "Report") of Oragenics, Inc. (the "Registrant"), as amended by Amendment No. 1 to the Annual Report on Form 10-K/A of the Company as filed with the Securities and Exchange Commission on the date hereof, I, Kimberly Murphy, hereby certify, to the best of my knowledge, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended; and
(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Registrant.

/s/ Kimberly Murphy
Name: Kimberly Murphy
Principal Executive Officer

Date: July 29, 2022

Exhibit 32.2

Certification of Principal Financial Officer

Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (18 U.S.C. Section 1350)

In connection with the Annual Report on Form 10-K for the period ended December 31, 2021 (the "Report") of Oragenics, Inc. (the "Registrant"), as amended by Amendment No. 1 to the Annual Report on Form 10-K/A of the Company as filed with the Securities and Exchange Commission on the date hereof, I, Michael Sullivan, hereby certify, to the best of my knowledge, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended; and
(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Registrant.

/s/ Michael Sullivan
Name: Michael Sullivan
Principal Financial Officer

Date: July 29, 2022