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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, DC 20549

FORM 10-K

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

For the fiscal year ended December 31, 2022
or

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

For the transition period from _____ to _____

Commission file Number 001-37853

FIRST WAVE BIOPHARMA, INC.

(Exact name of registrant as specified in its charter)

Delaware	46-4993860
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)

777 Yamato Road, Suite 502
Boca Raton, Florida 33431
(Address of principal executive offices)

(561) 589-7020
(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, par value $0.0001 per share	FWBI	The Nasdaq Capital Market

Securities registered under 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 Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☐	Accelerated filer	☐
Non-accelerated filer	☒	Smaller reporting company	☒
		Emerging growth company	☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☐

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

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

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

The aggregate market value of common stock held by non-affiliates of the registrant, based on the closing price of a share of the registrant's common stock on June 30, 2022, which is the last business day of the registrant's most recently completed second fiscal quarter, as reported by the The Nasdaq Capital Market on such date, was approximately $4.5 million.

There were 1,549,581 shares of the registrant's common stock, par value $0.0001 per share (the "Common Stock"), outstanding as of March 16, 2023.

FIRST WAVE BIOPHARMA, INC.
ANNUAL REPORT ON FORM 10-K
YEAR ENDED DECEMBER 31, 2022

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CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K ("*Annual Report"*) contains forward-looking statements that involve substantial risks and uncertainties. All statements contained in this Annual Report other than statements of historical facts, including statements regarding our strategy, future operations, future financial position, future revenue, projected costs, prospects, plans, objectives of management and expected market growth, are forward-looking statements. These statements involve known and unknown risks, uncertainties and other important factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements.

The words "anticipate", "believe", "estimate", "expect", "intend", "may", "plan", "predict", "project", "target", "potential", "will", "would", "could", "should", "continue" and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. These forward-looking statements include, among other things, statements about:

- our ability to maintain compliance with the continued listing requirements of The Nasdaq Capital Market;
- our ability to satisfy our payment obligations under the First Wave Acquisition (as defined below);
- statements regarding the impact of the COVID-19 pandemic and other geopolitical events, including the war in Ukraine and their effects on our operations, access to capital, research and development and clinical trials and potential disruption in the operations and business of third-party vendors, contract research organizations ("*CROs*"), contract development and manufacturing organizations ("*CDMOs*"), other service providers, and collaborators with whom we conduct business;
- the availability of capital to satisfy our working capital requirements;
- our current and future capital requirements and our ability to raise additional funds to satisfy our capital needs;
- the integration and effects of our acquisitions, including the First Wave Acquisition, and other strategic transactions;
- the accuracy of our estimates regarding expense, future revenue and capital requirements;
- our ability to continue operating as a going concern;
- our plans to develop and commercialize our product candidates, including niclosamide and the biologic adrulipase (formerly MS1819);
- our ability to initiate and complete our clinical trials and to advance our principal product candidates into additional clinical trials, including pivotal clinical trials, and successfully complete such clinical trials;
- regulatory developments in the U.S. and foreign countries;
- the performance of our third-party vendor(s), CROs, CDMOs and other third-party non-clinical and clinical development collaborators and regulatory service providers;
- our ability to obtain and maintain intellectual property protection for our core assets;
- the size of the potential markets for our product candidates and our ability to serve those markets;
- the rate and degree of market acceptance of our product candidates for any indication once approved;

- the success of competing products and product candidates in development by others that are or become available for the indications that we are pursuing;
- the loss of key scientific, clinical and nonclinical development, and/or management personnel, internally or from one of our third-party collaborators; and
- other risks and uncertainties, including those listed under Part I, Item 1A., "*Risk Factors*" of this Annual Report.

Factors that may cause actual results to differ materially from current expectations include, among other things, those set forth in Part I, Item 1A, "*Risk Factors*," herein and for the reasons described elsewhere in this Annual Report on Form 10-K. Any forward-looking statement in this Annual Report on Form 10-K reflects our current view with respect to future events and is subject to these and other risks, uncertainties and assumptions relating to our operations, results of operations, industry and future growth. Given these uncertainties, you should not rely on these forward-looking statements as predictions of future events. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee future results, levels of activity, performance or achievements. Except as required by law, we assume no obligation to update or revise these forward-looking statements for any reason, even if new information becomes available in the future.

This Annual Report on Form 10-K also contains estimates, projections and other information concerning our industry, our business and the markets for certain drugs and consumer products, including data regarding the estimated size of those markets, their projected growth rates and the incidence of certain medical conditions. Information that is based on estimates, forecasts, projections or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances reflected in this information. Unless otherwise expressly stated, we obtained these industry, business, market and other data from reports, research surveys, studies and similar data prepared by third parties, industry, medical and general publications, government data and similar sources and we have not independently verified the data from third party sources. In some cases, we do not expressly refer to the sources from which these data are derived.

In this Annual Report on Form 10-K, unless otherwise stated or as the context otherwise requires, references to "*First Wave*," the "*Company*," "*we*," "*us*," "*our*" and similar references are to First Wave BioPharma, Inc. and its subsidiaries on a consolidated basis. References to "*First Wave BioPharma*" refer to First Wave BioPharma, Inc. on an unconsolidated basis. References to "*AzurRx SAS*" refer to AzurRx SAS, First Wave BioPharma's former wholly-owned subsidiary through which we conducted our European operations, which was dissolved effective October 26, 2022. References to "*FWB*" refer to First Wave Bio, Inc., First Wave BioPharma's wholly-owned subsidiary.

PART I

ITEM 1. BUSINESS

Overview

We are engaged in the research and development of targeted, non-systemic therapies for the treatment of patients with gastrointestinal ("*GI*") diseases. Non-systemic therapies are drugs that act locally, i.e. in the intestinal lumen, skin or mucosa, without reaching an individual's systemic circulation.

We are developing our product candidates for a host of GI diseases where there are significant unmet clinical needs and limited therapeutic options, resulting in painful, life threatening and discomforting consequences for patients. Our mission is to help protect the health and restore quality of life for the millions of people afflicted by these GI diseases.

We are currently focused on developing our pipeline of gut-restricted GI clinical product candidates, including the biologic adrulipase (formerly MS1819), a recombinant lipase enzyme designed to enable the digestion of fats and other nutrients, and niclosamide, an oral small molecule with anti-inflammatory properties.

Our adrulipase programs are focused on the development of an oral, non-systemic, biologic capsule for the treatment of exocrine pancreatic insufficiency ("*EPI*") in patients with cystic fibrosis ("*CF*") and chronic pancreatitis ("*CP*"). Our goal is to provide CF and CP patients with a safe and effective therapy to control EPI that is non-animal derived and offers the potential to dramatically reduce their daily pill burden. In November 2022 we filed a Phase 2b investigational new drug ("*IND*") amendment for a bridging study using a new enteric microgranule formulation of adrulipase with the U.S. Food and Drug Administration ("*FDA*"). We initiated the Phase 2b monotherapy trial during the first quarter of 2023 and expect topline data in the third quarter of 2023.

Our niclosamide programs leverage proprietary oral and topical formulations to address multiple GI conditions, including inflammatory bowel diseases ("*IBD*") indications. In 2022 we advanced two separate Phase 2 clinical programs of our niclosamide formulations, including FW-COV for Severe Acute Respiratory Syndrome Coronavirus 2 ("*COVID-19*") GI infections, and FW-UP for ulcerative proctitis ("*UP*") and ulcerative proctosigmoiditis ("*UPS*").

We announced the completion of enrollment in the FW-COV trial in January 2022 and topline results in August 2022. In September 2022 we announced that we would no longer pursue the anti-viral COVID-GI clinical indication as a result of the mixed results from the FW-COVID-19 trial. Additionally, we are devoting fewer resources to the FW-UP/UPS niclosamide program due to inconclusive data from a small Phase 2 trial in Europe, the need for a new FDA-IND cleared protocol, and capital constraints.

We are continuing to develop FW-ICI-AC for Immune Checkpoint Inhibitor-associated colitis ("*ICI-AC*") and diarrhea in advanced stage oncology patients and have received FDA clearance for an IND application for this program. We are also continuing two pre-IND programs of our niclosamide therapies for additional IBD indications, including FW-UC for ulcerative colitis ("*UC*") and FW-CD for Crohn's disease ("*CD*").

Each drug candidate and clinical program is described below.

Adrulipase

Adrulipase is the active pharmaceutical ingredient ("*API*") derived from *Yarrowia lipolytica*, an aerobic yeast naturally found in various foods such as cheese and olive oil that is widely used as a biocatalyst in several industrial processes. Adrulipase is a secreted lipase naturally produced by *Yarrowia lipolytica*, known as LIP2, that we are developing through recombinant DNA technology for the treatment of EPI associated with CF and CP. Lipases are enzymes that help with the digestion of lipids and fat.

We previously held the exclusive right to commercialize adrulipase in the U.S., Canada, South America (excluding Brazil), Asia (excluding China and Japan), Australia, New Zealand and Israel pursuant to a sublicense from Laboratories Mayoly Spindler SAS ("*Mayoly*") under the Joint Research and Development Agreement ("*JDLA*"), which also granted us joint commercialization rights for Brazil, Italy, China and Japan. In March 2019, we purchased all rights, title and interest in and to adrulipase from Mayoly pursuant to the Mayoly Asset Purchas Agreement ("*APA*"), *provided*, *however*, Mayoly retained exclusive commercial rights in France and Russia.

Background

The pancreas is both an endocrine gland that produces several important hormones, including insulin, glucagon, and pancreatic polypeptide, as well as a digestive organ that secretes pancreatic juice containing digestive enzymes that assist with the absorption of nutrients and digestion in the small intestine.

The targeted indication of adrulipase is the treatment of EPI, which is observed when the exocrine functions of the pancreas are below 10% of normal. The symptomatology of EPI is essentially due to the deficiency of pancreatic lipase, an enzyme that hydrolyses triglycerides into monoglycerides and free fatty acids. The pancreatic lipase enzymatic activity is hardly compensated by extra-pancreatic mechanisms, because gastric lipase has nearly no lipolytic activity in the pH range of the intestine. On the other hand, when they are impaired, the pancreatic amylase and protease (enzymes that break up carbohydrates (starches) and proteins, respectively) activities can be compensated by the salivary amylase, the intestinal glycosidase, the gastric pepsin, and the intestinal peptidases, all of which are components of the gastric juice secreted by the stomach walls. Lipid maldigestion due to lipase deficiency is responsible for weight loss, steatorrhea featured by greasy diarrhea, and fat-soluble vitamin deficiencies (i.e. A, D, E and K vitamins).

CP, the most common cause of EPI, is a long-standing inflammation of the pancreas that alters its normal structure and functions. In the U.S., its prevalence rate is of 42 cases per 100,000 inhabitants, resulting in approximately 132,000 cases. Approximately 60% of patients affected with CP display EPI, resulting in approximately 90,000 patients requiring substitution therapy in the U.S. In Western societies, CP is caused by chronic alcoholic consumption in approximately 55-80% of cases. Other relatively frequent etiologies include the genetic form of the disease that is inherited as an autosomal dominant condition with variable penetrance, pancreatic trauma and idiopathic causes.

CF, another dominant etiology of EPI, is a severe genetic disease associated with chronic morbidity and life-span decrease of most affected individuals. In most Caucasian populations, CF prevalence is of 7-8 cases per 100,000 inhabitants, but is less common in other populations, resulting in more than 30,000 affected individuals in the U.S. and more than 70,000 affected individuals worldwide. CF is inherited as monogenic autosomal recessive disease due to the defect at a single gene locus that encodes the Cystic Fibrosis Transmembrane Regulator protein, or CFTR, a regulated chloride channel. Mutation of both alleles of this chloride channel gene results in the production of thick mucus, which causes a multisystem disease of the upper and lower respiratory tracts, digestive system, and the reproductive tract. The progressive destruction of the pancreas results in EPI that is responsible for malnutrition and contributes to significant morbidity and mortality. About 80-90% of patients with CF develop EPI, resulting in approximately 25,000-27,000 patients in the U.S. that require substitution therapy.

Current treatments for EPI stemming from CP and CF rely on porcine (pig derived) pancreatic enzyme replacement therapies ("*PERTs*"), which have been on the market since the late 1800s. PERTs are typically comprised of three digestive enzymes; lipases, proteases, and amylases. The PERT market is well established with estimated sales of approximately $1.4 billion in 2019 in the U.S. and has been growing for the past five years at a compound annual growth rate of approximately 20%. In spite of their long-term use, however, PERTs suffer from poor stability, formulation problems, possible transmission of conventional and non-conventional infectious agents due to their animal origins, and possible adverse events at high doses in patients with CF and limited effectiveness.

Pre-Clinical Program

The efficacy of adrulipase has been investigated in normal minipigs, which are generally considered to be a relevant model for digestive drug development because of their physiological similarities with humans and their omnivorous diet. Experimental pancreatitis was induced by pancreatic duct ligation, resulting in severe EPI with baseline CFA around 60% post-ligature. CFA is a measurement obtained by quantifying the amount of fat ingested orally over a defined time period and subtracting the amount eliminated in the stool to ascertain the amount of fat absorbed by the body. Pigs were treated with either adrulipase or enteric-coated PERTs, both administered as a single-daily dose.

At doses ranging from 10.5 to 211 mg, adrulipase increased the CFA by +25 to +29% in comparison to baseline ($p<0.05$ at all doses), whereas the 2.5 mg dose had milder activity. Similar efficacy was observed in pigs receiving 100,000 U lipase of enteric-coated porcine pancreatic extract. These findings demonstrate the *in vivo* activity of adrulipase in a relevant *in vivo* model at a level similar to the PERTs at dosages of 10.5mg or greater.

To date, two non-clinical toxicology studies have been conducted. Both show that adrulipase lipase is clinically well tolerated at levels up to 1000mg/kg in rats and 250 mg/kg in minipigs up to 13 weeks. Adrulipase is therefore considered non-toxic in both rodent and non-rodent species up to a maximum feasible dose of 1,000 mg/kg/day in the rats over six months of administration.

Clinical Program

We are developing adrulipase for two principal therapeutic indications: (i) children and adults affected by CF, and (ii) adult patients with CP. We have determined to initially pursue the adult indication in CF.

Chronic Pancreatitis

During 2010 and 2011, a phase 1/2a clinical trial of adrulipase was conducted in conjunction with Mayoly in a single center in France. The study was an exploratory study mainly designed to investigate the safety of adrulipase and was a randomized, double blind, placebo controlled, parallel clinical trial in 12 patients affected with CP or pancreatectomy and severe EPI. The primary efficacy endpoint of the study was defined as the relative change in steatorrhea (an established surrogate biomarker of EPI correction) in comparison to baseline. The study found that adrulipase was well tolerated with no serious adverse events. Only two adverse events were observed: constipation (two patients out of eight with adrulipase) and hypoglycemia (two patients out of eight with adrulipase, and one patient out of four with placebo). A non-statistically significant difference of the primary endpoint, possibly due to the small group size, was found between the two groups both in intention-to-treat, a group that included three patients who received the in-patient facility study diet but did not fulfill the protocol's inclusion criteria, and per-protocol analysis. This study was not designed, nor did it aim, to demonstrate statistically significant changes of CFA or steatorrhea under adrulipase.

We received regulatory approval in Australia and New Zealand in 2016, with the addition of a 2018 regulatory approval in France, to conduct a Phase 2 multi-center dose escalation study of adrulipase in CP and pancreatectomy. The primary endpoint of this study was to evaluate the safety of escalating doses of adrulipase in 11 CP patients. The secondary endpoint was to investigate the efficacy of adrulipase in these patients by analysis of the CFA and its change from baseline. In September 2018, we announced that in pre-planned analyses, both the study's primary and secondary endpoints were reached with a statistically significant ($p=0.002$) improvement in the CFA of 21.8%, in a per protocol analysis, with the highest evaluated dose of 2,240 mg/day of adrulipase. Statistical significance of the trial results is typically based on widely used, conventional statistical methods that establishes the p-value of the results. A p-value of 0.05 or less is required to demonstrate statistical significance. As such, these CFA levels are considered to be statistically significant.

Cystic Fibrosis Monotherapy

In October 2018, the FDA cleared our IND application for adrulipase in patients with EPI due to CF. In December 2018, we initiated the Phase 2 OPTION Bridging Dose Study to investigate adrulipase in CF patients with EPI and in February 2019, we dosed the first patients. The Phase 2 OPTION Bridging Dose Study investigated the safety, tolerability and efficacy of adrulipase in a head-to-head comparison against the current PERT standard of care. The OPTION Bridging Dose Study employed a six-week non-inferiority CFA primary efficacy endpoint comparing adrulipase to PERTs.

In September 2019, we announced positive results from the OPTION Bridging Dose Study. Results showed that the primary efficacy endpoint of CFA was comparable to the CFA in a prior Phase 2 study in patients with CP, while using the same dosage of adrulipase. The dosage used in the OPTION Bridging Dose Study was 2.2 grams per day, which was determined in agreement with the FDA as a bridging dose from the highest safe dose used in the Phase 2 CP dose escalation study. Although the study was not powered for statistical significance, the data demonstrated meaningful efficacy results, with approximately 50% of the patients showing CFAs high enough to reach non-inferiority with standard PERTs. Additionally, the CNA was comparable between the adrulipase and PERT arms, 93% vs. 97%, respectively, in the OPTION Bridging Dose Study. This important finding confirms that protease supplementation is not likely to be required with adrulipase treatment. A total of 32 patients, ages 18 or older, completed the OPTION Bridging Dose Study.

In October 2019, the CFF DSMB completed its review of our final results of the OPTION Bridging Dose Study and found no safety concerns for adrulipase and supported our plan to proceed to the Phase 2b OPTION 2 Trial. In December 2019, we submitted the clinical trial protocol to the existing IND at the FDA. In April 2020, we received approval to conduct the OPTION 2 Trial in Therapeutics Development Network clinical sites in the U.S.

The OPTION 2 Trial was designed to investigate the safety, tolerability and efficacy of adrulipase (2.2 gram and 4.4 gram doses in enteric capsules) head-to-head versus the current standard of care, PERT pills. The OPTION 2 Trial was an open-label, crossover study, conducted in 15 sites in the U.S. and Europe. Enrollment included a total of 30 CF patients 18 years or older. Adrulipase was administered in enteric capsules to provide gastric protection and test for optimal delivery of enzyme to the duodenum. Patients were first be randomized into two cohorts: the adrulipase arm, where they received a 2.2 gram daily oral dose of adrulipase for three weeks; or the PERT arm, where they received their pre-study dose of PERT pills for three weeks. After three weeks, stools were collected for analysis of CFA. Patients were then crossed over for another three weeks of the alternative treatment. After three weeks of cross-over therapy, stools were again collected for analysis of CFA. A parallel group of patients was randomized and studied in the same fashion using a 4.4 gram daily dose of adrulipase. All patients were followed for an additional two weeks after completing both crossover treatments for post study safety observation. Patients were assessed using descriptive methods for efficacy, comparing CFA between adrulipase and PERT arms, and for safety.

In January 2021, we announced an additional study arm in OPTION 2 Trial using an immediate release adrulipase capsules in order to identify the optimal dose and delivery method of adrulipase. This extension phase tested patients 18 years or older, who have already completed the crossover phase, at higher doses relative to the previously conducted OPTION Bridging Dose Study. This allowed us to compare data from the existing crossover arm using enteric (delayed release) capsules with data from the new immediate release extension arm.

In March 2021 we announced topline OPTION 2 data. The trial demonstrated that adrulipase was safe and well-tolerated and data from OPTION 2, and the other adrulipase Phase 2 clinical trials, demonstrated drug activity. However, OPTION 2 did not consistently meet the primary efficacy endpoint. Some patients were able to achieve CFA at levels beyond what is required to demonstrate non-inferiority with PERT therapies, but the majority did not.

We believe that the underlying cause of the drug's uneven efficacy performance in the OPTION 2 trial was the enteric capsule formulation. While the enteric coating protected the capsule from breaking down in the stomach acid, it also appeared to dissolve too slowly in the small intestine to release the lipase enzyme in time to aid with proper digestion and nutrient absorption.

In August 2021 we announced that we would begin development of a new enteric microgranule formulation of adrulipase. The new formulation is planned to be administered with food as an oral capsule that dissolves in the stomach and disperses acid-resistant micro-granules that thoroughly mix with food during the digestion process. The resultant mixture then passes to the small intestine where the lipase enzyme breaks up fat molecules so that they can be absorbed. We completed the reformulation work in the second half of 2022.

In November 2022 we announced that we had filed an IND amendment with the FDA for a Phase 2b bridging study with the new enteric microgranulation formulation of adrulipase. The new trial is designed to investigate the safety, tolerability and efficacy of the new formulation of adrulipase. It is an open-label study that will be conducted at three sites in the U.S. A total of 12 cystic fibrosis patients, 18 years or older are expected to be enrolled. The trial design employs a dose titration strategy. Patients will be screened at baseline to ensure that they have a coefficient of fat absorption (CFA) of at least 80%. Eligible patients will then be switched from their commercial enzyme product to adrulipase. Each patient will be started on a low dose of adrulipase. If the patient is not clinically controlled, the patient will be switched to a medium dose, and if not controlled on this dose, the patient will be advanced to a high dose. The titrations will be carried out over a three-week period, after which a CFA will be obtained. End of study CFAs will be compared to the baseline CFAs in a descriptive fashion. A post treatment safety visit will be conducted one week after completing the treatment period.

Following FDA review of the IND amendment, we initiated the Phase 2b pilot monotherapy trial during the first quarter of 2023 and anticipate topline data in the third quarter of 2023.

Combination Therapy

We launched the Phase 2 Combination Trial in Hungary in July 2019 to investigate adrulipase, in combination with PERT, in CF patients who suffer from severe EPI but continue to experience clinical symptoms of fat malabsorption despite taking the maximum daily dose of PERTs. The Combination Trial is designed to investigate the safety, tolerability and efficacy of escalating doses of adrulipase (700 mg, 1120 mg and 2240 mg per day, respectively), in conjunction with a stable dose of PERTs, in order to increase CFA and relieve abdominal symptoms. In October 2020, we opened a total of five clinical sites in Turkey and dosed the first patients in November 2020. In March 2021, we reached targeted minimum enrollment of 18 patents.

We announced positive interim data on the first five patients in the Combination Trial in August 2020. The primary efficacy endpoint was met, with CFAs greater than 80% for all patients across all visits. For secondary efficacy endpoints, we observed that stool weight decreased, the number of stools per day decreased, steatorrhea improved, and body weight increased. Additionally, no serious adverse events were reported.

In August 2021, we announced topline data collected from the 20 patients enrolled in the study. The data indicated that adrulipase in combination with PERT led to clinically meaningful improvements in CFA, the primary efficacy endpoint. Patients showed an average gain of more than six percentage points from baseline, compared to the five-point improvement in CFA cited by the clinical literature as clinically significant. The study also demonstrated positive improvements in weight gain and other secondary endpoints.

We believe a combination therapy of PERT and adrulipase has the potential to: (i) correct macronutrient and micronutrient maldigestion; (ii) eliminate abdominal symptoms attributable to maldigestion; and (iii) sustain optimal nutritional status on a normal diet in CF patients with severe EPI. We developed a new enteric microgranule formulation and initiated a Ph2b monotherapy trial in the first quarter of 2023. We expect topline date in the third quarter of 2023. Depending on the results of this trial, we may elect to conduct further combination therapy trials using the new formulation.

Niclosamide

Niclosamide, a pro-inflammatory pathway inhibitor, is a prescription small molecule drug that has been safely used on millions of patients. Niclosamide is listed as an essential medicine by the World Health Organization (WHO). In the U.S., niclosamide was approved by the United States Food and Drug Administration ("*FDA*") in 1982 for the treatment of intestinal tapeworm infections. Niclosamide's activity as an antihelminthic results from direct action in the intestinal lumen where it disrupts a parasitic metabolic function called oxidative phosphorylation, killing parasites. Niclosamide has been commercially available worldwide for more than 50 years as 500mg single-dose tablets intended for use in pediatric and adult populations, at a dose rate of 2g per adult or child over six years of age. No safety issues have ever been identified. In addition to its antihelminthic activity, niclosamide has demonstrated novel anti-inflammatory properties.

We believe niclosamide, and more specifically our proprietary and patent-pending micronized niclosamide formulation, has the potential to be an ideal therapeutic to treat multiple GI indications due to the following favorable properties:

(i) it has a reduced particle size (D(90) between 5 and 9 μM) as compared to regular non-micronized niclosamide (approximately D(90) ≥ 60μM) with greater surface to solvent ratio;

(ii) low oral bio-availability with minimal systemic absorption / exposure;

(iii) improved dissolution with broader distribution allowing for higher local GI concentrations (up to approximately 200 times based on preclinical study results); and

(iv) it exhibits anti-inflammatory effects while avoiding steroid-related complications and adverse events.

Scientific Background

Recent discoveries in immune cell metabolism suggest that it may be possible to selectively target disease-causing immune cells to treat inflammatory diseases without unwanted side effects associated with broad-based immunosuppression. Research indicates that IBD, including ulcerative colitis, ulcerative proctitis/proctosigmoiditis and Crohn's disease, is driven by pathogenic Th17 cells, which release a cascade of local cytokines that in turn cause inflammation in bowel wall tissues.

Th17 cells rely on a cellular process called oxidative phosphorylation to survive. Niclosamide is known to disrupt the oxidative phosphorylation in the mitochondria of pathogenic Th17 cells in a manner that selectively induces apoptosis of pathogenic Th17 cells, overcoming their inherent resistance to cell death. This effect is mild enough that it does not interfere with normal cells. By killing Th17 cells, niclosamide may reduce inflammation and calm the gut, selectively killing pathogenic, inflammatory cells while leaving healthy cells untouched.

Niclosamide has demonstrated beneficial effects in numerous cell culture studies using cells obtained by biopsy of inflamed bowel tissues from IBD patients, and also in animal models of IBD.

Our suite of proprietary, gut-restricted niclosamide product candidates are designed to target the metabolism of disease-causing Th17 cells to potentially halt or delay the progression of disease, stop flare-ups, and address patient needs at all stages of IBD, from mild to severe, and for cancer patients with ICI-AC.

Inflammatory Bowel Disease Background

IBD is an umbrella term used to describe disorders that involve chronic inflammation of the digestive track. IBD affects approximately 3 million people in the U.S. annually. IBD is divided into two main classes of gastrointestinal inflammatory diseases: (i) ulcerative colitis (UC), including ulcerative proctitis (UP) and ulcerative proctosigmoiditis (UPS), and (ii) Crohn's Disease (CD). There are similarities between UC and CD, such as immunopathology, and equal distribution between males and females. However, there are also notable differences. UC is generally limited to the colon, while CD may occur anywhere in the small or large intestine. UC usually affects continuous mucosal surfaces, while CD is patchier, with areas of normal bowel mucosa separating the inflammatory patches. Importantly, CD often involves deep bowel tissues and can lead to fistulas into the abdominal cavity or out to the skin surface. CD requires surgical intervention more often than UC. While medical treatments for UC and CD are generally similar, CD is much less responsive.

FW-COV Program for COVID-19 GI Infections

The COVID-19 pandemic is a global public health emergency caused by the SARS-CoV-2 virus. An increasing volume of convergent evidence indicates that GI infection and fecal-oral transmission of SARS-CoV-2 are important factors in the clinical presentation, virology and epidemiology of COVID-19. There is currently no etiological treatment for COVID-19 GI effects. As a result, we believe there is an unmet therapeutic need for safe and effective treatment of these effects.

A study published in July 2020 in *Antimicrobial Agents and Chemotherapy*, an American Society for Microbiology journal (Jeon *et. Al*, 2020) examined a small set (n=49) of FDA-approved drugs that were selected based on either having known activity against SARS-CoV or being recommended by infectious disease experts for activity against the SARS-CoV-2 virus. Results from this study indicated that niclosamide was the most potent of all agents tested in a Vero cell cytopathic assay with an IC50 value of 0.28 μM. For comparison, in terms of potency, niclosamide out-performed reference compounds chloroquine, lopinavir, and remdesivir with IC50 values of 7.28, 9.12, and 11.41 μM, respectively. IC50 is a quantitative measure that indicates how much of a particular inhibitory substance (e.g. a drug) is needed to inhibit, *in vitro*, a given biological process or biological component by fifty percent. Thus, niclosamide is approximately 40-fold more potent in vitro than VEKLURY® (remdesivir), an antiviral drug marketed by Gilead Sciences Inc. that received FDA approval in October 2020 for use in adult and pediatric patients for the treatment of COVID-19 requiring hospitalization.

Following oral administration, niclosamide is poorly absorbed, which results in a majority of the administered dose remaining in the GI tract. We believe this basic property of niclosamide, when combined with micronized niclosamide in the drug product to accelerate dissolution, will enable this drug product to achieve pharmacologically effective concentrations of niclosamide in the GI tract while having almost no bioavailability, potentially enhancing efficacy and safety.

An IND for FW-COV micronized niclosamide for COVID-19 GI infections was cleared by the FDA in September 2020. In April 2021, we initiated our Phase 2 RESERVOIR clinical trial for the treatment of COVID-19 related GI infections. The Phase 2 RESERVOIR clinical trial is a two-part, two-arm, randomized, placebo-controlled study examining the safety and efficacy of micronized oral niclosamide tablets in patients with COVID-19 GI infection. The two primary objectives of the RESERVOIR trial are to confirm the safety of niclosamide in the treatment of patients with COVID-19 GI infection and to demonstrate efficacy in clearing the SARS-CoV-2 virus from the GI tract.

Part 1 of the trial studied 9 patients with COVID-19 and diarrhea. Patients were randomized (2:1 niclosamide: placebo), treated for 14 days and observed closely for any signs of safety issues. In September 2021, we announced positive results from an independent Data Monitoring Committee review of the interim safety data. The Data Monitoring Committee also approved initiating patient enrollment in Part 2.

Part 2 of the trial studied approximately 150 patients in the U.S., Ukraine and India with mild or moderate COVID-19. Patients were randomized to either niclosamide, 400 mg tablets, three times a day, or placebo tablets three times a day. After 14 days of treatment, patients are taken off study drugs and remain on study observation for up to 6 months. Our trial samples from the clinical trial site in Ukraine have been completed and transported out of Ukraine.

The primary efficacy measure of the RESERVOIR trial is the rate of fecal SARS-CoV-2 virus clearance (rectal swab or stool sample) assessed by RT-PCR, comparing the niclosamide arm to the placebo arm for up to six months. These long-term observation data could indicate that niclosamide treatment has the potential to improve ‘long haul’ COVID-19 symptoms by decreasing viral load in the GI tract. There is evidence to support that the GI tract may be a possible reservoir for persistence and fecal spread of COVID-19 because ACE-2, the entry receptor for COVID-19, is highly expressed on GI cells.

In January 2022, we announced completion of patient enrollment for Part 2 of the RESERVOIR trial. In April 2022 the Company announced that top-line data results from the trial were mixed. FW-COV was demonstrated to be very safe with no drug-related serious adverse events (SAEs) reported by the more than 150 patients who participated in the trial. However, the efficacy endpoint in this trial – the ability of FW-COV to remove the SARS-CoV-2 (SARS2) virus from the digestive tract as measured by viral presence in the patient’s stool – did not demonstrate statistical significance when compared to placebo. As a result, the Company decided not to further pursue niclosamide clinical studies for the anti-viral treatment of COVID-GI.

FW-UC for Ulcerative Colitis (UC)

UC is an IBD that causes inflammation and ulcers (sores) in the digestive tract. UC generally affects the innermost lining of the large intestine (colon). UC affects approximately 830,000 patients in the U.S. annually and approximately 84% or 700,000 have mild to moderate disease. The immunopathology of UC is complex and is generally considered to be caused by a dysregulated immune system. There is evidence that a hereditary trait is involved. While the cause is not known, many researchers believe that invasive bacteria or virus in the bowel wall sets off an abnormal response by local T lymphocytes. Normally, a subgroup of lymphocytes called Th17 cells protect the bowel wall from microbial invaders. However, in patients with UC, these Th17 cells become pathogenic and release a cascade of local cytokines, which in turn cause inflammation in bowel wall tissues. This persistent inflammation causes tissue damage, and clinical symptoms. Clinical symptoms include abdominal pain, diarrhea, which is sometimes bloody, intermittent fever, anemia, and weight loss, and symptoms usually develop over time, rather than suddenly.

Severity of UC is generally classified as mild, moderate or severe. Mild disease is treated by sulfasalazine and 5-ASA’s, most commonly mesalamine. These may be given orally or rectally and are modestly potent anti-inflammatory agents. While inexpensive and well tolerated, only about 50% of UC patients will maintain a clinical response to these agents. Non-responders or relapsers will progress to moderate or even severe disease.

Patients failing on 5-ASA’s are usually placed onto steroid therapy, such as budesonide or prednisone, risking the well-known side effects of steroids. Failing, or not tolerating steroids leads to treatment with much more potent and expensive immunosuppressive agents such as anti-TNFs, or newer agents such as Entyvio® or Xeljanz®. We believe there is an unmet medical need for a well-tolerated, effective therapeutic for patients who fail first line treatment with 5-ASAs.

Our initial clinical trial in UC involves patients with ulcerative proctitis (UP) and ulcerative proctosigmoiditis (UPS), who are being treated with a topical rectal formulation, which is currently in a Phase 1b/2a clinical trial.

We intend to commence the clinical development of FW-UC, employing an oral tablet formulation in a Phase 1 clinical trial for subjects with UC in 2023, subject to successful results from Stage 2 of the FW-UP Phase 1b/2a clinical trial.

FW-UP Program for Ulcerative Proctitis (UP) and Ulcerative Proctosigmoiditis (UPS)

UP and UPS are two types of UC, a chronic inflammatory bowel disease consisting of fine ulcerations in the inner mucosal lining of the large intestine that do not penetrate the bowel muscle wall. UPS causes inflammation in the colon and rectum, while UP is confined only to the rectum. Symptoms include weight loss, fatigue, abdominal pain and cramps, rectal pain and bleeding, and diarrhea, although constipation can also develop as the body struggles to maintain normal bowel function. UP and UPS affect approximately 200,000 patients in the U.S. annually.

UP and UPS can occur at any point throughout life, with a high occurrence in young children and then again around 40-50 years of age. Progression of this disease to ulcerative colitis, extending farther up the bowel to involve the sigmoid colon, occurs in about 30-50% of patients. UP and UPS allow convenient clinical management and observation by local sigmoidoscopy. Although there is a range of treatments to help ease symptoms and induce remission, there is no cure.

We are developing FW-UP, a niclosamide-based, small molecule anti-inflammatory inhibitor therapy in enema formulation for the potential treatment of UP and UPS. FW-UP is currently being investigated in a three-stage Phase 1b/2a clinical trial in Europe studying the safety and potential efficacy of niclosamide in patients with UP and UPS.

Stage 1 of the trial studied 17 subjects with UP who had failed first line therapy with 5-ASAs. They were treated for six weeks with low dose FW-UP niclosamide rectal enemas twice a day. Preliminary results demonstrated that FW-UP niclosamide enemas were well tolerated, with a durable therapeutic effect. The efficacy endpoint was to achieve a clinical remission, defined as a Modified Mayo Score of 2 or less. A clinical remission rate of 59% was achieved, which is higher than currently approved second line therapy with budesonide (38% to 44%).

Stage 2 of the trial is designed to study a higher dose of niclosamide enema twice daily for six-weeks. Stage 2 enrollment was initiated in September 2021 and will enroll 28 patients in a placebo-controlled study to compare FW-UP, administered as an enema twice daily at a dose of 450 mg, to placebo enemas twice daily.

In September 2022 we announced that we would devote fewer resources to the FW-UP/UPS niclosamide program due to inconclusive data from Stage 2 of the Phase 2 trial in Europe, the need for a new FDA-IND cleared protocol and capital constraints.

We plan to initiate a new Phase 2 UP/UPS trial under an FDA IND cleared protocol upon securing sufficient financial resources.

FW-ICI-AC for Immune Checkpoint Inhibitor Colitis (ICI-AC)

Immune checkpoint inhibitors ("*ICIs*") are monoclonal antibodies that target down-regulators of the anti-cancer immune response and have significantly affected the treatment of a variety of malignancies. However, many immune-related adverse events, especially diarrhea and colitis, limit their use. A 2019 study titled, "Immune checkpoint inhibitor-induced colitis: A comprehensive review," published in *World Journal of Clinical Cases* (Sol *et.al*, 2019) estimated the incidence of IMC ranges from 1% to 25% depending on the type of ICI and whether they are used in combination. A 2017 study titled "Incidence of immune checkpoint inhibitor-related colitis in solid tumor patients: a systematic review and meta-analysis" published in *Oncoimmunology* (Wang *et.al*, 2017) estimated that approximately 44%, or 260,000 patients with advanced and metastatic tumors were eligible to receive ICIs. Further, approximately 30% of ICI patients develop diarrhea, which can progress to colitis. The onset of diarrhea in ICI-AC patients occurs within six to seven weeks and progressively worsens, and the progression to colitis is rapid and unpredictable.

In patients taking Yervoy® (ipilimumab), between 25% to 30% developed diarrhea and approximately 8% to 12% developed colitis, as reported in a peer-reviewed article, "Immune-checkpoint inhibitor-induced diarrhea and colitis in patients with advanced malignancies: retrospective review at MD Anderson" published in the *Journal for ImmunoTherapy of Cancer* (Wang *et. al,*, 2018). Moreover, there is a treatment trend towards the use of combination ICI therapies (for example combining Yervoy® and Opdivo®), which is believed to lead to a concomitant increase in both diarrhea and colitis.

We believe there currently is no approved treatment for Grade 1 colitis. The recommended treatment for Grade 2 or more severe colitis is administration of corticosteroids, or treatment with certain immunosuppressive biologics, while withholding ICI therapy (National Cancer Institute, 2020). The impact of this colitis complication and treatment may reduce the goal of progression-free cancer survival. We believe there is an unmet medical need and an oral, non-absorbed therapeutic, such as our FW-ICI-AC niclosamide, for Grade-1 colitis (diarrhea) which may prevent progression to Grade 2 or more severe disease.

In October 2021, we received FDA IND clearance to commence our Phase 1b/2a PASSPORT ICI-AC clinical trial using an oral immediate-release tablet formulation of niclosamide for Grade 1 and Grade 2 colitis and diarrhea in oncology patients receiving treatment with ICIs.

The Phase 2a PASSPORT clinical trial is designed as a double-blind, placebo-controlled study to determine the safety, tolerability, and preliminary efficacy of FW-ICI-AC in the treatment of immune checkpoint inhibitor-associated colitis (ICI-AC) and diarrhea in advanced cancer patients. 60 patients are planned to be enrolled in the trial and divided into two arms (30 patients per arm). One arm will receive FW-ICI-AC three times daily for two weeks, while the other arm will receive placebo three times daily for two weeks. Following treatment, each patient will enter a four-week evaluation period. The primary endpoint of the trial is safety and tolerability of FW-ICI-AC. Additional endpoints will measure early signals of efficacy, including resolution of the patient's diarrhea, sparing of steroids, and prevention of disease progression.

We plan to initiate the PASSPORT trial in the U.S. upon securing sufficient financial resources.

FW-CD for Crohn's Disease (CD)

While the immunopathology of CD resembles that of UC, the location of disease, the response to treatment and the overall morbidity are different, as CD is more difficult to manage. Patient response to standard therapy is more variable than in UC, thus making clinical management more challenging. In UC, a reasonably clear course of disease from mild to moderate severity can be predicted based upon response to first line treatment. In CD, first line treatment often includes more immunosuppressive agents, such as steroids, immunomodulators, and anti-TNF agents as compared to the 5-ASAs used for first line in UC.

CD affects approximately 660,000 patients in the U.S. annually and approximately 76% or 500,000 have mild to moderate disease. We believe FW-CD, an oral niclosamide-based small molecule anti-inflammatory inhibitor therapy can be an important therapeutic in the treatment of mild to moderate CD, with the goal of reducing steroid and immunomodulators treatments.

We plan to initiate the PASSPORT trial in the U.S. upon securing sufficient financial resources. We intend to commence clinical development of FW-CD in a Phase 2a clinical trial, subject to the successful completion of a FW-UC Phase 1 clinical trial.

Recent Developments

Issuance of Restricted Stock Units

On January 3, 2023, we issued to employees, consultants and the board of directors ten-year restricted stock units consisting of 160,239 shares of Common Stock, subject to service-based milestones vesting quarterly over one year under the 2020 Plan as payment for services rendered. Such issuance was exempt from registration under 4(a)(2) of the Securities Act of 1933, as amended (the "*Securities Act*").

Reverse Stock Split and Approval of Private Placement

On January 13, 2023, we held a special meeting of stockholders (the "*Special Meeting*"). The matters voted on at the Special Meeting were: (1) the approval of the issuance of more than 20% of our Common Stock pursuant to the November 2022 Offering and November Warrant Amendment for purposes of Nasdaq Listing Rule 5635(d), (2) the adoption and approval of the Amendment to our Charter to effect a reverse stock split of our issued and outstanding shares of Common Stock, at a specific ratio, ranging from one-for-three (1:3) to one-for-forty (1:40), and (3) the approval of the adjournment of the Special Meeting to the extent there are insufficient votes at the Special Meeting to approve any one or more of the foregoing proposals. At the Special Meeting, all of the matters voted on were approved.

On January 13, 2023, we filed the Amendment to our Charter with the Secretary of State of the State of Delaware to effect a reverse stock split of our Common Stock at a ratio of 1-to-7 (the "*Reverse Stock Split*"). The Reverse Stock Split became effective in accordance with the terms of the Amendment at 12:01 AM Eastern Time on January 18, 2023 under a new CUSIP number, 33749P309.

March 2023 Private Placement

On March 12, 2023, we entered into a securities purchase agreement (the "*March 2023 Purchase Agreement*") pursuant to which we agreed to sell, in a private placement (the "*March 2023 Private Placement*") priced at market under Nasdaq rules, an aggregate of (i) 128,000 shares of Common Stock, par value $0.0001 per share, of the Company, (ii) pre-funded warrants (the "*March 2023 Pre-Funded Warrants*") to purchase up to an aggregate of 895,018 shares of Common Stock (the "*March 2023 Pre-Funded Warrant Shares*") and (iii) common warrants (the "*March 2023 Warrants*") to purchase up to an aggregate of 2,046,036 shares of Common Stock. The public offering price for each share of Common Stock, March 2023 Pre-funded Warrant and accompanying March 2023 Warrant to purchase one share of Common Stock was $3.91 per share. The March 2023 Pre-Funded Warrants have an exercise price of $0.0001 per share, are exercisable immediately and will expire when exercised in full. The March 2023 Warrants have an exercise price of $3.66 per share, are exercisable immediately and will expire five years from the initial exercise date.

The March 2023 Private Placement closed on March 15, 2023. The gross proceeds from the offering were approximately $4.0 million, before deducting the placement agent's fees and other offering expenses payable by us.

Corporate History

We were incorporated on January 30, 2014 in the State of Delaware. In May 2014, we entered into a stock purchase agreement with Protea Biosciences Group, Inc. ("*Protea Group*") and its wholly-owned subsidiary, Protea Biosciences, Inc. ("*Protea Sub*" and, together with Protea Group, "*Protea*"), to acquire 100% of the outstanding capital stock of AzurRx SAS (formerly ProteaBio Europe SAS), a wholly-owned subsidiary of Protea Sub, which was completed in June 2014. In October 2016, we completed an initial public offering, which allowed us to list our shares of Common Stock on the Nasdaq Capital Market.

On September 13, 2021, we completed the acquisition of First Wave Bio, Inc. ("*FWB*"), which became our wholly- owned subsidiary. In connection with the acquisition, AzurRx BioPharma, Inc. changed its name to First Wave BioPharma, Inc.

Effective October 26, 2022, the AzurRx SAS subsidiary was dissolved.

Intellectual Property

Our goal is to obtain, maintain and enforce patent protection for our product candidates, formulations, processes, methods and any other proprietary technologies, preserve our trade secrets, and operate without infringing on the proprietary rights of other parties, both in the United States and in other countries. Our policy is to actively seek to obtain, where appropriate, the broadest intellectual property protection possible for our current product candidates and any future product candidates, proprietary information and proprietary technology through a combination of contractual arrangements and patents, both in the United States and abroad. However, patent protection may not afford us with complete protection against competitors who seek to circumvent our patents.

We also depend upon the skills, knowledge, experience and know-how of our management and research and development personnel, as well as that of our advisors, consultants and other contractors. To help protect our proprietary know-how, which is not patentable, and for inventions for which patents may be difficult to enforce, we currently rely and will in the future rely on trade secret protection and confidentiality agreements to protect our interests. To this end, we require all of our employees, consultants, advisors and other contractors to enter into confidentiality agreements that prohibit the disclosure of confidential information and, where applicable, require disclosure and assignment to us of the ideas, developments, discoveries and inventions important to our business.

Adrulipase

The adrulipase program is protected by the following issued patents that we had originally licensed under the Mayoly Agreement and now own:

- PCT/FR2006/001352 patent family (including the patent EP2035556 and patent US8,334,130 and US8,834,867) "Method for producing lipase, transformed *Yarrowia lipolytica* cell capable of producing said lipase and their uses" describes a method for producing *Yarrowia lipolytica* acid-resistant recombinant lipase utilizing a culture medium without any products of animal origin or non-characterized mixtures such as tryptone, peptone or lactoserum, in addition to its uses. The European patents expire June 15, 2026, U.S. patent 8,334,130 expires September 11, 2028, and U.S. patent 8,834,867 expires July 17, 2026.

In addition, a PCT International application was filed in 2021 directed to our proprietary formulation of adrulipase that has been nationalized in the United States, Canada, Mexico, Europe, Brazil, Chile, Columbia, Australia. New Zealand, China, India, Japan, Singapore and South Korea. Any patents issuing from these filings will have an expected expiration in 2041.

Two U.S. Utility Applications and corresponding PCT International applications were filed in 2022 directed to stable lipase formulations and methods of treatment. Any patents issuing from these filing will have an expected expiration in 2042.

A U.S. Provisional Application was filed in 2022 directed to adrulipase formulations. Any patents issuing from this filing will have an expected expiration in 2043.

Niclosamide

Our FW-ICI-AC, FW-UP, FW-UC and FW-CD niclosamide programs are protected by patent filings that include the following:

- US10,912,746; US10,905,666; US10,292,951; US10,772,854; US10,744,103; US10,799,468; US10,849,867; and related continuation applications as well as corresponding worldwide patent filings all entitled "Methods and Compositions for Treating Conditions Associated with an Abnormal Inflammatory Process." The expiration date of the issued patents is September 1, 2036; and

- A PCT International application filed in 2021 that has been nationalized in the United States directed to compositions and methods for treating conditions characterized by an abnormal inflammatory response such as an autoimmune disorder, colitis, autoimmune colitis, an inflammatory bowel disease, Crohn's disease and ulcerative colitis. Any national designated patent application from this filing upon issuance will have an expected expiration in 2041.

Our FW-COV niclosamide programs are protected by patent filings that include the following:

- US10,980,756 and US11,564,896 and corresponding continuation applications directed to the use of niclosamide for the treatment of COVID-19 gastrointestinal infections. The expiration of the issued patents is March 31, 2040.

- In addition, a PCT International application and a corresponding U.S. application was filed in 2022 directed to methods of treating Long Covid with niclosamide. Any patents issuing from these filings will have an expected expiration in 2042.

Manufacturing

We currently outsource all manufacturing, and we intend to use our collaborators and contract development and manufacturing organizations ("*CDMOs*") for the foreseeable future.

Adrulipase

Adrulipase API, including drug substance and drug product, is currently manufactured by Asymchem, Inc. at a contract facility located in Tianjin, China. Charles River Laboratories based in Malvern, Pennsylvania is responsible for maintaining our master and working cell banks. We believe there are multiple alternative contract manufacturers capable of producing the product we need for clinical trials; however, there is no guarantee that the processes are easily reproducible and transferrable.

Niclosamide

Niclosamide API is obtained by chemical synthesis and is currently manufactured by Olon SpA at a facility in Murcia, Spain. Niclosamide drug product is currently manufactured at a contract facility located in Milan, Italy owned by Monteresearch s.r.l. and at a contract facility located in Tianjin, China owned by Asymchem Inc. We believe there are multiple alternative contract manufacturers capable of producing the product we need for clinical trials; however, there is no guarantee that the processes are easily reproducible and transferrable.

Competition

The pharmaceutical and biotechnology industries are characterized by rapidly evolving technology and intense competition. Many companies of all sizes, including major pharmaceutical companies and specialized biotechnology companies, are engaged in the development and commercialization of therapeutic agents designed for the treatment of the same diseases and disorders that we target. Many of our competitors have substantially greater financial and other resources, larger research and development staff and more experience in the regulatory approval process. Moreover, potential competitors have or may have patents or other rights that conflict with patents covering our technologies.

Adrulipase

With respect to adrulipase, if approved, we would compete with PERTs (pancrelipase), a well-established market that is currently dominated by a few large pharmaceutical companies, including CREON® marketed by AbbVie Inc., ZENPEP® sold to Nestlé S.A. by Allergan plc. in January 2020, PANCREAZE® marketed by VIVUS, Inc. and PERTZYE® marketed by Chiesi Farmaceutici S.p.A. There are currently six PERT products that have been approved by the FDA for sale in the U.S. We believe our ability to compete in this market, if we are successful in developing and obtaining regulatory approval to market adrulipase, will depend on our ability (or that of a future corporate partner) to convince patients, their physicians, healthcare payors and the medical community of the benefits of using a non-animal-based product to treat EPI, as well as by addressing other shortcomings associated with PERTs, including a large pill burden.

Niclosamide

With respect to FW-COV, our oral micronized formulation of niclosamide for COVID-19 GI infections, if approved, would compete with currently approved antivirals, including Pfizer's Inc.'s PAXLOVID™, Merck & Co. Inc. and Ridgeback Biotherapeutics' molnupiravir, VEKLURY® (remdesivir) marketed by Gilead Sciences, Inc. and vaccines, including those marketed by Pfizer Inc. and BioNTech SE, Moderna, Inc. Johnson & Johnson and AstraZeneca plc. There are also several therapeutic and vaccine candidates in various stages of development that may obtain regulatory approval for the treatment or prevention of COVID-19 infections. Additionally, there are currently ongoing clinical studies using niclosamide by ANA Therapeutics (acquired by NeuroBo Pharmaceuticals, Inc.), Daewoong Pharmaceuticals Co Ltd, and Union Therapeutics A/S, among others at various stages of development. We believe our approach to target COVID-19 GI infections is differentiated. We believe our ability to compete in this market, if we are successful in developing and obtaining regulatory approval to market FW-COV, will depend on our ability (or that of future corporate partners) to convince patients, their physicians, healthcare agencies and payors and the medical community of the benefits of using FW-COV to treat patients with COVID-19 infections with GI symptoms.

With respect to FW-ICI-AC, our oral micronized formulation and niclosamide for ICI-AC, if approved, would compete with both oral and intravenous administered steroids as well as hospital-based infusions of biologics, including infliximab and vedolizumab. We believe our ability to compete in this market, if we are successful in developing and obtaining regulatory approval to market FW- ICI-AC, will depend on our ability (or that of future corporate partners) to convince patients, their physicians, healthcare agencies and payors and the medical community of the benefits of using a non-steroidal, non-biologic therapeutic option for the treatment of ICI-AC.

With respect to FW-UP and FW-UC, our topical formulation of niclosamide for UP, if approved, would compete with sulfasalazines and 5-ASAs, for the treatment of mild disease, steroids, including budesonide and prednisone, azathioprine, 6-mercaptopurine, and methotrexate for the treatment of moderate disease, and Anti-TNFs, Entyvio® (vedolizumab), Xeljanz® (Tofacitinib); Stelara® (Ustekinumab) for the treatment of severe disease. We believe our ability to compete in this market, if we are successful in developing and obtaining regulatory approval to market FW-UP and FW-UC, will depend on our ability (or that of future corporate partners) to convince patients, their physicians, healthcare agencies and payors and the medical community of the benefits of using a non-steroidal, non-biologic therapeutic option to prevent the advancement disease requiring more toxic immunosuppressive therapeutic option for the treatment of mild and moderate UP and UC.

Government Regulation and Product Approval

Government authorities in the United States, at the federal, state and local level, and other countries extensively regulate, among other things, the research, development, testing, manufacture, quality control, approval, labeling, packaging, storage, record-keeping, promotion, advertising, distribution, post-approval monitoring and reporting, marketing and export and import of products such as those we are developing. To date, our internal research and development efforts have been conducted in France. We expect to conduct late-stage development work, including clinical trials for niclosamide and adrulipase in both the United States and Europe, as North America is our principal target market for our product candidates that we may successfully develop.

U.S. Government Regulation

In the United States, the FDA regulates drugs under the Federal Food, Drug, and Cosmetic Act, or FDCA, and its implementing regulations, and biologics under the FDCA and the Public Health Service Act, or PHSA, and its implementing regulations. FDA approval is required before any new unapproved drug or dosage form, including a new use of a previously approved drug, can be marketed in the United States. Drugs and biologics are also subject to other federal, state and local statutes and regulations. If we fail to comply with applicable FDA or other requirements at any time during the drug development process, clinical testing, the approval process or after approval, we may become subject to administrative or judicial sanctions. These sanctions could include the FDA's refusal to approve pending applications, license suspension or revocation, withdrawal of an approval, warning letters, product recalls, product seizures, placement on Import Alerts, debarment of personnel, employees or officers, total or partial suspension of production or distribution, injunctions, fines, civil penalties or criminal prosecution.

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

- completion of extensive preclinical laboratory tests, preclinical animal studies, and toxicity data, all performed in accordance with the good laboratory practices, or GLP, regulations;

- submission to the FDA of an IND, which must become effective before human clinical studies may begin;

- approval by an independent IRB or ethics committee representing each clinical site before each clinical study may be initiated;

- performance of adequate and well-controlled human clinical studies to establish the safety and efficacy, or in the case of a biologic, the safety, purity and potency, of the drug candidate for each proposed indication;

- preparation of and submission to the FDA of a new drug application, or NDA, or biologics license application, or BLA, which must include data from required pre-clinical studies and all pivotal clinical studies and information showing that the product can be manufactured in a controlled manner;

- a determination by the FDA within 60 days of its receipt of an NDA or BLA to file the application for review;

- review of the product application by an FDA advisory committee, where appropriate and if applicable;

- satisfactory completion of an FDA pre-approval inspection of the manufacturing facilities where the drug candidate is produced to assess compliance with cGMP; and

- FDA review and approval of an NDA or BLA prior to any commercial marketing or sale of the drug or biologic in the United States.

An IND is a request for authorization from the FDA to administer an investigational new drug product to humans. The central focus of an IND submission is on the general investigational plan and the protocol(s) for human studies. The IND also includes results of animal and in vitro studies assessing the toxicology, pharmacokinetics, pharmacology and pharmacodynamic characteristics of the product; chemistry, manufacturing and controls information; and any available human data or literature to support the use of the investigational new drug. An IND must become effective before human clinical studies may begin. An IND will automatically become effective 30 days after receipt by the FDA, unless before that time the FDA raises concerns or questions related to the proposed clinical studies. In such a case, the IND may be placed on clinical hold and the IND sponsor and the FDA must resolve any outstanding concerns or questions before clinical studies can begin. Accordingly, submission of an IND may or may not result in the FDA allowing clinical studies to commence.

Clinical Studies

Clinical studies involve the administration of the investigational new drug to human subjects under the supervision of qualified investigators in accordance with GCPs, which include the requirement that all research subjects provide their informed consent for their participation in any clinical study. Clinical studies are conducted under protocols detailing, among other things, the objectives of the study, and the parameters to be used in monitoring safety and the efficacy criteria to be evaluated. A protocol for each clinical study and any subsequent protocol amendments must be submitted to the FDA as part of the IND. Additionally, approval must also be obtained from each clinical study site's IRB before the studies may be initiated, and the IRB must monitor the study until completed. There are also requirements governing the reporting of ongoing clinical studies and clinical study results to public registries, such as ClinicalTrials.gov.

The clinical investigation of a drug or biologic is generally divided into three or four phases. Although the phases are usually conducted sequentially, they may overlap or be combined.

- *Phase 1*. The drug or biologic is initially introduced into healthy human subjects or patients with the target disease or condition. These studies are designed to evaluate the safety, dosage tolerance, metabolism and pharmacologic actions of the investigational new drug in humans, the side effects associated with increasing doses, and if possible, to gain early evidence on effectiveness.

- *Phase 2*. The drug or biologic is administered to a limited patient population to evaluate dosage tolerance and optimal dosage, identify possible adverse side effects and safety risks and preliminarily evaluate efficacy.

- *Phase 3*. The drug or biologic is administered to an expanded patient population, generally at geographically dispersed clinical study sites to generate enough data to statistically evaluate dosage, clinical effectiveness and safety, to establish the overall benefit-risk relationship of the investigational product and to provide an adequate basis for product approval.

- *Phase 4*. In some cases, the FDA may condition approval of an NDA or BLA for a drug candidate on the sponsor's agreement to conduct additional clinical studies after approval. In other cases, a sponsor may commit to conducting or voluntarily conduct additional clinical studies after approval to gain more information about the drug. Such post-approval studies are typically referred to as Phase 4 clinical studies.

A confirmatory or pivotal study is a clinical study that adequately meets regulatory agency requirements for the evaluation of a drug candidate's efficacy and safety such that it can be used to justify the approval of the product. Generally, pivotal studies are Phase 3 studies, but the FDA may accept results from Phase 2 studies if the study design provides a well-controlled and reliable assessment of clinical benefit, particularly in situations where there is an unmet medical need and the results are sufficiently robust. In such cases, FDA may require post-market studies for safety and efficacy to be conducted for the drug candidate. The FDA may withdraw the approval if the results indicate that the approved drug is not safe or effective.

The FDA, the IRB or the clinical study sponsor may suspend or terminate a clinical study at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Additionally, some clinical studies are overseen by an independent group of qualified experts organized by the clinical study sponsor, known as a data safety monitoring board or committee. This group provides authorization for whether or not a study may move forward at designated check points based on access to certain data from the study. We may also suspend or terminate a clinical study based on evolving business objectives and/or competitive climate.

Chemistry, Manufacturing and Control Information

Companies seeking FDA approval of drugs must also develop data and information about the physical characteristics of the components of a product as well as finalize processes for manufacturing the components in commercial quantities in accordance with GMP requirements. The manufacturing process must be capable of consistently producing quality batches of the product candidate and, among other things, the sponsor must develop methods for testing the identity, strength, quality, potency and purity of the final product. Additionally, appropriate packaging must be selected and tested, and stability studies must be conducted to demonstrate that the components of a product candidate do not undergo unacceptable deterioration over their shelf life.

Submission of an NDA or BLA to the FDA

Assuming successful completion of all required testing in accordance with all applicable regulatory requirements, detailed investigational new drug product information is submitted to the FDA in the form of an NDA or BLA requesting approval to market the product for one or more indications. Under federal law, the submission of most NDAs and BLAs is subject to a substantial application user fee. Applications for orphan drug products are exempted from the NDA and BLA application user fees.

An NDA or BLA must include all relevant data available from pertinent preclinical and clinical studies, including negative or ambiguous results as well as positive findings, together with detailed information relating to the product's chemistry, manufacturing, controls and proposed labeling, among other things. Data can come from company-sponsored clinical studies intended to test the safety and effectiveness of a use of a product, or from a number of alternative sources, including studies initiated by investigators. To support marketing approval, the data submitted must be sufficient in quality and quantity to establish the safety and effectiveness of the investigational product to the satisfaction of the FDA.

Once an NDA or BLA has been submitted, the FDA's goal is to review the application within ten months after it accepts the application for filing, or, if the application relates to an unmet medical need in a serious or life-threatening indication, six months after the FDA accepts the application for filing. The review process is often significantly extended by FDA requests for additional information or clarification.

Before approving an NDA or BLA, the FDA typically will inspect the facility or facilities where the product is manufactured. The FDA will not approve an application unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Additionally, before approving an NDA or BLA, the FDA will typically inspect one or more clinical sites to assure compliance with GCP.

The FDA is required to refer an application for an investigational drug or biologic to an advisory committee or explain why such referral was not made. An advisory committee is a panel of independent experts, including clinicians and other scientific experts, that reviews, evaluates and provides a recommendation as to whether the investigational product application should be approved and under what conditions. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions and typically follows such recommendations.

The FDA's Decision on an NDA or BLA

After the FDA evaluates the NDA or BLA and conducts inspections of manufacturing facilities, it may issue an approval letter or a Complete Response Letter. An approval letter authorizes commercial marketing of the drug or biologic with specific prescribing information for specific indications. A Complete Response Letter indicates that the review cycle of the application is complete, and the application is not ready for approval. A Complete Response Letter may require additional clinical data and/or an additional pivotal Phase 3 clinical study(ies), and/or other significant, expensive and time-consuming requirements related to clinical studies, preclinical studies or manufacturing. Even if such additional information is submitted, the FDA may ultimately decide that the NDA or BLA does not satisfy the criteria for approval. The FDA could also approve the NDA or BLA with a REMS to mitigate risks, which could include medication guides, physician communication plans or elements to assure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. The FDA also may condition approval on, among other things, changes to proposed labeling, development of adequate controls and specifications or a commitment to conduct one or more post-market studies or clinical studies. Such post-market testing may include Phase 4 clinical studies and surveillance to further assess and monitor the product's safety and effectiveness after commercialization. The FDA may have the authority to withdraw its approval if post-market testing fails to verify the approved drug's clinical benefit, if the applicant does not perform the required testing with due diligence, or if the any other evidence demonstrates the approved drug is not safe or effective, among other reasons. Also, new government requirements, including those resulting from new legislation, may be established, or the FDA's policies may change, which could delay or prevent regulatory approval of our products under development.

Expedited Review and Accelerated Approval Programs

The FDA has various programs, including fast track designation, breakthrough therapy designation, accelerated approval, regenerative medicine advanced therapy and priority review, that are intended to expedite the development and approval of new drugs and biologics that address unmet medical needs in the treatment of serious or life-threatening diseases and conditions. To be eligible for a fast-track designation, the FDA must determine, based on the request of a sponsor, that a product is intended to treat a serious or life-threatening disease or condition and demonstrates the potential to address an unmet medical need. The FDA may review sections of the NDA for a fast-track product on a rolling basis before the complete application is submitted, if the sponsor provides a schedule for the submission of the sections of the NDA, the FDA agrees to accept sections of the NDA and determines that the schedule is acceptable, and the sponsor pays any required user fees upon submission of the first section of the NDA.

The FDA may give a priority review designation to drugs that offer major advances in treatment or provide a treatment where no adequate therapy exists. A priority review means that the goal for the FDA to review an application is six months, rather than the standard review of ten months under current. These six and ten-month review periods are measured from the "filing" date rather than the receipt date for NDAs for new molecular entities, which typically adds approximately two months to the timeline for review and decision from the date of submission. Most products that are eligible for fast-track designation are also likely to be considered appropriate to receive a priority review.

In addition, products studied for their safety and effectiveness in treating serious or life-threatening illnesses and that provide meaningful therapeutic benefit over existing treatments may be eligible for accelerated approval and may be approved on the basis of adequate and well-controlled clinical studies establishing that the product has an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit, or on a clinical endpoint that can be measured earlier than irreversible morbidity or mortality, that is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity or prevalence of the condition and the availability or lack of alternative treatments. As a condition of approval, the FDA may require a sponsor of a drug receiving accelerated approval to perform post-marketing studies to verify and describe the predicted effect on irreversible morbidity or mortality or other clinical endpoint, and the drug may be subject to accelerated withdrawal procedures.

Moreover, under the provisions of the FDA Safety and Innovation Act passed in July 2012, a sponsor can request designation of a drug candidate as a "breakthrough therapy." A breakthrough therapy is defined as a drug or biologic that is intended, alone or in combination with one or more other drugs or biologics, to treat a serious or life-threatening disease or condition, and preliminary clinical evidence indicates that the product may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. Drugs designated as breakthrough therapies are also eligible for the other expedited review and approval programs, including accelerated approval, priority review, regenerative medicine advanced therapy, and fast-track designation. The FDA must take certain actions, such as holding timely meetings and providing advice, intended to expedite the development and review of an application for approval of a breakthrough therapy.

In addition, the 21st Century Cures Act in 2016 made the Regenerative Medicine Advanced Therapy, or RMAT, designation available for investigational drugs that are intended to treat, modify, reverse, or cure a serious condition, with preliminary clinical evidence indicating that the drug has the potential for addressing unmet medical needs for such condition. The RMAT designation is available for cell therapy, therapeutic tissue engineering products, human cell and tissue products, and combination products that use such therapies or products. The advantages of RMAT designation include those of breakthrough and fast track designations, such as early interactions with FDA and rolling review of applications, and the drug candidate with the RMAT designation may be eligible for accelerated approval. Requests for RMAT designations should be made with the IND application (if preliminary clinical evidence is available), but no later than the end-of-phase-2 meeting.

Even if a product qualifies for one or more of these programs, the FDA may later decide that the product no longer meets the conditions for qualification or decide that the time period for FDA review or approval will not be shortened.

Post-Approval Requirements

Drugs and biologics marketed pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product sampling and distribution, advertising and promotion and reporting of adverse experiences with the product. After approval, most changes to the approved product, such as adding new indications or other labeling claims are subject to prior FDA review and approval. There also are continuing, annual user fee requirements.

Manufacturers are subject to periodic unannounced inspections by the FDA and state agencies for compliance with cGMP requirements. Changes to the manufacturing process are strictly regulated and, depending on the significance of the change, may require prior FDA approval before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP and impose reporting and documentation requirements upon us and any third-party manufacturers that we may decide to use. Accordingly, manufacturers must continue to expend time, money and effort in the area of production and quality control to maintain compliance with cGMP and other aspects of regulatory compliance.

Discovery of previously unknown problems with a product or the failure to comply with applicable requirements may result in restrictions on a product, manufacturer or holder of an approved NDA or BLA, including withdrawal or recall of the product from the market or other voluntary, FDA-initiated or judicial action that could delay or prohibit further marketing. Also, new government requirements, including those resulting from new legislation, may be established, or the FDA's policies may change, which could delay or prevent regulatory approval of our products under development.

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

- restrictions on the marketing or manufacturing of the product;
- complete withdrawal of the product from the market or product recalls;
- fines, warning letters or holds on post-approval clinical studies;

- refusal of the FDA to approve pending NDAs or BLAs or supplements to approved NDAs or BLAs, or suspension or revocation of product licenses or approvals;
- product seizure or detention, or refusal to permit the import or export of products; or
- injunctions or the imposition of civil or criminal penalties.

The FDA strictly regulates marketing, labeling, advertising and promotion of products that are placed on the market. Drugs may be promoted only for the approved indications and in accordance with the provisions of the approved label. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant liability.

Orphan Designation and Exclusivity

Under the Orphan Drug Act, the FDA may grant orphan designation to a drug or biologic intended to treat a rare disease or condition, defined as a disease or condition with a patient population of fewer than 200,000 individuals in the United States, or a patient population greater than 200,000 individuals in the United States and when there is no reasonable expectation that the cost of developing and making available the drug or biologic in the United States will be recovered from sales in the United States for that drug or biologic. Orphan drug designation must be requested before submitting a BLA or NDA. After the FDA grants orphan drug designation, the generic identity of the therapeutic agent and its potential orphan use are disclosed publicly by the FDA.

If a product that has orphan drug designation subsequently receives the first FDA approval for a particular active ingredient for the disease for which it has such designation, the product is entitled to orphan product marketing exclusivity, which means that the FDA may not approve any other applications, including a full BLA, to market the same biologic for the same use or indication for seven years, except in limited circumstances, such as a showing of clinical superiority to the product with orphan drug exclusivity or if FDA finds that the holder of the orphan drug exclusivity has not shown that it can assure the availability of sufficient quantities of the orphan drug to meet the needs of patients with the disease or condition for which the drug was designated. Orphan drug exclusivity does not prevent the FDA from approving a different drug or biologic for the same disease or condition, or the same drug or biologic for a different disease or condition. Among the other benefits of orphan drug designation are tax credits for certain research and a waiver of the BLA or NDA application user fee.

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

Biosimilars and Exclusivity

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

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

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

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

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

Hatch-Waxman Amendments and Exclusivity

Section 505 of the FDCA describes three types of marketing applications that may be submitted to the FDA to request marketing authorization for a new drug. A Section 505(b)(1) NDA is an application that contains full reports of investigations of safety and efficacy. A 505(b)(2) NDA is an application that contains full reports of investigations of safety and efficacy but where at least some of the information required for approval comes from investigations that were not conducted by or for the applicant and for which the applicant has not obtained a right of reference or use from the person by or for whom the investigations were conducted. This regulatory pathway enables the applicant to rely, in part, on the FDA's prior findings of safety and efficacy for an existing product, or published literature, in support of its application. Section 505(j) establishes an abbreviated approval process for a generic version of approved drug products through the submission of an ANDA. An ANDA provides for marketing of a generic drug product that has the same active ingredients, dosage form, strength, route of administration, labeling, performance characteristics and intended use, among other things, to a previously approved product. ANDAs are termed "abbreviated" because they are generally not required to include preclinical (animal) and clinical (human) data to establish safety and efficacy. Instead, generic applicants must scientifically demonstrate that their product is bioequivalent to, or performs in the same manner as, the innovator drug through in vitro, in vivo or other testing. The generic version must deliver the same amount of active ingredients into a subject's bloodstream in the same amount of time as the innovator drug and can often be substituted by pharmacists under prescriptions written for the reference listed drug. In seeking approval for a drug through an NDA, applicants are required to list with the FDA each patent with claims that cover the applicant's drug or a method of using the drug. Upon approval of a drug, each of the patents listed in the application for the drug is then published in the Orange Book. Drugs listed in the Orange Book can, in turn, be cited by potential competitors in support of approval of an ANDA or 505(b)(2) NDA.

Upon submission of an ANDA or a 505(b)(2) NDA, an applicant must certify to the FDA that (1) no patent information on the drug product that is the subject of the application has been submitted to the FDA; (2) such patent has expired; (3) the date on which such patent expires; or (4) such patent is invalid or will not be infringed upon by the manufacture, use or sale of the drug product for which the application is submitted. Generally, the ANDA or 505(b)(2) NDA cannot be approved until all listed patents have expired, except where the ANDA or 505(b)(2) NDA applicant challenges a listed patent through the last type of certification, also known as a paragraph IV certification. If the applicant does not challenge the listed patents or indicates that it is not seeking approval of a patented method of use, the ANDA or 505(b)(2) NDA application will not be approved until all of the listed patents claiming the referenced product have expired.

If the ANDA or 505(b)(2) NDA applicant has provided a Paragraph IV certification to the FDA, the applicant must send notice of the Paragraph IV certification to the NDA and patent holders once the application has been accepted for filing by the FDA. The NDA and patent holders may then initiate a patent infringement lawsuit in response to the notice of the paragraph IV certification. If the paragraph IV certification is challenged by an NDA holder or the patent owner(s) asserts a patent challenge to the paragraph IV certification, the FDA may not approve that application until the earlier of 30 months from the receipt of the notice of the paragraph IV certification, the expiration of the patent, when the infringement case concerning each such patent was favorably decided in the applicant's favor or settled, or such shorter or longer period as may be ordered by a court. This prohibition is generally referred to as the 30-month stay. In instances where an ANDA or 505(b)(2) NDA applicant files a paragraph IV certification, the NDA holder or patent owner(s) regularly take action to trigger the 30-month stay, recognizing that the related patent litigation may take many months or years to resolve.

The FDA also cannot approve an ANDA or 505(b)(2) application until all applicable non-patent exclusivities listed in the Orange Book for the branded reference drug have expired. For example, a pharmaceutical manufacturer may obtain five years of non-patent exclusivity upon NDA approval of a new chemical entity, or NCE, which is a drug containing an active moiety that has not been approved by FDA in any other NDA. An "active moiety" is defined as the molecule responsible for the drug substance's physiological or pharmacologic action. During that five-year exclusivity period, the FDA cannot accept for filing (and therefore cannot approve) any ANDA seeking approval of a generic version of that drug or any 505(b)(2) NDA that relies on the FDA's approval of the drug, provided that that the FDA may accept an ANDA four years into the NCE exclusivity period if the ANDA applicant also files a Paragraph IV certification.

A drug, including one approved under Section 505(b)(2), may obtain a three-year period of exclusivity for a particular condition of approval, or change to a marketed product, such as a new formulation for a previously approved product, if one or more new clinical studies (other than bioavailability or bioequivalence studies) was essential to the approval of the application and was conducted/sponsored by the applicant. Should this occur, the FDA would be precluded from approving any ANDA or 505(b)(2) application for the protected modification until after that three-year exclusivity period has run. However, unlike NCE exclusivity, the FDA can accept an application and begin the review process during the exclusivity period.

Other Healthcare Laws and Compliance Requirements

Pharmaceutical companies are subject to additional healthcare regulation and enforcement by the federal government and by authorities in the states and foreign jurisdictions in which they conduct their business. Such laws include, without limitation, state and federal anti-kickback, fraud and abuse, false claims, privacy and security and physician sunshine laws and regulations. If their operations are found to be in violation of any of such laws or any other governmental regulations that apply, they may be subject to penalties, including, without limitation, civil and criminal penalties, damages, fines, the curtailment or restructuring of operations, exclusion from participation in federal and state healthcare programs and individual imprisonment.

Coverage and Reimbursement

Sales of any product depend, in part, on the extent to which such product will be covered by third-party payors, such as federal, state and foreign government healthcare programs, commercial insurance and managed healthcare organizations and the level of reimbursement for such product by third-party payors. Decisions regarding the extent of coverage and amount of reimbursement to be provided are made on a plan-by-plan basis. These third-party payors are increasingly reducing reimbursements for medical products, drugs and services. In addition, the U.S. government, state legislatures and foreign governments have continued implementing cost-containment programs, including price controls, restrictions on coverage and reimbursement and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit sales of any product. Decreases in third-party reimbursement for any product or a decision by a third-party payor not to cover a product could reduce physician usage and patient demand for the product and also have a material adverse effect on sales. Even after FDA approves a product, failure to have the product covered by third-party payors may have material adverse effect on sales. Federal and state governments continue to promulgate new policies and regulations; such policies and regulations may have material adverse effect on sales. These laws and regulations may restrict, prohibit, or preventing us from implementing a wide range of pricing, discounting, marketing, promotion, sales commission, incentive programs, and other business activities. No uniform policy of coverage and reimbursement among third-party payors exists in the United States. Such payors often rely upon Medicare coverage policy establishing their coverage and reimbursement policies. However, each payor makes independent and separate decisions regarding the extent of coverage and amount of reimbursement to be provided.

Legislative and Regulatory Changes, Including Health Care Reform

The laws and regulation that affect our business are subject to change from time to time, and entirely new laws and regulations are sometimes adopted. In particular, healthcare reforms that have been adopted, and that may be adopted in the future, could result in further reductions in coverage and levels of reimbursement for pharmaceutical products, increases in rebates payable under U.S. government rebate programs and additional downward pressure on pharmaceutical product prices. On September 9, 2021, the Biden administration published a wide-ranging list of policy proposals, most of which would need to be carried out by Congress, to reduce drug prices and drug payment. The Department of Health and Human Services, or HHS, plan includes, among other reform measures, proposals to lower prescription drug prices, including by allowing Medicare to negotiate prices and disincentivizing price increases, and to support market changes that strengthen supply chains, promote biosimilars and generic drugs, and increase price transparency. Many similar proposals, including the plans to give Medicare Part D authority to negotiate drug prices, require drug manufacturers to pay rebates on drugs whose prices increase greater than the rate of inflation, and cap out-of-pocket costs, have already been included in policy statements and legislation currently being considered by Congress. Individual states in the United States have also become increasingly active in implementing regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, proposing to encourage importation from other countries and bulk purchasing. It is unclear to what extent these and other statutory, regulatory, and administrative initiatives will be enacted and implemented.

Foreign Corrupt Practices Act

Our business activities may be subject to the Foreign Corrupt Practices Act, or FCPA, and similar anti-bribery or anti-corruption laws, regulations or rules of other countries in which we operate. The FCPA generally prohibits offering, promising, giving, or authorizing others to give anything of value, either directly or indirectly, to a non-U.S. government official in order to influence official action, or otherwise obtain or retain business. The FCPA also requires public companies to make and keep books and records that accurately and fairly reflect the transactions of the corporation and to devise and maintain an adequate system of internal accounting controls. Our business is heavily regulated and therefore involves significant interaction with public officials, including officials of non-U.S. governments. Additionally, in many other countries, the health care providers who prescribe pharmaceuticals are employed by their government, and the purchasers of pharmaceuticals are government entities; therefore, our dealings with these prescribers and purchasers are subject to regulation under the FCPA. There is no certainty that all of our employees, agents, suppliers, manufacturers, contractors, or collaborators, or those of our affiliates, will comply with all applicable laws and regulations, particularly given the high level of complexity of these laws. Violations of these laws and regulations could result in fines, criminal sanctions against us, our officers, or our employees, the closing down of facilities, including those of our suppliers and manufacturers, requirements to obtain export licenses, cessation of business activities in sanctioned countries, implementation of compliance programs, and prohibitions on the conduct of our business. Any such violations could include prohibitions on our ability to offer our products in one or more countries as well as difficulties in manufacturing or continuing to develop our products, and could materially damage our reputation, our brand, our international expansion efforts, our ability to attract and retain employees, and our business, prospects, operating results, and financial condition.

European Union Drug Development

In the European Union, our product candidates may also be subject to extensive regulatory requirements. As in the United States, medicinal products can only be marketed if a marketing authorization from the competent regulatory agencies has been obtained.

Similar to the United States, the various phases of preclinical and clinical research in the European Union are subject to significant regulatory controls. Clinical trials of medicinal products in the European Union must be conducted in accordance with European Union, national regulations and international standards for good clinical practice, or GCP.

Clinical trials are currently governed by EU Clinical Trials Directive 2001/20/EC that set out common rules for the control and authorization of clinical trials in the European Union.

To improve the current system, Regulation (EU) No 536/2014 on clinical trials on medicinal products for human use was adopted in 2014. The Regulation aims at harmonizing and streamlining the clinical trials authorization process, simplifying adverse event reporting procedures, improving the supervision of clinical trials, and increasing their transparency, notably via a clinical trial information system set up by the EMA. The new Regulation expressly provides that it will not be applied before six months after the publication of a notice delivered by the European Commission on the European Union clinical trial portal and database. As such notice requires a successful (partial) audit of the database and as that database is still under development, there is no scheduled application date yet. Pursuant to the transitory provisions of the new regulation, the Clinical Trials Directive 2001/20/EC will still apply for three years after the implementation of the European Union clinical trial portal and database. Thus, the sponsor has the possibility to choose between the requirements of the directive and the regulation for a period of three years from the entry into force of the regulation.

European Union Drug Review and Approval

In the EEA (which is comprised of the 28 Member States of the European Union plus Norway, Iceland and Liechtenstein), medicinal products can only be commercialized after obtaining a Marketing Authorization, or MA. MAs may be granted either centrally (Community MA) or nationally (National MA).

The Community MA is issued centrally by the European Commission through the Centralized Procedure, based on the opinion of the CHMP of the EMA and is valid throughout the entire territory of the EEA. The Centralized Procedure is mandatory for certain types of products such as orphan medicinal products and medicinal products containing a new active substance indicated for the treatment of neurodegenerative disorders. The Centralized Procedure is optional for products containing a new active substance not yet authorized in the EEA, or for products that constitute a significant therapeutic, scientific or technical innovation or which are in the interest of public health in the European Union.

National MAs are issued nationally by the competent authorities of the Member States of the EEA and only cover their respective territory. National MAs are available for products not falling within the mandatory scope of the Centralized Procedure. We do not foresee that any of our current product candidates will be suitable for a National MA as they fall within the mandatory criteria for the Centralized Procedure. Therefore, our product candidates will be approved through Community MAs.

Under the above-described procedures, before granting the MA, the EMA or the competent authorities of the Member States of the EEA make an assessment of the risk-benefit balance of the product on the basis of scientific criteria concerning its quality, safety and efficacy.

The pediatric use marketing authorization, or PUMA, is a dedicated marketing authorization for medicinal products indicated exclusively for use in the pediatric population, with, if necessary, an age-appropriate formulation. Pursuant to Regulation (EC) No. 1901/2006 (The "*Pediatric Regulation*"), all PUMA applications for marketing authorization for new medicines must include to be valid, in addition to the particulars and documents referred to in Directive 2001/83/EC, the results of all studies performed and details of all information collected in compliance with a pediatric investigation plan agreed between regulatory authorities and the applicant, unless the medicine is exempt because of a deferral or waiver of the EMA.

Before the EMA is able to begin its assessment of a Community MA application, it will validate that the applicant has complied with the agreed pediatric investigation plan. The applicant and the EMA may, where such a step is adequately justified, agree to modify a pediatric investigation plan to assist validation. Modifications are not always possible; may take longer to agree than the period of validation permits; and may still require the applicant to withdraw its marketing authorization application and to conduct additional non-clinical and clinical studies. Products that are granted a MA on the basis of the pediatric clinical trials conducted in accordance with the Pediatric Investigation Plan, or PIP, are eligible for a six-month extension of the protection under a supplementary protection certificate (if any is in effect at the time of approval) or, in the case of orphan medicinal products, a two-year extension of the orphan market exclusivity. This pediatric reward is subject to specific conditions and is not automatically available when data in compliance with the PIP are developed and submitted.

Orphan Drugs

In the European Union, Regulation (EC) No 141/2000 of the European Parliament and of the Council of December 16, 1999 on orphan medicinal products, as amended, states that a drug shall be designated as an orphan drug if its sponsor can establish that the three following cumulative conditions are met:

- the product is intended for the diagnosis, prevention or treatment of a life-threatening or chronically debilitating condition;

- the prevalence of the conditions is not more than five in ten thousand persons in the European Union when the application is made, or that it is intended for the diagnosis, prevention or treatment of a life-threatening, seriously debilitating or serious and chronic condition in the European Union and that without incentives it is unlikely that the marketing of the drug in the European Union would generate sufficient return to justify the necessary investment; and

- that there is no satisfactory method of diagnosis, prevention or treatment of the condition in question that has been authorized in the European Union or, if such method exists, that the drug will be of significant benefit to those affected by that condition.

Pursuant to Regulation (EC) No. 847/2000 of April 27, 2000 laying down the provisions for implementation of the criteria for designation of a medicinal product as an orphan medicinal product and definitions of the concepts “similar medicinal product” and “clinical superiority”, an application for the designation of a drug as an orphan drug must be submitted at any stage of development of the drug before filing of a MA application.

The European Union offers incentives to encourage the development of designated orphan medicines (protocol assistance, fee reductions, etc.) and provides opportunities for market exclusivity. Pursuant to abovementioned Regulation (EC) No. 141/2000, products receiving orphan designation in the European Union can obtain market exclusivity for a certain number of years in the European Union following the marketing approval.

If a Community MA in respect of an orphan drug is granted, regulatory authorities will not, for a period of usually ten years, accept another application for a MA, or grant a MA or accept an application to extend an existing MA, for the same therapeutic indication, in respect of a similar drug. This period may however be reduced to six years if, at the end of the fifth year, it is established, in respect of the drug concerned, that the above-mentioned criteria for orphan drug designation are no longer met, in other words, when it is shown on the basis of available evidence that the product is sufficiently profitable not to justify maintenance of market exclusivity.

Pursuant to Regulation No. 1901/2006, for orphan medicinal products, instead of an extension of the supplementary protection certificate, the ten-year period of orphan market exclusivity should be extended to 12 years if the requirement for data on use in the pediatric population is fully met (i.e. when the request contains the results of all studies carried out under the approved PIP and when the declaration attesting the conformity of the request to this PIP is included in the MA).

Notwithstanding the foregoing, a MA may be granted, for the same therapeutic indication, to a similar drug if:

- the holder of the MA for the original orphan drug has given its consent to the second applicant;

- the holder of the MA for the original orphan drug is unable to supply sufficient quantities of the drug; or

- the second applicant can establish in the application that the second drug, although similar to the orphan drug already authorized, is safer, more effective or otherwise clinically superior.

The abovementioned Regulation (EC) No. 141/2000 provides for other incentives regarding orphan medicinal products.

Post-Approval Controls

The holder of a MA must comply with EU requirements applicable to manufacturing, marketing, promotion and sale of medicinal products. In particular, the holder of the MA must establish and maintain a pharmacovigilance system and appoint an individual qualified person for pharmacovigilance, or QPPV, who is responsible for oversight of that system and who will reside and operate in the EU. Key obligations include safety expedited reporting of suspected serious adverse reactions and submission of periodic safety update reports, or PSURs.

All new MAs must include a risk management plan, or RMP, to submit to the EMA, describing the risk management system that the company will put in place and documenting measures to prevent or minimize the risks associated with the product. The regulatory authorities may also impose specific obligations as a condition of the MA. Such risk-minimization measures or post-authorization obligations may include additional safety monitoring, more frequent submission of PSURs, or the conduct of additional clinical trials or post-authorization safety studies. RMPs and PSURs are routinely available to third parties requesting access, subject to limited redactions. All advertising and promotional activities for the product must be consistent with the approved summary of product characteristics, and therefore all off-label promotion is prohibited. Direct-to-consumer advertising of prescription medicines is also prohibited in the European Union. Although general requirements for advertising and promotion of medicinal products are established under EU directives, the details are governed by regulations in each EU Member State and can differ from one country to another.

Reimbursement

The European Union provides options for its Member States to restrict the range of medicinal products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. A Member State may approve a specific price for the medicinal product, or it may instead adopt a system of direct or indirect controls on the profitability of the company placing the medicinal product on the market. For example, in France, effective market access will be supported by agreements with hospitals and products may be reimbursed by the Social Security Fund. The price of medicines covered by national health insurance is negotiated with the Economic Committee for Health Products, or CEPS. There can be no assurance that any country that has price controls or reimbursement limitations for pharmaceutical products will allow favorable reimbursement and pricing arrangements for any of our product candidates. Historically, products launched in the European Union do not follow price structures of the United States and generally prices tend to be significantly lower.

Other European Regulatory Matters

French Regulatory Framework for Clinical Development

In France, Directive No. 2001/20/EC has been implemented in French national law, establishing a system of prior authorization and requiring a prior favorable opinion from an ethics committee.

Parties to a clinical trial agreement, or CTA, must use a CTA template (“unique agreement” or “convention unique”) to organize the conduct of interventional clinical trials with commercial purpose, as well as specific template exhibits to this agreement. Once concluded, the CTA is communicated for information by the sponsor to the French national board of physicians (Ordre national des médecins) without delay.

The processing of personal data collected during clinical trials has to comply with the Regulation (EU) 2016/679 of the European Parliament and of the Council of April 27, 2016 and Law No 2018-493 of June 20, 2018 on the protection of personal data, implementing the Regulation (EU) 2016/679 requirements. Regarding automatic processing operations for the purpose of research or clinical studies, formalities have to be completed before the French data protection authority, the Commission Nationale de l’Informatique et des Libertés, or CNIL, so as to obtain the authorization to process personal data. However, there are simplified standards.

Law No. 2011-2012 of December 29, 2011, or Loi Bertrand, aimed at strengthening the health safety of medicinal and health products, as amended (and its implementing decrees), introduced into French law provisions regarding transparency of fees received by some healthcare professionals from health product industries, i.e. companies manufacturing or marketing health products (Article L.1453-1 of the French Public Health Code). These provisions have been recently extended and redefined by Decree No. 2016-1939 of December 28, 2016, which clarified French "Sunshine" regulations. The decree notably provides that companies manufacturing or marketing health care products (medicinal products, medical devices, etc.) in France shall publicly disclose (mainly on a specific public website available at: https://www.entreprises-transparence.sante.gouv.fr) the advantages and fees paid to healthcare professionals amounting to €10 or above, as well as the agreements concluded with the latter, along with detailed information about each agreement (the precise subject matter of the agreement, the date of signature of the agreement, its end date, the total amount paid to the healthcare professional, etc.). Another declaration must also be filed to the competent healthcare professional body. Law No. 2011-2012 also reinforced the French anti-gift rules and Order No. 2017-49 of January 19, 2017 amended the law and expanded the scope of the general prohibition of payments from pharmaceutical and device manufacturers to healthcare professionals to broadly cover any company manufacturing or marketing health products, regardless of whether or not payment for the products is reimbursed under the French social security system (new Articles L. 1453-3 et seq. of the French Public Health Code). It also changed the procedure related to the prior submission to the national or departmental board of the relevant healthcare professional body. Moreover, the penalties incurred for non-compliance with the requirements of the Anti-Gift Law will be doubled to a fine of up to €750,000. The changes of the anti-gift rules will only enter into force after the publication of implementing measures.

Employees

As of December 31, 2022, we had 10 full-time employees, all of whom are located in the United States.

Available Information

As a public company, we are required to file our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, proxy statements on Schedule 14A and other information (including any amendments) with the Securities and Exchange Commission (the "*SEC*"). The SEC maintains an Internet site that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC. You can find our SEC filings at the SEC's website at www.sec.gov.

Our Internet address is www.firstwavebio.com. Information contained on our website is not part of this Annual Report. Our SEC filings (including any amendments) will be made available free of charge on www.firstwavebio.com, as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC.

ITEM 1A. RISK FACTORS

We are subject to various risks that could have a material adverse effect on our business, our financial condition and our results of operations. These risks could cause actual operating results to differ from those expressed in certain "forward looking statements" contained in this Annual Report as well as in other communications.

Summary of Risk Factors

- We have never generated any product revenues.
- We expect to incur significant losses for the foreseeable future and may never achieve or maintain profitability.
- We will need substantial additional funding, and certain terms included in our financing transactions may restrict our ability to raise such capital at the times and in the manner we may require.
- To date, most of our development activities have been focused on our niclosamide and adrulipase product candidates, which are still under clinical development, and if niclosamide and adrulipase do not receive regulatory approval or is not successfully commercialized, our business will be harmed.
- The COVID-19 pandemic and other geopolitical events, including the war in Ukraine could adversely impact our business, including our clinical trials.
- We will require additional capital to fund our operations, and if we fail to obtain necessary financing, we may not be able to complete the development and commercialization of our product candidates.
- Clinical trials are very expensive, time-consuming, difficult to design and implement and involve an uncertain outcome.
- We face significant competition from other biotechnology and pharmaceutical companies, and our operating results will suffer if we fail to compete effectively.
- We do not have our own manufacturing capabilities and will rely on third parties to produce clinical and commercial supplies of our product candidates.
- We intend to rely on third parties to conduct, supervise and monitor our clinical trials, and if those third parties perform in an unsatisfactory manner, it may harm our business.
- If we are unable to obtain and maintain patent protection for our technology and products or if the scope of the patent protection obtained is not sufficiently broad, we may not be able to compete effectively in our markets.
- We do not currently intend to pay dividends on our Common Stock in the foreseeable future, and consequently, any gains from an investment in our Common Stock will likely depend on appreciation in the price of our Common Stock.

Risks Related to Our Business, Financial Position and Capital Requirements

We are a clinical stage biopharmaceutical company and have a limited operating history upon which to base an investment decision.

We are a clinical stage biopharmaceutical company. Since inception, we have engaged primarily in research and development activities of niclosamide and adrulipase. We have not generated any revenue from product sales and have incurred significant net losses. We have not demonstrated our ability to perform the functions necessary for the successful commercialization of any product candidates. The successful commercialization of any of our products will require us to perform a variety of functions, including:

- continuing to undertake pre-clinical development and clinical trials;
- participating in regulatory approval processes;
- formulating and manufacturing products; and
- conducting sales and marketing activities.

Our operations to date have been limited to organizing and staffing, acquiring, developing and securing the proprietary rights for, and undertaking pre-clinical development, manufacturing and clinical trials of adrulipase, and the acquisition of rights to and clinical trials for niclosamide. These operations provide a limited basis for our stockholders and prospective investors to assess our ability to complete development of or commercialize niclosamide and adrulipase or any other product candidates and the advisability of investing in our securities.

We have incurred significant losses and negative cash flows from our operations since inception. As of December 31, 2022, we had accumulated deficit of approximately $168.5 million and negative working capital of approximately $0.8 million. Based on our historical and anticipated rate of cash expenditures, we do not anticipate our existing working capital will be sufficient to sustain our business through the commercialization of our product candidates. Therefore, we are dependent on obtaining, and are continuing to pursue, the necessary funding from outside sources, including obtaining additional funding from the sale of securities in order to continue our operations. We are actively working to obtain additional funding. We cannot make any assurances that additional financings will be available to us and, if available, completed on a timely basis, on acceptable terms or at all. If we are unable to complete an equity and/or debt offering, or otherwise obtain sufficient financing when and if needed, it would negatively impact our business and operations, which would likely cause the price of our Common Stock to decline or ultimately force us to cease our operations.

We will face intense competition and may not be able to compete successfully.

We operate in highly competitive segments of the biotechnology and biopharmaceutical markets. We face competition from many different sources, including commercial pharmaceutical and biotechnology enterprises, academic institutions, government agencies, and private and public research institutions. Niclosamide and adrulipase, if successfully developed and approved, will compete with established therapies, as well as new treatments that may be introduced by our competitors. Many of our competitors have significantly greater financial, product development, manufacturing and marketing resources than us. Large pharmaceutical companies have extensive experience in clinical testing and obtaining regulatory approval for drugs. We also may compete with these organizations to recruit management, scientists and clinical development personnel. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. New developments, including the development of other biological and pharmaceutical technologies and methods of treating disease, occur in the pharmaceutical and life sciences industries at a rapid pace. Developments by competitors may render our product candidates obsolete or noncompetitive. We will also face competition from these third parties in recruiting and retaining qualified personnel, establishing clinical trial sites and patient registration for clinical trials and in identifying and in-licensing new product candidates. In the case of niclosamide, we may also face competition from other companies developing different formulation of niclosamide for the same indications for which we intend to develop niclosamide, or from off-label uses of niclosamide approved for other indications.

We may incur substantial product liability or indemnification claims relating to the use of our product candidates.

We face an inherent risk of product liability exposure based on the use of niclosamide and adrulipase in human clinical trials, or, if obtained, following marketing approval and commercialization. Claims could be brought against us if use or misuse of one of our product candidates causes, or merely appears to have caused, personal injury or death. Although we have and intend to maintain product liability insurance relating to our clinical trials, our coverage may not be sufficient to cover claims that may be made against us and we may be unable to maintain such insurance. Any claims against us, regardless of their merit, could severely harm our financial condition, strain our management and other resources or destroy the prospects for commercialization of the product which is the subject of any such claim. We are unable to predict if we will be able to obtain or maintain product liability insurance for any products that may be approved for marketing. Additionally, we have entered into various agreements where we indemnify third parties for certain claims relating to the testing and use of our product candidates. These indemnification obligations may require us to pay significant sums of money for claims that are covered by these indemnifications.

We cannot predict all of the possible harms or side effects that may result from the use of our products and, therefore, the amount of insurance coverage we currently hold, or that we or our collaborators may obtain, may not be adequate to protect us from any claims arising from the use of our products that are beyond the limit of our insurance coverage. If we cannot protect against potential liability claims, we or our collaborators may find it difficult or impossible to commercialize our products, and we may not be able to renew or increase our insurance coverage on reasonable terms, if at all. The marketing, sale and use of our products and our planned future products could lead to the filing of product liability claims against us if someone alleges that our products failed to perform as designed. A product liability or professional liability claim could result in substantial damages and be costly and time-consuming for us to defend.

Any product liability or professional liability claim brought against us, with or without merit, could increase our insurance rates or prevent us from securing insurance coverage. Additionally, any product liability lawsuit could damage our reputation, result in the recall of products, or cause current partners to terminate existing agreements and potential partners to seek other partners, any of which could impact our results of operations.

We use biological materials and may use hazardous materials, and any claims relating to improper handling, storage or disposal of these materials could be time consuming or costly.

We may use hazardous materials, including chemicals and biological agents and compounds, that could be dangerous to human health and safety or the environment. Our operations also produce hazardous waste products. Federal, state and local laws and regulations govern the use, generation, manufacture, storage, handling and disposal of these materials and wastes. Compliance with applicable environmental laws and regulations may be expensive, and current or future environmental laws and regulations may impair our product development efforts. In addition, we cannot entirely eliminate the risk of accidental injury or contamination from these materials or wastes. We do not carry specific biological or hazardous waste insurance coverage and our property and casualty, and general liability insurance policies specifically exclude coverage for damages and fines arising from biological or hazardous waste exposure or contamination. Accordingly, in the event of contamination or injury, we could be held liable for damages or penalized with fines in an amount exceeding our resources, and our clinical trials or regulatory approvals could be suspended.

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

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

We will need to grow the size of our organization, and we may experience difficulties in managing this growth.

As of December 31, 2022, we had 10 employees. As our development and commercialization plans and strategies develop, we expect to need additional managerial, operational, research and development, sales, marketing, financial and other personnel. Future growth would impose significant added responsibilities on members of management, including:

- identifying, recruiting, integrating, maintaining and motivating additional employees;

- managing our internal development efforts effectively, including the clinical, FDA and international regulatory review process for our product candidates, while complying with our contractual obligations to contractors and other third parties; and

- improving our operational, financial and management controls, reporting systems and procedures.

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

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

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

Disruptions in the global economy and supply chains may have a material adverse effect on our business, financial condition and results of operations.

The disruptions to the global economy in 2020 and into 2022 have impeded global supply chains, resulting in longer lead times and also increased critical component costs and freight expenses. We have taken and may have to take steps to minimize the impact of these disruptions in lead times and increased costs by working closely with our suppliers and other third parties on whom we rely for the conduct of our business. Despite the actions we have undertaken or may have to undertake to minimize the impacts from disruptions to the global economy, there can be no assurances that unforeseen future events in the global supply chain will not have a material adverse effect on our business, financial condition and results of operations.

Furthermore, inflation can adversely affect us by increasing the costs of clinical trials, the research and development of our product candidates, as well as administration and other costs of doing business. We may experience increases in the prices of labor and other costs of doing business. In an inflationary environment, cost increases may outpace our expectations, causing us to use our cash and other liquid assets faster than forecasted. If this happens, we may need to raise additional capital to fund our operations, which may not be available in sufficient amounts or on reasonable terms, if at all, sooner than expected.

Adverse global conditions, including economic uncertainty, may negatively impact our financial results.

Global conditions, dislocations in the financial markets, any negative financial impacts affecting United States as a result of tax reform or changes to existing trade agreements or tax conventions, may adversely impact our business.

In addition, the global macroeconomic environment could be negatively affected by, among other things, COVID-19 or other pandemics or epidemics, instability in global economic markets, increased U.S. trade tariffs and trade disputes with other countries, instability in the global credit markets, supply chain weaknesses, instability in the geopolitical environment as a result of the withdrawal of the United Kingdom from the European Union, the Russian invasion of Ukraine and other political tensions, and foreign governmental debt concerns. Such challenges have caused, and may continue to cause, uncertainty and instability in local economies and in global financial markets.

Geopolitical risks associated with Russia's invasion of Ukraine could result in increased market volatility and uncertainty, which could negatively impact our business, financial condition, and results of operations.

The uncertain nature, scope, magnitude, and duration of hostilities stemming from Russia's military invasion of Ukraine, including the potential effects of such hostilities as well as sanctions, embargoes, asset freezes, cyber-attacks and other actions taken in response to such hostilities on the world economy and markets, have disrupted global markets and contributed to increased market volatility and uncertainty, which could have an adverse impact on macroeconomic and other factors that affect our business and supply chain. There can be no certainty regarding the impacts stemming from the invasion, including the imposition of additional sanctions, embargoes, asset freezes or other economic or military measures resulting from the invasion. The impact of these developments, and additional events that may occur as a result, is currently unknown and could adversely affect our business, supply chain, suppliers and customers and potential customers. It is not possible to predict the broader consequences of this conflict, which could include further sanctions, embargoes, regional instability, geopolitical shifts and adverse effects on macroeconomic conditions, the availability and cost of materials, supplies, labor, currency exchange rates and financial markets, all of which could negatively impact our business, financial condition and results of operations.

Significant disruptions of information technology systems or breaches of data security could materially adversely affect our business, results of operations and financial condition.

We collect and maintain information in digital form that is necessary to conduct our business, and we are increasingly dependent on information technology systems and infrastructure to operate our business. In the ordinary course of our business, we collect, store and transmit large amounts of confidential information, including intellectual property, proprietary business information and personal information. It is critical that we do so in a secure manner to maintain the confidentiality and integrity of such confidential information. We have established physical, electronic and organizational measures to safeguard and secure our systems to prevent a data compromise, and rely on commercially available systems, software, tools, and monitoring to provide security for our information technology systems and the processing, transmission and storage of digital information. We have also outsourced elements of our information technology infrastructure, and as a result a number of third-party vendors may or could have access to our confidential information. Our internal information technology systems and infrastructure, and those of our current and any future collaborators, contractors and consultants and other third parties on which we rely, are vulnerable to damage from computer viruses, malware, natural disasters, terrorism, war, telecommunication and electrical failures, cyber-attacks or cyber-intrusions over the Internet, attachments to emails, persons inside our organization, or persons with access to systems inside our organization.

The risk of a security breach or disruption, particularly through cyber-attacks or cyber-intrusion, including by computer hackers, foreign governments and cyber-terrorists, has generally increased as the number, intensity and sophistication of attempted attacks and intrusions from around the world have increased. In addition, the prevalent use of mobile devices that access confidential information increases the risk of data security breaches, which could lead to the loss of confidential information or other intellectual property. The costs to us to mitigate network security problems, bugs, viruses, worms, malicious software programs and security vulnerabilities could be significant, and while we have implemented security measures to protect our data security and information technology systems, our efforts to address these problems may not be successful, and these problems could result in unexpected interruptions, delays, cessation of service and other harm to our business and our competitive position. If such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our product development programs. For example, the loss of clinical trial data from completed or 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. Moreover, if a computer security breach affects our systems or results in the unauthorized release of personally identifiable information, our reputation could be materially damaged.

In addition, such a breach may require notification to governmental agencies, the media or individuals pursuant to various federal and state privacy and security laws, if applicable, including the Health Insurance Portability and Accountability Act of 1996, as amended by the Health Information Technology for Clinical Health Act of 2009, and its implementing rules and regulations, as well as regulations promulgated by the Federal Trade Commission and state breach notification laws.

Under the EU regulation and notably the General Data Protection Regulation, or GDPR, No. 2016/679, which entered into force on May 25, 2018 and is applicable personal data that we process in relation to our presence in the EU, the offering of products or services to individuals in the EU or the monitoring of the behavior of individuals in the EU, we have also a legal responsibility to report personal data breaches to the competent supervisory authority. The EU data protection regulation includes a broad definition and a short deadline for the notification of personal data breaches, which may be difficult to implement in practice and requires that we implement robust internal processes. Under this regulation, we have to report personal data breaches to the competent supervisory authority within 72 hours of the time we become aware of a breach "unless the personal data breach is unlikely to result in a risk to the right and freedoms of natural persons" (Article 33 of the GDPR). In addition, the GDPR requires that we communicate the breach to the Data Subject if the breach is "likely to result in a high risk to the rights and freedoms of natural persons" (Article 34 of the GDPR). In order to fulfil these requirements, we have to implement specific internal processes to be followed in case of a personal data breach, which will allow us to (a) contain and recover the breach, (b) assess the risk to the data subjects, (c) notify, and possibly communicate the breach to the data subjects, (d) investigate and respond to the breach. The performance of these processes implies substantial costs in resources and time.

Moreover, as we may rely on third parties that will also process as processor the data for which we are a data controller—for example, in the context of the manufacturing of our product candidates or for the conduct of clinical trials, we must contractually ensure that strict security measures, as well as appropriate obligations including an obligation to report in due delay any security incident are implemented, in order to allow us fulfilling our own regulatory requirements.

We would also be exposed to a risk of loss or litigation and potential liability for any security breach on personal data for which we are data controller. The costs of above-mentioned processes together with legal penalties, possible compensation for damages and any resulting lawsuits arising from a breach may be extensive and may have a negative impact on reputation and materially adversely affect our business, results of operations and financial condition.

In August 2019, management was advised that it was a victim of a cyber-related fraud whereby a hacker impersonated one of our key vendors to redirect payments, totaling approximately $420,000. Management and our Audit Committee completed our investigation and is reviewing all available avenues of recovery, including from our financial institution to recover the payments. As of December 31, 2021, we recovered approximately $50,000 from our financial institution and we do not expect to recover anything further from the cyber-related fraud. As a result of the cyber-related fraud, we have instituted additional controls and procedures and all employees now undergone cybersecurity training.

Requirements associated with being a public company will increase our costs significantly and will divert significant company resources and management attention.

Since we are no longer an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012, we are no longer able to take advantage of certain exemptions from various reporting requirements that were previously available to us, but which were not available to other public companies that are not emerging growth companies. Accordingly, we will be required to comply with increased disclosure obligations regarding executive compensation in our periodic reports and proxy statements and the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved. As a result, we will incur greater expenses associated with such reporting requirements. These expenses would further increase if we ceased to be a "smaller reporting company." In addition, if we are deemed an accelerated filer or large accelerated filer in the future, we expect to incur additional management time and cost to comply with the more stringent reporting requirements applicable to companies that are deemed accelerated filers or large accelerated filers, including complying with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act. We have not yet completed the process of compiling the system and processing documentation needed to comply with such requirements. We may not be able to complete our evaluation, testing and any required remediation in a timely fashion when required to do so. In that regard, we currently do not have an internal audit function, and we will need to hire or contract for additional accounting and financial staff with appropriate public company experience and technical accounting knowledge.

Our management and other personnel need to devote a substantial amount of time to these compliance initiatives. Moreover, these rules and regulations will increase our legal and financial compliance costs and will make some activities more time-consuming and costly. We cannot predict or estimate the amount of additional costs we may incur as a result of this.

Risks Related to Clinical Development, Regulatory Approval and Commercialization

Our product candidates are at an early stage of development and may not be successfully developed or commercialized.

We have no products approved for sale. Niclosamide, which we acquired in 2021, and adrulipase are in the early stages of clinical development. Our product candidates will require substantial capital expenditures, development, testing, and regulatory clearances prior to commercialization. The development and regulatory approval process take several years, and it is not likely that any such products, even if successfully developed and approved by the FDA or any comparable foreign regulatory authority, would be commercially available for a significant period of time. Many promising drug candidates fail at some stage of their clinical development. Accordingly, even if we are able to obtain the requisite financing to fund our development programs, we cannot assure you that our product candidates will be successfully developed, receive required regulatory approvals and successfully commercialized. Our failure to develop, manufacture or receive regulatory approval for or successfully commercialize any of our product candidates, could result in the failure of our business and a loss of all of your investment in our company.

Any product candidates we advance into and through clinical development are subject to extensive regulation, which can be costly and time consuming, cause unanticipated delays or prevent the receipt of the required approvals to commercialize our product candidates.

The clinical development, manufacturing, labeling, storage, record-keeping, advertising, promotion, import, export, marketing and distribution of our product candidates are subject to extensive regulation by the FDA in the United States and by comparable health authorities in foreign markets, including Health Canada's Therapeutic Products Directorate, or the TPD, and the European Medicines Agency, or the EMA. In the United States, we are not permitted to market our product candidates until we receive approval of an NDA (New Drug Application) or BLA (Biologic License Application) from the FDA. The process of obtaining such approval is expensive, often takes many years and can vary substantially based upon the type, complexity and novelty of the products involved. In addition to the significant clinical testing requirements, our ability to obtain marketing approval for these product candidates depends on obtaining the final results of required non-clinical testing, including characterization of the manufactured components of our product candidates and validation of our manufacturing processes. The FDA may determine that our product manufacturing processes, testing procedures or facilities are insufficient to justify approval. Approval policies or regulations may change, and the FDA has substantial discretion in the pharmaceutical approval process, including the ability to delay, limit or deny approval of a product candidate for many reasons. Despite the time and expense invested in clinical development of product candidates, regulatory approval is never guaranteed.

The FDA, the TPD and/or the EMA can delay, limit or deny approval of a product candidate for many reasons, including, but not limited to:

- disagreement with the design or implementation of our clinical trials;
- failure to demonstrate to their satisfaction that a product candidate is safe and effective for any indication;
- failure to accept clinical data from trials which are conducted outside their jurisdiction;
- the results of clinical trials may not meet the level of statistical significance required for approval;
- we may be unable to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;
- such agencies may disagree with our interpretation of data from preclinical studies or clinical trials;
- failure to approve the manufacturing processes or facilities of third-party manufacturers with which we or our collaborators contract for clinical and commercial supplies; or

- changes in the approval policies or regulations of such agencies may significantly change in a manner rendering our clinical data insufficient for approval.

Any delay in obtaining, or inability to obtain, applicable regulatory approvals would prevent us from commercializing our product candidates.

If we encounter difficulties enrolling patients in our clinical trials, our clinical development activities could be delayed or otherwise adversely affected.

We may experience difficulties in patient enrollment in our clinical trials for a variety of reasons. The timely completion of clinical trials in accordance with their protocols depends, among other things, on our ability to enroll a sufficient number of patients who remain in the trial until its conclusion. The enrollment of patients depends on many factors, including:

- the patient eligibility criteria defined in the protocol;
- the size of the patient population;
- the proximity and availability of clinical trial sites for prospective patients;
- the design of the trial;
- our ability to recruit clinical trial investigators with the appropriate competencies and experience;
- The availability of other clinical trials and competition for eligible patients;
- our ability to obtain and maintain patient consents; and
- the risk that patients enrolled in clinical trials will drop out of the trials before completion.

Our clinical trials will compete with other clinical trials for product candidates that are in the same therapeutic areas as our product candidates. This competition will reduce the number and types of patients and qualified clinical investigators available to us, because some patients who might have opted to enroll in our trials may instead opt to enroll in a trial being conducted by one of our competitors or clinical trial sites may not allow us to conduct our clinical trial at such site if competing trials are already being conducted there. Since the number of qualified clinical investigators is limited, we expect to conduct some of our clinical trials at the same clinical trial sites that some of our competitors use, which will reduce the number of patients who are available for our clinical trials in such clinical trial site. We may also encounter difficulties finding a clinical trial site at which to conduct our trials.

Delays in patient enrollment may result in increased costs or may affect the timing or outcome of our planned clinical trials, which could prevent completion of these clinical trials and adversely affect our ability to advance the development of our product candidates.

Because the results of preclinical studies and early clinical trials are not necessarily predictive of future results, any product candidate we advance into clinical trials may not have favorable results in later clinical trials, if any, or receive regulatory approval.

Pharmaceutical development has inherent risk. We will be required to demonstrate through well-controlled clinical trials that our product candidates are safe and effective with a favorable benefit-risk profile for use in their target indications before we can seek regulatory approvals for their commercial sale. Adrulipase, has only completed three Phase 2 clinical trials in two separate indications (two Phase 2 in CF patients and one Phase 2 in CP patients). Niclosamide has completed a Phase 1b/2a study, conducted by First Wave, in patients with mild-to-moderate ulcerative colitis. Success in pre-clinical studies or early clinical trials does not mean that later clinical trials will be successful, as product candidates in later-stage clinical trials may fail to demonstrate sufficient safety or efficacy despite having progressed through initial clinical testing. We also may need to conduct additional clinical trials that are not currently anticipated. Drug developers frequently suffer significant setbacks in advanced clinical trials, even after earlier clinical trials have shown promising results.

Any product candidate we advance into and through clinical trials may cause unacceptable adverse events or have other properties that may delay or prevent their regulatory approval or commercialization or limit their commercial potential.

Unacceptable adverse events caused by niclosamide and adrulipase in clinical trials could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in the denial of regulatory approval by the FDA or other regulatory authorities for any or all targeted indications and markets. This, in turn, could prevent us from commercializing the affected product candidate and generating revenues from its sale. We have not yet completed testing of any of our product candidates for the treatment of the indications for which we intend to seek product approval in humans, and we currently do not know the extent of adverse events, if any, that will be observed in patients who receive any of our product candidates. If any of our product candidates cause unacceptable adverse events in clinical trials, we may not be able to obtain regulatory approval or commercialize such product or, if such product candidate is approved for marketing, future adverse events could cause us to withdraw such product from the market.

Delays in the commencement or completion of our clinical trials could result in increased costs and delay our ability to pursue regulatory approval and commercialization of our product candidates.

The commencement and completion of clinical trials can be delayed for a variety of reasons, including delays in:

- obtaining regulatory clearance to commence a clinical trial;
- identifying, recruiting and training suitable clinical investigators;
- reaching agreement on acceptable terms with prospective clinical research organizations ("*CROs*") and trial sites, the terms of which can be subject to extensive negotiation, may be subject to modification from time to time and may vary significantly among different CROs and trial sites;
- obtaining sufficient quantities of investigational product ("*IP*") for our product candidates for use in clinical trials;
- obtaining Institutional Review Board ("*IRB*") or ethics committee approval to conduct a clinical trial at a prospective site;
- identifying, recruiting and enrolling patients to participate in a clinical trial, including delays and/or interruptions resulting from geo-political actions, such as the war in Ukraine, disease or public health epidemics, such as the coronavirus, or natural disasters;
- retaining patients who have initiated a clinical trial but may withdraw due to adverse events from the therapy, insufficient efficacy, changing clinical protocols, fatigue with the clinical trial process, or personal issues;
- retaining patients who may not follow the clinical trial protocols due to factors including the coronavirus epidemic; and
- availability of funds.

Any delays in the commencement of our clinical trials will delay our ability to pursue regulatory approval for our product candidates. In addition, many of the factors that cause, or lead to, a delay in the commencement of clinical trials may also ultimately lead to the denial of regulatory approval of a product candidate.

If we encounter difficulties enrolling patients in our clinical trials, our clinical development activities could be delayed or otherwise adversely affected.

The timely completion of clinical trials in accordance with their protocols depends, among other things, on our ability to enroll a sufficient number of patients who remain in the trial until its conclusion. We may experience difficulties in patient enrollment in our clinical trials for a variety of reasons, including the size and nature of the patient population and the patient eligibility criteria defined in the protocol, competition from competing companies, natural disasters, geo-political events, such as the war in Ukraine or public health epidemics, such as the coronavirus impacting the U.S., Europe and elsewhere.

We may be required to suspend, repeat or terminate our clinical trials if they are not conducted in accordance with regulatory requirements, the results are negative or inconclusive or the trials are not well designed.

Regulatory agencies, IRBs or data safety monitoring boards may at any time recommend the temporary or permanent discontinuation of our clinical trials or request that we cease using investigators in the clinical trials if they believe that the clinical trials are not being conducted in accordance with applicable regulatory requirements, or that they present an unacceptable safety risk to participants. Clinical trials must be conducted in accordance with current cGCPs or other applicable foreign government guidelines governing the design, safety monitoring, quality assurance and ethical considerations associated with clinical studies. Clinical trials are subject to oversight by the FDA, other foreign governmental agencies and IRBs at the study sites where the clinical trials are conducted. In addition, clinical trials must be conducted with product candidates produced in accordance with applicable cGMPs, which are the FDA's regulations governing the design, monitoring and control of manufacturing processes and facilities. Clinical trials may be suspended by the FDA, other foreign governmental agencies, or us for various reasons, including:

- deficiencies in the conduct of the clinical trials, including failure to conduct the clinical trial in accordance with regulatory requirements or clinical protocols;
- deficiencies in the clinical trial operations or trial sites;
- the product candidate may have unforeseen adverse side effects;
- deficiencies in the trial design necessary to demonstrate efficacy;
- fatalities or other adverse events arising during a clinical trial due to medical problems that may not be related to clinical trial treatments;
- the product candidate may not appear to be more effective than current therapies; or
- the quality or stability of the product candidate may fall below acceptable standards.

If we elect or are forced to suspend or terminate a clinical trial for niclosamide and adrulipase the commercial prospects for that product candidate will be harmed and our ability to generate product revenue from that product candidate may be delayed or eliminated. Furthermore, any of these events could prevent us or our partners from achieving or maintaining market acceptance of the affected product candidate and could substantially increase the costs of commercializing our product candidates and impair our ability to generate revenue from the commercialization of these product candidates either by us or by our collaboration partners.

The approval processes of regulatory authorities are lengthy, time consuming, expensive and inherently unpredictable. If we are unable to obtain approval for our product candidates from applicable regulatory authorities, we will not be able to market and sell those product candidates in those countries or regions and our business will be substantially harmed.

The time required to obtain approval by the FDA and comparable foreign authorities is unpredictable, but typically takes many years following the commencement of clinical trials and depends upon numerous factors, including the substantial discretion of the regulatory authorities. We have not submitted an NDA or similar filing or obtained regulatory approval for any drug candidate in any jurisdiction and it is possible that none of our existing product candidates or any product candidates we may seek to develop in the future will ever obtain regulatory approval.

Niclosamide and adrulipase could fail to receive regulatory approval for many reasons, including any one or more of the following:

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

The time and expense of the approval process, as well as the unpredictability of clinical trial results and other contributing factors, may result in our failure to obtain regulatory approval to market, in one or more jurisdictions niclosamide, adrulipase or future product candidates, which would significantly harm our business, results of operations and prospects.

In addition, even if we were to obtain regulatory approval in one or more jurisdictions, regulatory authorities may approve niclosamide and adrulipase for fewer or more limited indications than we request, may not approve the prices we may propose to charge for our products, may grant approval contingent on the performance of costly post-marketing clinical trials, or may approve a product candidate with labeling that does not include the claims necessary or desirable for the successful commercialization of that product candidate. Any of the foregoing circumstances could materially harm the commercial prospects for niclosamide and adrulipase.

Our product candidates may cause undesirable side effects or have other properties that could delay or prevent their regulatory approval, limit the commercial profile of the approved labeling, or result in significant negative consequences following marketing approval, if any.

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

Additionally, if niclosamide and adrulipase receive marketing approval, and we or others later identify undesirable side effects caused by our products, a number of potentially significant negative consequences could result, including:

- regulatory authorities may withdraw approvals of such product;
- regulatory authorities may require additional warnings in the product's labeling;
- we may be required to create a medication guide for distribution to patients that outlines the risks of such side effects;
- we could be sued and held liable for harm caused to patients; and
- our reputation may suffer.

Any of these events could prevent us from achieving or maintaining market acceptance of the particular product, if approved, and could significantly harm our business, results of operations and prospects.

If we are unable to execute our sales and marketing strategy for our products and are unable to gain market acceptance, we may be unable to generate sufficient revenue to sustain our business.

We are a clinical-stage biopharmaceutical company and have yet to begin to generate revenue from niclosamide and adrulipase. Our product candidates are in an early stage of clinical development, and, if we obtain marketing approval for any of products in the future, which we anticipate would not occur for several years, if at all.

We may never gain significant market acceptance for our product candidates and therefore may never generate substantial revenue or profits for us. We will need to establish a market for any of our product candidates that receive regulatory approval through physician education, sales and marketing efforts, awareness programs and the publication of clinical data. Gaining acceptance in medical communities requires, among other things, publication in leading peer-reviewed journals of results from our studies. The process of publication in leading medical journals is subject to a peer review process and peer reviewers may not consider the results of our studies sufficiently novel or worthy of publication. Failure to have our studies published in peer-reviewed journals could limit the adoption of niclosamide and adrulipase. Our ability to successfully market our product candidates that we may develop will depend on numerous factors, including:

- the FDA or comparable foreign regulatory authorities may disagree with the design or implementation of our clinical trials;
- the efficacy and safety as demonstrated in clinical trials;
- the clinical indications for which the product is approved;
- the inability to demonstrate effectively that the clinical and other benefits of a product candidate outweigh any safety or other perceived risks;

- the inability to demonstrate effectively that the efficacy of a product candidate is superior to a competing treatment;
- conducting clinical utility studies of our product candidates to demonstrate economic usefulness to providers and payers;
- relative convenience and ease of administration;
- whether our current or future partners, support our offerings;
- the success of the sales force and marketing effort;
- unfavorable publicity relating to the product;
- whether healthcare providers believe our product candidates provide clinical utility relative to their cost; and
- whether private health insurers, government health programs and other third-party payers will cover our product candidates.

We currently have no commercial organization. If we are unable to establish satisfactory sales and marketing capabilities or secure a sales and marketing partner, we may not successfully commercialize any of our product candidates.

We have no commercial infrastructure. In order to commercialize products that are approved for marketing, we must either establish our own sales and marketing infrastructure or collaborate with third parties that have such commercial infrastructure.

We may not be able to enter into collaboration agreements on terms acceptable to us or at all. In addition, even if we enter into such relationships, we may have limited or no control over the sales, marketing and distribution activities of these third parties. Our future revenues may depend heavily on the success of the efforts of these third parties. If we elect to establish a sales and marketing infrastructure, we may not realize a positive return on this investment. In addition, we will have to compete with established and well-funded pharmaceutical and biotechnology companies to recruit, hire, train and retain sales and marketing personnel. Factors that may inhibit our efforts to commercialize our product candidates without strategic partners or licensees include:

- our inability to recruit and retain adequate numbers of effective sales and marketing personnel;
- the inability of sales personnel to obtain access to or persuade adequate numbers of physicians to prescribe our future products;
- the lack of complementary products to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines; and
- unforeseen costs and expenses associated with creating an independent sales and marketing organization.

If we are not successful in recruiting sales and marketing personnel or in building a sales and marketing infrastructure, or if we do not successfully enter into appropriate collaboration arrangements, we will have difficulty successfully commercializing our product candidates and any we may develop or acquire, which would adversely affect our business, operating results and financial condition. Outside the United States, we may commercialize our product candidates by entering into collaboration agreements with pharmaceutical partners. We may not be able to enter into such agreements on terms acceptable to us or at all. In addition, even if we enter into such relationships, we may have limited or no control over the sales, marketing and distribution activities of these third parties. Our future revenues may depend heavily on the success of the efforts of these third parties.

We may form or seek strategic alliances or enter into additional licensing arrangements in the future, and we may not realize the benefits of such alliances or licensing arrangements.

From time to time, we may form or seek strategic alliances, create joint ventures or collaborations or enter into additional licensing arrangements with third parties that we believe will complement or augment our development and commercialization efforts with respect to niclosamide and adrulipase and any future product candidates that we may develop. Any of these relationships may require us to incur non-recurring and other charges, increase our near and long-term expenditures, issue securities that dilute our existing stockholders or disrupt our management and business. These relationships also may result in a delay in the development of niclosamide and adrulipase if we become dependent upon the other party and such other party does not prioritize the development of our product candidates relative to its other development activities. In addition, we face significant competition in seeking appropriate strategic partners and the negotiation process is time-consuming and complex. Moreover, we may not be successful in our efforts to establish a strategic partnership or other alternative arrangements for our product candidates because they may be deemed to be at too early of a stage of development for collaborative effort and third parties may not view our product candidates as having the requisite potential to demonstrate safety and efficacy. If we license products or businesses, we may not be able to realize the benefit of such transactions if we are unable to successfully integrate them with our existing operations and company culture. We cannot be certain that, following a strategic transaction or license, we will achieve the revenue or specific net income that justifies such transaction. We rely completely on third parties to manufacture our preclinical and clinical pharmaceutical supplies and expect to continue to rely on third parties to produce commercial supplies of our product candidates, and our dependence on third party suppliers could adversely impact our business.

We rely completely on third parties to manufacture our preclinical and clinical pharmaceutical supplies and expect to continue to rely on third parties to produce commercial supplies of any approved product candidate, and our dependence on third party suppliers could adversely impact our business.

We rely on third parties to manufacture our product candidates, including niclosamide and adrulipase. The proprietary yeast cell line from which the adrulipase API is derived is kept at a storage facility maintained by Charles River Laboratories Inc. Adrulipase drug substance and drug product are currently manufactured at a contract facility located in Tianjin, China owned by Asymchem Life Science Co., Ltd. We believe there are multiple alternative contract manufacturers capable of producing the adrulipase product we need for clinical trials. There is no guarantee that the processes are easily reproducible and transferrable.

Niclosamide API is obtained by chemical synthesis and is currently manufactured by Olon SpA at a facility in Murcia, Spain. The drug product manufacturing for niclosamide is currently conducted at a contract facility located in Milan, Italy and Tianjin, China owned by Monteresearch s.r.l. and Asymchem Life Science Co., Ltd, respectively.

We are completely dependent on these third parties for product supply and our niclosamide and adrulipase development programs would be adversely affected by a significant interruption in our ability to receive such materials. We have not yet entered into long-term manufacturing or supply agreements with any third parties. Furthermore, our third-party suppliers will be required to maintain compliance with cGMPs and will be subject to inspections by the FDA or comparable regulatory authorities in other jurisdictions to confirm such compliance. In the event that the FDA or such other authorities determine that our third-party suppliers have not complied with cGMP, our clinical trials could be terminated or subjected to a clinical hold until such time as we are able to obtain appropriate replacement material. Any delay, interruption or other issues that arise in the manufacture, packaging, or storage of our products as a result of a failure of the facilities or operations of our third-party suppliers to pass any regulatory agency inspection could significantly impair our ability to develop and commercialize our products.

We do not expect to have the resources or capacity to commercially manufacture any of our proposed products, if approved, and will likely continue to be dependent upon third party manufacturers. Our dependence on third parties to manufacture and supply us with clinical trial materials and any approved products may adversely affect our ability to develop and commercialize our products on a timely basis or at all.

We rely on third parties to conduct our clinical trials. If these third parties do not meet our deadlines or otherwise conduct the trials as required, our clinical development programs could be delayed or unsuccessful and we may not be able to obtain regulatory approval for or commercialize our product candidates when expected or at all.

We do not have the ability to conduct all aspects of our preclinical testing or clinical trials ourselves. We use contract research organizations (CROs) to conduct our clinical trials and will rely upon such CROs, as well as medical institutions, clinical investigators and consultants, to conduct our trials in accordance with our clinical protocols. Our CROs, investigators and other third parties will play a significant role in the conduct of these trials and the subsequent collection and analysis of data from the clinical trials.

There is no guarantee that any CROs, investigators and other third parties upon which we rely for administration and conduct of our clinical trials will devote adequate time and resources to such trials or perform as contractually required. If any of these third parties fail to meet expected deadlines, fail to adhere to our clinical protocols or otherwise perform in a substandard manner, our clinical trials may be extended, delayed or terminated. If any of our clinical trial sites terminate for any reason, we may experience the loss of follow-up information on patients enrolled in our ongoing clinical trials unless we are able to transfer the care of those patients to another qualified clinical trial site. In addition, principal investigators for our clinical trials may serve as scientific advisors or consultants to us from time to time and receive cash or equity compensation in connection with such services. If these relationships and any related compensation result in perceived or actual conflicts of interest, the integrity of the data generated at the applicable clinical trial site may be jeopardized.

We intend to rely on market exclusivity periods that may not be or remain available to us.

We intend to rely on our ability to obtain and maintain a regulatory period of market exclusivity for any of our product candidates, including niclosamide and adrulipase that are successfully developed and approved for commercialization. Although this period in the United States is currently 12 years from the date of marketing approval, reductions to this period have been proposed. This exclusivity period in Europe is currently 10 years from the date of marketing approval by the EMA. Once any regulatory period of exclusivity expires, depending on the status of our patent coverage and the nature of the product, we may not be able to prevent others from marketing products that are biosimilar to or interchangeable with our products, which would materially adversely affect us.

Because niclosamide is a small molecule it would be subject either to three or five year exclusivity, depending on the regulatory pathway of any clinical trials. Niclosamide is not entitled to the same 12-year exclusivity as our biologic product candidates.

Due to the significant resources required for the development of our product candidates, we must prioritize development of certain product candidates and/or certain disease indications. We may expend our limited resources on candidates or indications that do not yield a successful product and fail to capitalize on product candidates or indications that may be more profitable or for which there is a greater likelihood of success.

We intend to develop a pipeline of product candidates to treat GI and other diseases. Due to the significant resources required for the development of product candidates, we must focus our attention and resources on specific diseases and/or indications and decide which product candidates to pursue and the amount of resources to allocate to each. We are currently focusing our resources on the development of our product candidates, niclosamide and adrulipase.

Our decisions concerning the allocation of research, development, collaboration, management and financial resources toward particular product candidates or therapeutic areas may not lead to the development of any viable commercial product and may divert resources away from better opportunities. Similarly, any decision to delay, terminate or collaborate with third parties in respect of certain programs or product candidates may subsequently prove to be suboptimal and could cause us to miss valuable opportunities. If we make incorrect determinations regarding the viability or market potential of any of our programs or product candidates or misread trends in the GI, CF, CP, COVID-19, ICI-AC or biotechnology industry, our business, financial condition and results of operations could be materially adversely affected. As a result, we may fail to capitalize on viable commercial products or profitable market opportunities, be required to forego or delay pursuit of opportunities with other product candidates or other diseases and indications that may later prove to have greater commercial potential than those we choose to pursue, or relinquish valuable rights to such product candidates through collaboration, licensing or other royalty arrangements in cases in which it would have been advantageous for us to invest additional resources to retain development and commercialization rights.

If we fail to attract and retain key management and clinical development personnel, we may be unable to successfully develop or commercialize our product candidates.

We are dependent on our management team and clinical development personnel and our success will depend on their continued service, as well as our ability to attract and retain highly qualified personnel. In particular, the continued employment of our senior management team, which now includes James Sapirstein, our President and Chief Executive Officer and Sarah Romano, our Chief Financial Officer, is critical to our success. The market for the services of qualified personnel in the biotechnology and pharmaceutical industries are highly competitive. The loss of service of any member of our senior management team or key personnel could prevent, impair or delay the implementation of our business plan, the successful conduct and completion of our planned clinical trials and the commercialization of any product candidates that we may successfully develop. We do not carry key man insurance for any member of our senior management team.

Healthcare reform and restrictions on reimbursements may limit our financial returns.

Our ability or the ability of our collaborators to commercialize any of our product candidates that we successfully develop may depend, in part, on the extent to which government health administration authorities, private health insurers and other organizations will reimburse consumers for the cost of these products. These third parties are increasingly challenging both the need for and the price of new drug products. Significant uncertainty exists as to the reimbursement status of newly approved therapeutics. Adequate third-party reimbursement may not be available for our product candidates to enable us or our collaborators to maintain price levels sufficient to realize an appropriate return on their and our investments in research and product development.

Changes in healthcare law and implementing regulations, including government restrictions on pricing and reimbursement, as well as healthcare policy and other healthcare payor cost-containment initiatives, may negatively impact our ability to generate revenues.

The potential pricing and reimbursement environment for niclosamide, adrulipase and any future drug products may change in the future and become more challenging due to, among other reasons, policies advanced by the current or any new presidential administration, federal agencies, healthcare legislation passed by Congress, or fiscal challenges faced by all levels of government health administration authorities.

If we or any of our independent contractors, consultants, collaborators, manufacturers, vendors or service providers fail to comply with healthcare laws and regulations, we or they could be subject to enforcement actions, which could result in penalties and affect our ability to develop, market and sell our product candidates and may harm our reputation.

We are subject to federal, state, and foreign healthcare laws and regulations pertaining to fraud and abuse and patients' rights. These laws and regulations include:

- the U.S. federal healthcare program anti-kickback law, which prohibits, among other things, persons and entities from soliciting, receiving or providing remuneration, directly or indirectly, to induce either the referral of an individual for a healthcare item or service, or the purchasing or ordering of an item or service, for which payment may be made under a federal healthcare program such as Medicare or Medicaid;

- the U.S. federal false claims and civil monetary penalties laws, which prohibit, among other things, individuals or entities from knowingly presenting or causing to be presented, claims for payment by government funded programs such as Medicare or Medicaid that are false or fraudulent, and which may apply to us by virtue of statements and representations made to customers or third parties;

- the U.S. federal Health Insurance Portability and Accountability Act ("*HIPAA*"), which prohibits, among other things, executing a scheme to defraud healthcare programs;

- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act, or HITECH, imposes requirements relating to the privacy, security, and transmission of individually identifiable health information, and requires notification to affected individuals and regulatory authorities of certain breaches of security of individually identifiable health information;

- the federal Physician Payment Sunshine Act, which requires certain manufacturers of drugs, devices, biologics and medical supplies to report annually to the Centers for Medicare & Medicaid Services, or CMS, information related to payments and other transfers of value to physicians, other healthcare providers and teaching hospitals, and ownership and investment interests held by physicians and other healthcare providers and their immediate family members, which is published in a searchable form on an annual basis; and

- state laws comparable to each of the above federal laws, such as, for example, anti-kickback and false claims laws that may be broader in scope and also apply to commercial insurers and other non-federal payors, requirements for mandatory corporate regulatory compliance programs, and laws relating to patient data privacy and security.

If our operations are found to be in violation of any such health care laws and regulations, we may be subject to penalties, including administrative, civil and criminal penalties, monetary damages, disgorgement, imprisonment, the curtailment or restructuring of our operations, loss of eligibility to obtain approvals from the FDA, or exclusion from participation in government contracting, healthcare reimbursement or other government programs, including Medicare and Medicaid, any of which could adversely affect our financial results. Although effective compliance programs can mitigate the risk of investigation and prosecution for violations of these laws, these risks cannot be entirely eliminated. Any action against us for an alleged or suspected violation could cause us to incur significant legal expenses and could divert our management's attention from the operation of our business, even if our defense is successful. In addition, achieving and sustaining compliance with applicable laws and regulations may be costly to us in terms of money, time and resources.

Our employees and independent contractors, including principal investigators, consultants, commercial collaborators, service providers and other vendors may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements, which could have an adverse effect on our results of operations.

We are exposed to the risk that our employees and independent contractors, including principal investigators, consultants, any future commercial collaborators, service providers and other vendors may engage in misconduct or other illegal activity. Misconduct by these parties could include intentional, reckless and/or negligent conduct or other unauthorized activities that violate the laws and regulations of the FDA, EMA and other similar regulatory bodies, including those laws that require the reporting of true, complete and accurate information to such regulatory bodies; manufacturing standards; healthcare fraud and abuse, data privacy laws and other similar laws; or laws that require the true, complete and accurate reporting of financial information or data. Activities subject to these laws also involve the improper use or misrepresentation of information obtained in the course of clinical trials, the creation of fraudulent data in our preclinical studies or clinical trials, or illegal misappropriation of product, which could result in regulatory sanctions and cause serious harm to our reputation. It is not always possible to identify and deter misconduct by employees and other third parties, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. In addition, we are subject to the risk that a person or government could allege such fraud or other misconduct, even if none occurred. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business and financial results, including, without limitation, the imposition of significant civil, criminal and administrative penalties, damages, monetary fines, disgorgements, possible exclusion from participation in governmental healthcare programs, individual imprisonment, other sanctions, 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 results of operations.

Risks Related to our Intellectual Property

Our success will depend upon intellectual property, proprietary technologies and regulatory market exclusivity periods, and we may be unable to protect our intellectual property.

Our success will depend, in large part, on obtaining and maintaining patent protection and trade secret protection for niclosamide and adrulipase and their formulations and uses, as well as successfully defending these patents against third-party challenges. If we or our licensors fail to appropriately prosecute and maintain patent protection for our product candidates, our ability to develop and commercialize these product candidates may be adversely affected and we may not be able to prevent competitors from making, using and selling competing products. This failure to properly protect the intellectual property rights relating to these product candidates could have a material adverse effect on our financial condition and results of operations.

The patent application process is subject to numerous risks and uncertainties, and there can be no assurance that we or our partners will be successful in protecting our product candidates by obtaining and defending patents. These risks and uncertainties include the following:

- patent applications may not result in any patents being issued or any issued patents may not be of sufficient scope to cover our products;

- patents that may be issued or in-licensed may be challenged, invalidated, modified, revoked, circumvented, found to be unenforceable, or otherwise may not provide any competitive advantage;

- our competitors, many of which have substantially greater resources than we or our partners and many of which have made significant investments in competing technologies, may seek, or may already have obtained, patents that will limit, interfere with, or eliminate our ability to make, use, and sell our potential products;

- there may be significant pressure on the United States government and other international governmental bodies to limit the scope of patent protection both inside and outside the United States for disease treatments that prove successful as a matter of public policy regarding worldwide health concerns;

- countries other than the United States may have patent laws less favorable to patentees than those upheld by United States courts, allowing foreign competitors a better opportunity to create, develop, and market competing products;

- others may allege ownership of our patents or patent applications or those of our licensors, and defense of such allegation or potential proceeding could be expensive, time consuming and unsuccessful; and

- we may be involved in lawsuits to protect or enforce our patents or the patents of our licensors, which could be expensive, time consuming and unsuccessful.

In addition to patents, we and our partners also rely on trade secrets and proprietary know-how. Although we have taken steps to protect our trade secrets and unpatented know-how, including entering into confidentiality agreements with third parties, and confidential information and inventions agreements with employees, consultants and advisors, third parties may still obtain this information or come upon this same or similar information independently. We may become subject to claims that we or consultants, advisors or independent contractors that we may engage to assist us in developing niclosamide and adrulipase have wrongfully or inadvertently disclosed to us or used trade secrets or other proprietary information of their former employers or their other clients.

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

Our success also depends upon our ability and the ability of any of our future collaborators to develop, manufacture, market and sell our product candidates without infringing the proprietary rights of third parties. Numerous United States and foreign issued patents and pending patent applications, which are owned by third parties, exist in the fields in which we are developing products, some of which may be directed at claims that overlap with the subject matter of our intellectual property. Because patent applications do not publish for 18 months from their priority date, can be filed with a non-publication request in the United States, and can take many years to issue, there may be currently pending applications, unknown to us, which may later result in issued patents that our product candidates or proprietary technologies may infringe. Similarly, there may be issued patents relevant to our product candidates of which we are not aware.

There is a substantial amount of litigation involving patent and other intellectual property rights in the biotechnology and biopharmaceutical industries generally. If a third-party claims that we or any of our licensors, suppliers or collaborators infringe the third party's intellectual property rights, we may have to:

- obtain licenses, which may not be available on commercially reasonable terms, if at all;

- abandon an infringing product candidate or redesign our products or processes to avoid infringement;

- pay substantial damages, including the possibility of treble damages and attorneys' fees, if a court decides that the product or proprietary technology at issue infringes on or violates the third party's rights;

- pay substantial royalties, fees and/or grant cross licenses to our technology; and/or

- defend litigation or administrative proceedings which may be costly whether we win or lose, and which could result in a substantial diversion of our financial and management resources.

Our ability to compete may decline if we do not adequately protect our proprietary rights.

Our success depends on obtaining and maintaining proprietary rights to our product candidates for the treatment of age-related diseases, as well as successfully defending these rights against third-party challenges. We will only be able to protect our product candidates, and their uses from unauthorized use by third parties to the extent that valid and enforceable patents, or effectively protected trade secrets, cover them. Our ability to obtain patent protection for our product candidates is uncertain due to a number of factors, including:

- we may not have been the first to make the inventions covered by pending patent applications or issued patent;

- we may not have been the first to file patent applications for our product candidates or the compositions we developed or for their uses;

- others may independently develop identical, similar or alternative products or compositions and uses thereof;

- our disclosures in patent applications may not be sufficient to meet the statutory requirements for patentability;

- any or all of our pending patent applications may not result in issued patents;

- we may not seek or obtain patent protection in countries that may eventually provide us a significant business opportunity;

- any patents issued to us may not provide a basis for commercially viable products, may not provide any competitive advantages, or may be successfully challenged by third parties;

- our compositions and methods may not be patentable;

- others may design around our patent claims to produce competitive products which fall outside of the scope of our patents;

- others may identify prior art or other bases which could invalidate our patents.

Even if we have or obtain patents covering our product candidates or compositions, we may still be barred from making, using and selling our product candidates or technologies because of the patent rights of others. Others may have filed, and in the future may file, patent applications covering compositions or products that are similar or identical to ours. There are many issued U.S. and foreign patents relating to chemical compounds and therapeutic products, and some of these relate to compounds we intend to commercialize. These could materially affect our ability to develop our product candidates or sell our products if approved. Because patent applications do not publish for 18 months from their priority date, can be filed with a non-publication request in the United States, and can take many years to issue, there may be currently pending applications unknown to us that may later result in issued patents that our product candidates or compositions may infringe. These patent applications may have priority over patent applications filed by us.

Obtaining and maintaining a patent portfolio entails significant expense and resources. Part of the expense includes periodic maintenance fees, renewal fees, annuity fees, various other governmental fees on patents and/or applications due in several stages over the lifetime of patents and/or applications, as well as the cost associated with complying with numerous procedural provisions during the patent application process. We may or may not choose to pursue or maintain protection for particular inventions. In addition, there are situations in which failure to make certain payments or noncompliance with certain requirements in the patent process can result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. If we choose to forgo patent protection or allow a patent application or patent to lapse purposefully or inadvertently, our competitive position could suffer.

Legal actions to enforce our proprietary rights (including patents and trademarks) can be expensive and may involve the diversion of significant management time. In addition, these legal actions could be unsuccessful and could also result in the invalidation of our patents or trademarks or a finding that they are unenforceable. We may or may not choose to pursue litigation or other actions against those that have infringed on our patents or trademarks, or used them without authorization, due to the associated expense and time commitment of monitoring these activities. If we fail to protect or to enforce our intellectual property rights successfully, our competitive position could suffer, which could harm our results of operations.

Risks Related to our Securities

Our failure to maintain compliance with Nasdaq's continued listing requirements could result in the delisting of our Common Stock.

Our common stock is currently listed for trading on The Nasdaq Capital Market. We must satisfy the continued listing requirements of Nasdaq, to maintain the listing of our common stock on The Nasdaq Capital Market.

As we have previously reported, on November 26, 2021, we received notice from the Listing Qualifications Staff (the "*Staff*") of The Nasdaq Stock Market LLC ("*Nasdaq*") indicating that we were not in compliance with the $2.5 million minimum stockholders' equity requirement for continued listing of the Common Stock on Nasdaq, as set forth in Nasdaq Listing Rule 5550(b)(1) (the "*Minimum Stockholders' Equity Rule*").

On January 10, 2022, we submitted a plan to the Staff to regain compliance with the Minimum Stockholders' Equity Rule and on February 15, 2022, the Staff notified us that Nasdaq had granted us an extension through May 25, 2022, to regain compliance. On May 26, 2022, we received a letter from the Staff indicating that, based upon our continued non-compliance with the Minimum Stockholders' Equity Rule, the Staff had determined to delist the Company's securities from Nasdaq unless we timely requested a hearing before a Nasdaq Hearing Panel (the "*Panel*").

Additionally, on May 16, 2022, we received notice from the Staff indicating that, based upon the closing bid price of the Common Stock for the prior 30 consecutive business days, we were not in compliance with the requirement to maintain a minimum bid price of $1.00 per share for continued listing on Nasdaq, as set forth in Nasdaq Listing Rule 5550(a)(2) (the "*Bid Price Rule*"). We had 180 days from May 16, 2022, or through November 14, 2022, to regain compliance with the Bid Price Rule. After receiving stockholder approval at the annual meeting of stockholders, on August 26, 2022, we effected a one-for-thirty reverse stock split of the Common Stock (the "*Prior Reverse Split*"). By letter dated September 12, 2022, Nasdaq advised us that we had regained compliance with the Bid Price Rule.

We timely requested a hearing before the Panel. Following the hearing, on July 11, 2022 the Panel granted our request for continued listing of our common stock (the "*Extension*"). The Exception is subject to a number of significant conditions that must be satisfied on or before specific deadlines set forth in the Exception, including the completion of one or more significant equity financings on terms described in the Exception. The final term of the Exception expired on November 22, 2022. On December 20, 2022, we received a letter from the Panel confirming that we had regained compliance with the Minimum Stockholders' Equity Rule.

On December 14, 2022, we received a deficiency notice from the Staff of Nasdaq indicating that, based upon the closing bid price of our common stock for the prior 30 consecutive business days, we were not in compliance with the Bid Price Rule. After receiving stockholder approval at a special meeting of stockholders on January 13, 2023, we effected a 1:7 reverse stock split on January 18, 2023. On February 6, 2023, we received a letter from the Panel indicating that we have regained compliance with the Minimum Bid Price Rule and that the Panel's oversight process of us is now closed.

Additionally, in 2020, the SEC approved a previously proposed Nasdaq rule change to expedite delisting of securities with a closing bid price at or below $0.10 for 10 consecutive trading days during any bid price compliance period and that have had one or more reverse stock splits with a cumulative ratio of one for 250 or more shares over the prior two-year period. In addition, if a company falls out of compliance with the $1.00 minimum bid price after completing reverse stock splits over the immediately preceding two years that cumulatively result in a ratio one for 250 shares, the company will not be able to avail itself of any bid price compliance periods under Rule 5810(c)(3)(A), and Nasdaq will instead require the issuance of a Staff delisting determination. We could appeal the determination to a hearings panel, which could grant us a 180-day exception to remain listed if it believes we would be able to achieve and maintain compliance with the bid price requirement. Following the exception, the company would be subject to the procedures applicable to a company with recurring deficiencies (Nasdaq Rule 5815(d)(4)(B)).

If our common stock were delisted from Nasdaq, trading of our common stock would most likely take place on an over-the-counter market established for unlisted securities, such as the OTCQB or the Pink Market maintained by OTC Markets Group Inc. An investor would likely find it less convenient to sell, or to obtain accurate quotations in seeking to buy, our common stock on an over-the-counter market, and many investors would likely not buy or sell our common stock due to difficulty in accessing over-the-counter markets, policies preventing them from trading in securities not listed on a national exchange or other reasons. In addition, as a delisted security, our common stock would be subject to SEC rules as a "penny stock," which impose additional disclosure requirements on broker-dealers. The regulations relating to penny stocks, coupled with the typically higher cost per trade to the investor of penny stocks due to factors such as broker commissions generally representing a higher percentage of the price of a penny stock than of a higher-priced stock, would further limit the ability of investors to trade in our common stock. In addition, delisting would materially and adversely affect our ability to raise capital on terms acceptable to us, or at all, and may result in the potential loss of confidence by investors, suppliers, customers and employees and fewer business development opportunities. For these reasons and others, delisting would adversely affect the liquidity, trading volume and price of our common stock, causing the value of an investment in us to decrease and having an adverse effect on our business, financial condition and results of operations, including our ability to attract and retain qualified employees and to raise capital.

The limited public market for our securities may adversely affect an investor's ability to liquidate an investment in us.

Although our Common Stock is currently listed on the Nasdaq Capital Market, there is limited trading activity. We can give no assurance that an active market will develop, or if developed, that it will be sustained. If an investor acquires shares of our Common Stock, the investor may not be able to liquidate our shares should there be a need or desire to do so.

The market price of our Common Stock may be volatile which could subject us to securities class action litigation and prevent you from being able to sell your shares at or above the offering price.

The market price for our Common Stock has been and may continue to be volatile and subject to wide fluctuations in response to factors including the following:

- sales or potential sales of substantial amounts of our Common Stock, including sales required for us to regain and maintain compliance with Nasdaq's continued listing requirements;
- delay or failure in initiating or completing pre-clinical or clinical trials or unsatisfactory results of these trials;
- announcements about us or about our competitors, including clinical trial results, regulatory approvals or new product introductions;
- developments concerning our licensors or product manufacturers;
- litigation and other developments relating to our patents or other proprietary rights or those of our competitors;
- conditions in the pharmaceutical or biotechnology industries;
- governmental regulation and legislation;
- variations in our anticipated or actual operating results;
- change in securities analysts' estimates of our performance, or our failure to meet analysts' expectations; foreign currency values and fluctuations; and
- overall economic conditions.

Many of these factors are beyond our control. The stock markets in general, and the market for pharmaceutical and biotechnological companies in particular, have historically experienced extreme price and volume fluctuations. These fluctuations often have been unrelated or disproportionate to the operating performance of these companies. These broad market and industry factors could reduce the market price of our Common Stock, regardless of our actual operating performance.

We have never paid and do not intend to pay cash dividends on our Common Stock. As a result, capital appreciation, if any, will be your sole source of gain.

We have never paid cash dividends on any of our capital stock and we currently intend to retain future earnings, if any, to fund the development and growth of our business. Our Series B Preferred Stock carries a dividend rate of 9.0% per year, which is cumulative and continues to accrue on a daily basis whether or not declared and whether or not we have assets legally available therefor. We may pay such dividends at our option either in cash or in kind in additional shares of preferred stock. We do not expect to pay any dividends in cash and have paid accrued dividends in kind in additional shares of preferred stock to date. In addition, the terms of future debt agreements may preclude us from paying dividends. As a result, capital appreciation, if any, of our Common Stock will be your sole source of gain for the foreseeable future.

Provisions in our Charter, our amended and restated by-laws and Delaware law might discourage, delay or prevent a change in control of our company or changes in our management and, therefore, depress the trading price of our Common Stock.

Provisions of our Charter, our amended and restated by-laws and Delaware law may have the effect of deterring unsolicited takeovers or delaying or preventing a change in control of our company or changes in our management, including transactions in which our stockholders might otherwise receive a premium for their shares over then current market prices. In addition, these provisions may limit the ability of stockholders to approve transactions that they may deem to be in their best interests. These provisions include:

- the inability of stockholders to call special meetings;

- the ability of our board of directors to designate the terms of and issue new series of preferred stock without stockholder approval, which could include the right to approve an acquisition or other change in our control or could be used to institute a rights plan, also known as a poison pill, that would work to dilute the stock ownership of a potential hostile acquirer, likely preventing acquisitions that have not been approved by our board of directors;

- advance notice required for any nomination or other business to be properly brought before an annual meeting of stockholders which requires notice to be delivered to our secretary not later than the close of business on the 90th day, nor earlier than the close of business on the 120th day prior to the first anniversary of the preceding year's annual meeting, subject to certain exceptions;

- any vacancies on our board of directors that results from the death, disability, resignation, disqualification or removal of any director or from any other cause shall be filled solely by the affirmative vote of a majority of the total number of directors then in office, even if less than a quorum, or by a sole remaining director and shall not be filled by the stockholders; provided that a vacancy created by the removal of a director by the stockholders may be filled by the stockholders; and

- forum selection provisions that state that unless we consent in writing to the selection of an alternative forum, (A) (i) any derivative action or proceeding brought on our behalf, (ii) any action asserting a claim of breach of a fiduciary duty owed by any current or former director, officer, other employee or stockholder of the Company to us or our stockholders, (iii) any action asserting a claim arising pursuant to any provision of the General Corporation Law of the State of Delaware ("*DGCL*"), the Charter or the by-laws as to which the DGCL confers jurisdiction on the Court of Chancery of the State of Delaware or (iv) any action asserting a claim governed by the internal affairs doctrine of the law of the State of Delaware shall, to the fullest extent permitted by law, be exclusively brought in the Court of Chancery of the State of Delaware or, if such court does not have subject matter jurisdiction thereof, the federal district court of the State of Delaware; and (B) the federal district courts of the United States shall be the exclusive forum for the resolution of any complaint asserting a cause of action arising under the Securities Act of 1933, as amended.

In addition, Section 203 of the DGCL prohibits a publicly held Delaware corporation from engaging in a business combination with an interested stockholder, generally a person which together with its affiliates owns, or within the last three years, has owned 15% of our voting stock, for a period of three years after the date of the transaction in which the person became an interested stockholder, unless the business combination is approved in a prescribed manner.

The existence of the foregoing provisions and anti-takeover measures could limit the price that investors might be willing to pay in the future for shares of our Common Stock. They could also deter potential acquirers of our company, thereby reducing the likelihood that you could receive a premium for your Common Stock in an acquisition.

If securities or industry analysts do not publish research or reports about our business, if they adversely change their recommendations regarding our shares or if our results of operations do not meet their expectations, our share price and trading volume could decline.

The trading market for our shares is influenced by the research and reports that industry or securities analysts publish about us or our business. We do not have any control over these analysts. If one or more of these analysts cease coverage of our company or fail to publish reports on us regularly, we could lose visibility in the financial markets, which in turn could cause our share price or trading volume to decline. Moreover, if one or more of the analysts who cover us downgrade our stock, or if our results of operations do not meet their expectations, our share price could decline.

We currently have Series B Preferred Stock outstanding and may be required to issue additional shares of our Series C Preferred Stock upon the exercise of the Series B Exchange Right. Our certificate of incorporation authorizes our Board to create new series of preferred stock without further approval by our stockholders, which could adversely affect the rights of the holders of our Common Stock.

Our Board has the authority to fix and determine the relative rights and preferences of preferred stock. Our Board also has the authority to issue preferred stock without further stockholder approval.

We currently have approximately 545.94 shares of Series B Preferred Stock outstanding with a stated value of $7,700 per share, which are currently convertible at the holder's option at any time, together with any accrued but unpaid dividends thereon, into shares of Common Stock at a conversion price of $1,617.00, subject to certain adjustments.

Our Series B Preferred Stock gives its holders the preferred right to our assets upon liquidation and the right to receive dividend payments at 9.00% per annum before dividends are distributed to the holders of Common Stock, among other things. In addition, in the event we effect any issuance of Common Stock or Common Stock equivalents for cash consideration, or a combination of units thereof, the holders of the Series B Preferred Stock have the right, subject to certain exceptions, at their option, to exchange (in lieu of cash subscription payments) all or some of the Series B Preferred Stock then held (with a value per share of the Series B Preferred Stock equal to the Series B stated value per share of $7,700 plus accrued and unpaid dividends thereon) for any securities or units issued in such issuance on a dollar-for-dollar basis. The holders of the Series B Preferred Stock, voting as a separate class, also have customary consent rights with respect to certain corporate actions, including the issuance of an increased number of shares of Series B Preferred Stock, the establishment of any capital stock ranking senior to or on parity the Series B Preferred Stock as to dividends or upon liquidation, the incurrence of indebtedness, and certain changes to our Charter or Bylaws including other actions.

Our Board also created the following series of preferred stock: (i) Series C Preferred Stock ("*Series C Preferred Stock*"), of which 75,000 shares are authorized for issuance, none of which are currently outstanding; (ii) Series D Preferred Stock ("*Series D Preferred Stock*"), of which 150 shares are authorized for issuance, none of which are currently outstanding; (iii) Series E Preferred Stock ("*Series E Preferred Stock*"), of which 150 shares are authorized for issuance, none of which are currently outstanding; and (iv) Series F Preferred Stock ("*Series F Preferred Stock*"), of which 7,000 shares are authorized for issuance, none of which are currently outstanding. Pursuant to the Series B Exchange Right, we may be required to issue shares of Series C Preferred Stock in certain circumstances.

Our obligations to the holders of the Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and any future holders of any additional series of preferred stock we may issue could limit our ability to obtain additional financing or increase our borrowing costs, which could have an adverse effect on our financial condition and hinder the accomplishment of our corporate goals.

In addition to the Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock and Series F Preferred Stock, our Board could authorize the issuance of additional series of preferred stock with such rights preferential to the rights of our Common Stock, including the issuance of a series of preferred stock that has greater voting power than our Common Stock or that is convertible into our Common Stock, which could decrease the relative voting power of our Common Stock or result in dilution to our existing stockholders.

As a result of the Series B Exchange Right in the Certificate of Designations, Powers, Preferences and Rights of the Series B Preferred Stock (the "Series B Certificate of Designations"), we may be required to issue additional securities to the investors who purchased shares of our Series B Preferred Stock and related warrants to purchase shares of our Common Stock in a private placement in July 2020.

On July 16, 2020, we consummated a private placement offering (the "*Series B Private Placement*") in which we issued an aggregate of approximately 2,912.58 shares of Series B Preferred Stock, at a price of $7,700.00 per share, initially convertible into an aggregate of 13,869 shares of Common Stock at $1,617 per share, together with warrants to purchase an aggregate of 6,934 shares of Common Stock at an exercise price of $1,785.00 per share. The Series B Preferred Stock carries a cumulative dividend at a rate of 9.0% per annum, payable at our option either in cash or in kind in additional shares of Series B Preferred Stock.

As a result of previous conversions and exchanges, as of December 31, 2022, 550.17 shares of Series B Preferred Stock were outstanding, with an aggregate stated value of approximately $4.2 million, plus accrued and unpaid dividends through such date of approximately $761,000, and a conversion price of $1,617.00 per share.

Under the Series B Certificate of Designations, in the event we effect any issuance of Common Stock or Common Stock equivalents for cash consideration, or a combination of units thereof (a "*Subsequent Financing*"), each holder of the Series B Preferred Stock has the right to exchange the stated value, plus accrued and unpaid dividends, of the Series B Preferred Stock for any securities issued in the Subsequent Financing, in lieu of any cash subscription payments therefor (the "*Series B Exchange Right*"). As a result of sales of additional shares of common stock made on November 30, 2021, at a price of $549.297 per share, pursuant to our At The Market Agreement dated May 26, 2021 (the "*ATM Agreement*") (such price being the lowest price per share sold under the ATM Agreement to date), as of March 16, 2023, we may be required to issue in aggregate up to 9,146 shares of common stock, with no warrants, to any holders of Series B Preferred Stock who elect to exercise their Series B Exchange Right into shares of common stock. In any event, we anticipate that we would convert any shares of Series C Preferred Stock to be issued pursuant to the Series B Exchange Right into underlying shares of common stock immediately upon issuance.

In February 2022, we entered into waiver agreements (the "*February 2022 Waiver*") with certain holders of Series B Preferred Stock, pursuant to which we agreed to pay a cash waiver fee equal to ten percent of the stated value of the shares of Series B Preferred Stock held by such holder (other than holders who are company insiders who did not receive a cash waiver fee), and such holder agreed to irrevocably waive its Series B Exchange Right with respect to any Subsequent Financing that occurs from and after the date of the Waiver until December 31, 2022. Effective May 12, 2022, the holders of 81.3% of the outstanding shares of the Series B Preferred Stock permanently waived for themselves and all other holders of the Series B Preferred Stock the Series B Exchange Right with respect to any Subsequent Financing occurring on or after January 1, 2022 (the "*Permanent Waiver*").

If the holders of our Series B Preferred Stock exercise their Series B Exchange Rights, it will result in certain dilution to our stockholders, and would afford our stockholders a smaller percentage interest in our voting power, liquidation value and aggregate book value. The sale or resale of the Common Stock issued upon conversion of the preferred stock could cause the market price of our Common Stock to decline. In addition, the issuance of Common Stock upon the exercise of the Investor Warrants will result in similar dilution to our stockholders. This dilution, or the possibility that it may occur, may make it more difficult for us to sell equity securities in the future at a time and a price that we deem appropriate.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Facilities

We lease the space for our principal executive offices at 777 Yamato Road, Suite 502, Boca Raton, FL 334315 and an administrative office at 760 Parkside Avenue, Downstate Biotechnology Incubator, Suite 217, Brooklyn, NY 11226 on a month-to-month basis. We believe that our facilities are adequate to meet our current needs.

ITEM 3. LEGAL PROCEEDINGS

On January 27, 2023, David Hoffman, a member of our board of directors, filed a complaint in the Court of Chancery of the State of Delaware against the Company seeking advancement of his reasonable attorneys' fees and expenses relating to certain aspects of his service of a director of the Company (the "Complaint"). The Complaint alleges that Mr. Hoffman is entitled to reimbursement of approximately $115,000 of expenses. We are currently pursuing settlement discussions with Mr. Hoffman and do not expect that the terms of any settlement will have a material adverse effect on our financial condition or results of operations.

On March 7, 2023, the Company filed a demand for arbitration with a CRO in connection with two clinical trial agreements. We believe we have fulfilled all payment obligations to the CRO. The amount of potential payments due, if any, are not able to be estimated at this time. There can be no assurance that we will be successful in arbitration or any potential subsequent legal proceedings with respect to this matter.

ITEM 4. MINE SAFETY DISCLOSURES

None.

PART II

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

Our Common Stock is listed on the Nasdaq Capital Market, or Nasdaq, under the symbol "FWBI".

Holders of Record

At March 16, 2023, there were 1,549,581 shares of our Common Stock issued and outstanding and approximately 100 stockholders of record.

Dividends

We did not declare any dividends on our Common Stock for the years ended December 31, 2022 and 2021, respectively. Our board of directors does not intend to distribute dividends in the future. Instead, we plan to retain any earnings to finance the development of our product candidates and expansion of our business. The declaration, payment and amount of any future dividends will be made at the discretion of the board of directors, and will depend upon, among other things, the results of our operations, cash flows and financial condition, operating and capital requirements, and other factors as the board of directors considers relevant. There is no assurance that future dividends will be paid, and if dividends are paid, there is no assurance with respect to the amount of any such dividend.

Future cash dividends, if any, will be at the discretion of our board of directors and will depend upon our future operations and earnings, capital requirements and surplus, general financial condition, contractual restrictions and other factors as our board of directors may deem relevant. We can pay dividends only out of our profits or other distributable reserves and dividends or distribution will only be paid or made if we are able to pay our debts as they fall due in the ordinary course of business.

Cumulative dividends on the shares of Series B Preferred Stock accrue at the rate of 9% of the Stated Value per annum, payable semi-annually on June 30 and December 31 of each year, commencing on December 31, 2020. Dividends are payable in additional shares of Series B Preferred Stock valued at the Stated Value or in cash at our sole option.

Unregistered Sales of Equity Securities

In October 2022, we issued an aggregate of 7,142 shares of Common Stock to a consultant with a grant date fair value of approximately $82,000 for investor relations services provided. Such issuance was exempt from registration under 4(a)(2) of the Securities Act.

During the year ended December 31, 2022, there were no other sales of our securities that were not reported in a Current Report on Form 8-K or our Quarterly Report on Form 10-Q.

ITEM 6. RESERVED

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

You should read the following discussion and analysis in conjunction with our consolidated financial statements, including the notes thereto contained in this Annual Report. This discussion contains forward-looking statements that involve risks, uncertainties and assumptions. Our actual results may differ materially from those anticipated in these forward-looking statements as a result of a variety of certain factors, including those set forth under "Risk Factors Associated with Our Business" and elsewhere in this Annual Report.

Overview

We are engaged in the research and development of targeted, non-systemic therapies for the treatment of patients with gastrointestinal ("*GI*") diseases. Non-systemic therapies are non-absorbable drugs that act locally, i.e., in the intestinal lumen, skin or mucosa, without reaching an individual's systemic circulation.

We are currently focused on developing our pipeline of gut-restricted GI clinical drug candidates, including the biologic adrulipase (formerly MS1819), a recombinant lipase enzyme designed to enable the digestion of fats and other nutrients, and niclosamide, an oral small molecule with anti-viral and anti-inflammatory properties.

Our adrulipase programs are focused on the development of an oral, non-systemic, biologic capsule for the treatment of exocrine pancreatic insufficiency ("*EPI*") in patients with cystic fibrosis ("*CF*") and chronic pancreatitis ("*CP*"). Our goal is to provide CF and CP patients with a safe and effective therapy to control EPI that is non-animal derived and offers the potential to dramatically reduce their daily pill burden. In March 2021, we announced topline results from our Phase 2b OPTION 2 monotherapy trial, and in 2021, we announced positive topline results from our Phase 2 Combination trial in Europe. In November 2022 we filed a Phase 2b investigational new drug ("*IND*") amendment for a bridging study using a new enteric microgranule formulation of adrulipase with the U.S. Food and Drug Administration ("*FDA*"). We initiated the Phase 2b monotherapy trial during the first quarter of 2023 and expect topline data in the third quarter of 2023.

Our niclosamide programs leverage proprietary oral and topical formulations to address multiple GI conditions, including inflammatory bowel diseases ("*IBD*") indications. In 2022 we advanced two separate Phase 2 clinical programs of our niclosamide formulations, including FW-COV for Severe Acute Respiratory Syndrome Coronavirus 2 ("*COVID-19*") GI infections, and FW-UP for ulcerative proctitis ("*UP*") and ulcerative proctosigmoiditis ("*UPS*").

We announced the completion of enrollment in the FW-COV trial in January 2022 and topline results in August 2022. In September 2022 we announced that we would no longer pursue the anti-viral COVID-GI clinical indication as a result of the mixed results from the FW-COVID-19 trial. Additionally, we are devoting fewer resources to the FW-UP/UPS niclosamide program due to inconclusive data from a small Phase 2 trial in Europe, the need for a new FDA-IND cleared protocol, and capital constraints.

We are further developing FW-ICI-AC for Immune Checkpoint Inhibitor-associated colitis ("*ICI-AC*") and diarrhea in advanced stage oncology patients, which received FDA IND clearance for a Phase 2a clinical trial in October 2021, and two pre-IND programs of our niclosamide therapies for additional IBD indications, including FW-UC for ulcerative colitis ("*UC*") and FW-CD for Crohn's disease ("*CD*").

The FWB Action

As a result of the topline data from the Phase 2 RESERVOIR COVID-19 GI clinical trial and the ongoing volatility in the biotechnology sector, we initiated certain measures during the 2022 fiscal year to reduce our expenses and conserve capital. Included in these measures was a reduction in our headcount, as well as the closure of our California office at the end of May 2022 and our facility in Langlade, France. We also determined to suspend payments related to our acquisition of First Wave Bio, Inc. ("*FWB*"), in order to conserve capital. On May 19, 2022, Fortis Advisors LLC, the hired representative (in such capacity, the "*Representative*") of the former stockholders of FWB in connection with the Agreement and Plan of Merger dated as of September 13, 2021, by and among us, Alpha Merger Sub, Inc. and FWB (the "*Merger Agreement*"), filed a complaint in the Court of Chancery of the State of Delaware (the "*FWB Action*"), for breach of contract and anticipatory repudiation or for unjust enrichment. The FWB Action sought specific performance of the Company's obligations under the Merger Agreement and the settlement agreement by and between us and the Representative, dated November 15, 2021 (the "*November 2021 Settlement Agreement*"), including all payments currently owed and to be owed to the Representative, and damages at the maximum amount permitted by law.

On July 29, 2022, we reached an agreement with the Representative to settle the FWB Action and to restructure our obligations to the former FWB stockholders (the "*July 2022 Term Sheet*"). We agreed to pay the Representative: (i) $1.5 million in cash on July 29, 2022; (2) $1.0 million in cash no later than September 29, 2022 (the "*Second Payment*"); and (iii) $2.0 million on the earlier of November 30, 2022 and our completion of one or more qualifying equity offerings (collectively, the "*Payments*"). As of December 31, 2022, we made these payments for a total of $4.5 million. The Representative is also entitled to receive future cash payments conditioned on the achievement of certain development milestones for adrulipase and to a percentage of any consideration received by us in the event of a license or sale of adrulipase, subject to a cap. The Representative is also entitled receive a percentage of the consideration received by us in the event of a license or sale of niclosamide and will retain its existing milestone payment rights with respect to niclosamide. In the event that the consideration received by us in connection with the sale or license of adrulipase or niclosamide consists of securities or other non-cash consideration, the Representative will have the right to elect either to receive its payment in such form of consideration or to cause the licensee or acquirer to assume the obligations described herein. In the event of a "Company Sale" (as defined in the July 2022 Term Sheet), the Representative is entitled to receive a pro rata share of the total consideration received by us or our stockholders up to $4.0 million (plus any unpaid Payments whether or not then due) based on a formula set forth in the July 2022 Term Sheet. In certain circumstances, the Representative has the right to treat a "Company Sale" as a sale of adrulipase or niclosamide, as applicable, and to treat the Company Sale as a sale of the related asset and to receive the consideration with respect thereto described herein.

In the July 2022 Term Sheet, the Representative agreed to stay the FWB Action for a period of 90 days and to eliminate our obligation to pay a portion of any offering proceeds to the Representative. In addition, our obligation to use commercially reasonable efforts to develop niclosamide will be deferred for a period of 24 months from the date of the July 2022 Term Sheet. Effective upon the Second Payment, the Representative agreed to dismiss the FWB Action with prejudice and to extinguish the approximately $10.1 million of remaining fixed payment obligations that were owed to the former FWB shareholders.

On November 30, 2022, we entered into a formal settlement agreement with the Representative on substantially the same terms as the July 2022 Term Sheet. (the "*November 2022 Settlement Agreement*").

In the event that we are not able to meet the obligations under the Merger Agreement or the November 2022 Settlement Agreement, we may have to further curtail our operations or take other actions to preserve our capital, including the filing of a petition for protection under applicable bankruptcy law.

Nasdaq Listing Extension

On November 26, 2021, we received a letter from the Listing Qualifications Staff (the "*Staff*") of The Nasdaq Stock Market LLC ("*Nasdaq*") indicating that we were not in compliance with the $2.5 million minimum stockholders' equity requirement for continued listing of our common stock on Nasdaq as set forth in Nasdaq Listing Rule 5550(b)(1) (the "*Minimum Stockholder's Equity Rule*"). In that regard, we reported a stockholders' deficit of $(6,969,988) in our Quarterly Report on Form 10-Q for the period ended September 30, 2021 (we did not then, and do not now, meet the alternative compliance standards relating to the market value of listed securities of $35 million or net income from continuing operations of $500,000 in the most recently completed fiscal year or in two of the last three most recently completed fiscal years).

On January 10, 2022, we submitted a plan to the Staff to regain compliance with the Minimum Stockholders' Equity Rule and on February 15, 2022, the Staff notified us that Nasdaq had granted us an extension through May 25, 2022, to regain compliance (this represented the maximum extension period available to the Staff under the Nasdaq Listing Rules). On May 26, 2022, we received a letter from the Staff indicating that, based upon our continued non-compliance with the Minimum Stockholders' Equity Rule, the Staff had determined to delist our securities from Nasdaq unless we timely requested a hearing before the Nasdaq hearings Panel (the "*Panel*").

Additionally, on May 16, 2022, we received notice from the Staff indicating that, based upon the closing bid price of our common stock for the prior 30 consecutive business days, we were not currently in compliance with the requirement to maintain a minimum bid price of $1.00 per share for continued listing on Nasdaq as set forth in Nasdaq Listing Rule 5550(a)(2) (the "*Bid Price Rule*"). We had 180 days from May 16, 2022, or through November 14, 2022, to regain compliance with the Bid Price Rule. We completed a 1-for-30 reverse stock split effective August 26, 2022, and by letter dated September 12, 2022, Nasdaq advised us that we had regained compliance with the Bid Price Rule.

We requested a hearing before the Panel. Following the hearing, on July 11, 2022, the Panel granted our request for continued listing of our common stock (the "*Exception*"). The Exception was subject to a number of significant conditions that must be satisfied on or before specific deadlines set forth in the Exception, including the completion of one or more additional equity financings. The final term of the Exception expired on November 22, 2022. On December 20, 2022, we received a letter from the Panel confirming that we had regained compliance with the Minimum Stockholders' Equity Rule.

On December 14, 2022, we received a deficiency notice from the Staff indicating that, based upon the closing bid price of our common stock for the prior 30 consecutive business days, we were not in compliance with the Bid Price Rule. We effected a 1:7 reverse stock split on January 18, 2023. On February 6, 2023, we received a letter from the Panel indicating that we have regained compliance with the Minimum Bid Price Rule and that the Panel's oversight process of us is now closed.

Series B Exchange Right Waivers

Between February 1, 2022 and February 7, 2022, we entered into waiver agreements (the "*Temporary Waiver*") with certain holders of our Series B Convertible Preferred Stock, par value $0.0001 per share (the "*Series B Preferred Stock*"), pursuant to which we agreed to pay a cash waiver fee equal to ten percent of the stated value of the shares of Series B Preferred Stock held by such holder (other than holders who are insiders who did not receive a cash waiver fee) and such holder agreed to irrevocably waive its Series B Exchange Right (as defined below) with respect to any Subsequent Financing (as defined below) that occurs from and after the date of the Temporary Waiver until December 31, 2022.

Pursuant to the Series B Preferred Stock Certificate of Designations (the "*Series B Certificate of Designations*"), in the event of any issuance by us or any of our subsidiaries of our common stock or common stock equivalents for cash consideration or a combination of units thereof (a "*Subsequent Financing*"), each holder of our Series B Preferred Stock has the right, subject to certain exceptions set forth in the Series B Certificate of Designations, at its option, to exchange (in lieu of cash subscription payments) all or some of the Series B Preferred Stock then held (with a value per share of Series B Preferred Stock equal to the stated value of each share of Series B Preferred Stock, or $7,700.00, plus accrued and unpaid dividends thereon, of the Series B Preferred Stock) for any securities or units issued in a Subsequent Financing on a dollar-for-dollar basis (the "*Series B Exchange Right*").

We entered into Temporary Waivers with holders of approximately $2.88 million of stated value of our Series B Preferred Stock, including with Company insiders holding approximately $474,000 of stated value of our Series B Preferred Stock for which we did not pay a waiver fee.

Effective May 12, 2022, the holders of 81.3% of the outstanding shares of the Series B Preferred Stock permanently waived for themselves and all other holders of the Series B Preferred Stock the Series B Exchange Right with respect to any Subsequent Financing (as defined below) occurring on or after January 1, 2022 (the "*Permanent Waiver*"). Holders of Series B Preferred Stock as of the April 27, 2022 record date were entitled to notice of and to consent to the Permanent Waiver (the "*Record Holders*").

Pursuant to the terms of the Series B Certificate of Designations, the written consent of the holders of at least a majority of the Series B Preferred Stock outstanding was required to consent to the Permanent Waiver (the "*Required Consent*"). We requested that the Record Holders consent to the Permanent Waiver by executing and delivering a joinder to the Waiver Agreement (as defined below). The execution and delivery of the joinder to the Waiver Agreement was deemed, for purposes of Section 228 of the General Corporation Law of the State of Delaware, to be an action by written consent in lieu of a meeting to approve the Permanent Waiver. Our solicitation of consents to the Permanent Waiver terminated in accordance with its terms at 5:00 p.m., Eastern Time, on May 12, 2022 (the "*Expiration Date*"). The Record Holders who consented to the Permanent Waiver prior to the Expiration Date are referred to herein as the "Consenting Holders".

The Required Consent was obtained from the Consenting Holders and the solicitation terminated in accordance with its terms as of the Expiration Date. The Permanent Waiver was effective immediately upon the Expiration Date and is binding on all holders of the Series B Preferred Stock, including those holders that did not timely consent to the Permanent Waiver prior to the Expiration Date. The Permanent Waiver will also be applicable to any future holder of Series B Preferred Stock. A notation of the Permanent Waiver was made on the books and records of the Company's transfer agent and a legend reflecting the Permanent Waiver will be placed on any physical share certificate representing shares of Series B Preferred Stock.

Pursuant to the terms of a Waiver Agreement entered into by us and the Consenting Holders (the "*Waiver Agreement*"), we have permanently reduced the exercise price of the Series B Warrants originally issued on July 16, 2020 (the "*Series B Warrants*") held by the Consenting Holders to $52.50 per share or, in the case of Consenting Holders who are officers and directors of the Company, $69.17 (the "*Exercise Price Reduction*"). Only Consenting Holders are entitled to the Exercise Price Reduction. Series B Warrants to purchase an aggregate of approximately 1,178 shares of our common stock received the Exercise Price Reduction which was effective as of the Expiration Date.

Financial Operations Overview

Revenue

To date, we have not generated any revenue from the sale of our product candidates or otherwise. In the future, we expect that we will seek to generate revenue primarily from product sales, but we may also generate non-product revenue from sources including, but not limited to, research funding, development and milestone payments, and royalties on future product sales in connection with any out-license or other strategic relationships and/or government grants we may establish. Our product candidates are at an early stage of development and may never be successfully developed or commercialized.

Research and Development Expense

Conducting research and development is central to our business. Historically, the majority of our research and development expenses have been focused on the development of adrulipase and the acquisition and development of niclosamide. Research and development expenses consist primarily of internal and external costs incurred for our development activities, which include, among other things:

- personnel-related costs, which include salaries, benefits, and stock-based compensation expense;
- fees paid to third parties for services directly related to our drug development and regulatory efforts;
- Expenses incurred under agreements with clinical research organizations ("*CROs*"), investigative sites and consultants and contractors that conduct or provide other services relating to our clinical trials and research activities;
- the cost of acquiring drug product, drug supply and clinical trial materials from contract development and manufacturing organization ("*CDMOs*") and third-party contractors;
- costs associated with preclinical and non-clinical activities;
- payments and other costs in connection with the acquisition our product candidates under licensing agreements; and
- amortization of intangible assets, including patents, in-process research and development and license agreements.

Costs incurred in connection with research and development activities are expensed as incurred.

We expect our research and development expenses to increase for the foreseeable future as we focus our efforts on the clinical development of our product candidates, including niclosamide and adrulipase through late-stage clinical trials, as well as chemistry, manufacturing and controls ("*CMC*") efforts. The process of conducting non-clinical studies and clinical trials necessary to obtain regulatory approval is costly and time-consuming. It is difficult to determine with certainty the duration and costs of any non-clinical study or clinical trial that we may conduct. In addition, if our product development efforts are successful, we expect to incur substantial costs to prepare for potential commercialization of any late-stage product candidates and, in the event any of our product candidates receives regulatory approval, to potentially fund the launch and sales and marketing efforts of the product.

The probability of success for any of our current or future product candidates will depend on numerous factors, including competition, manufacturing capability and commercial viability. We will determine which programs to pursue and how much to fund each program in response to the scientific and clinical success of each drug candidate, as well as an assessment of each drug candidate's commercial potential.

We do not record or maintain information regarding costs incurred in research and development on a program or project specific basis. Our research and development staff, outside consultants, contractors, CROs, and CDMOs are deployed across several programs and/or indications. Additionally, many of our costs are not attributable to individual programs and/or indications. Therefore, we believe that allocating costs on the basis of time incurred by our personnel does not accurately reflect the actual costs of a project.

General and Administrative Expense

General and administrative expenses consist primarily of personnel-related expenses, including salaries, benefits and stock-based compensation, related to our executive, finance, business development and support functions, legal fees relating to both intellectual property and corporate matters, insurance, costs associated with operating as a public company, including corporate communications and investor relations expense, information technology, professional fees for accounting, auditing and other professional services, and facility-related costs.

We anticipate our general and administrative expenses to increase for the foreseeable future to support of our expanded research and development activities, intellectual property, patent and corporate legal expense, insurance, and costs associated with operating as a public company, including corporate communications and investor relations expense. Additional increases in general and administrative expenses are expected in connection with increased business development efforts, including potential partnership and/or collaboration agreements and financing activities, expanding infrastructure, including information technology administration, and the hiring of additional personnel and consultants, among other expenses.

Liquidity and Capital Resources

To date, we have not generated any revenues and have experienced net losses and negative cash flows from our activities.

As of December 31, 2022, we had cash and cash equivalents of approximately $1.4 million, working capital of approximately $0.8 million, and had sustained cumulative losses attributable to common stockholders of approximately $168.5 million. Subsequent to December 31, 2022, we have raised aggregate gross proceeds of approximately $4.0 million from the March 2023 Private Placement. We have not yet achieved profitability and anticipate that we will continue to incur net losses for the foreseeable future. We expect that our expenses will continue to grow and, as a result, we will need to generate significant product revenues to achieve profitability. We may never achieve profitability. As such, we are dependent on obtaining, and are continuing to pursue, the necessary funding from outside sources, including obtaining additional funding from the sale of securities in order to continue our operations. Without adequate funding, we may not be able to meet our obligations. We believe these conditions may raise substantial doubt about our ability to continue as a going concern.

Our primary sources of liquidity come from capital raises through additional equity and/or debt financings. This may be impacted by the COVID-19 pandemic and other geopolitical events, including war in Ukraine, which are evolving and could negatively impact our ability to raise additional capital in the future.

We have funded our operations to date primarily through the issuance of debt, convertible debt securities, preferred stock, as well as the issuance of Common Stock in various public offerings and private placement transactions. We expect to incur substantial expenditures in the foreseeable future for the development of niclosamide and adrulipase. We will require additional financing to develop our product candidates, run clinical trials, prepare regulatory filings and obtain regulatory approvals, fund operating losses, and, if deemed appropriate, establish manufacturing, sales and marketing capabilities. Our current financial condition raises substantial doubt about our ability to continue as a going concern. Our failure to raise capital as and when needed would have a material adverse impact on our financial condition, our ability to meet our obligations, and our ability to pursue our business strategies. We will seek funds through additional equity and/or debt financings, collaborative or other arrangements with corporate sources, or through other sources of financing.

Although, we are primarily focused on the development of our product candidates, including niclosamide and adrulipase, we are also opportunistically focused on expanding our product pipeline of clinical assets through collaborations, and also through acquisitions of products and companies. We are continually evaluating potential asset acquisitions business combinations, and other partnership opportunities. To finance such acquisitions, we might raise additional equity capital, incur additional debt, or both.

We are able to sell securities on a shelf registration statement pursuant to the ATM Agreement with H.C. Wainwright & Co., LLC. Under current Securities and Exchange Commission regulations, if at any time our public float is less than $75.0 million, and for so long as our public float remains less than $75.0 million, the amount we can raise through primary public offerings of securities in any twelve-month period using shelf registration statements is limited to an aggregate of one-third of our public float, which is referred to as the baby shelf rules. As of December 31, 2022, our calculated public float is below $75.0 million and we will be subject to baby shelf rules for any offerings conducted on our shelf registration statement. As such, we will be restricted from selling more than an aggregate of one-third of our public float pursuant to a shelf registration statement in any twelve-month period, so long as the aggregate market value of our Common Stock held by non-affiliates is less than $75.0 million.

Our ability to issue securities is subject to market conditions. Each issuance under the shelf registration statements will require the filing of a prospectus supplement identifying the amount and terms of the securities to be issued.

On July 29, 2022, we entered into the July 2022 Term Sheet with the Representative of the former FWB stockholders and a formal settlement agreement with the Representative on substantially the same terms as the July 2022 Term Sheet on November 30, 2022. Pursuant to the November 2022 Settlement Agreement, as of December 31, 2022, we paid the Representative $4.5 million in cash and the approximately $10.1 million of remaining fixed payment obligations then owed to the former FWB stockholders was extinguished.

The Representative is also entitled to receive future cash payments conditioned on the achievement of certain development milestones for adrulipase and to a percentage of any consideration received by us in the event of a license or sale of adrulipase, subject to a cap. The Representative also is entitled receive a percentage of the consideration received by us in the event of a license or sale of niclosamide and will retain its existing milestone payment rights with respect to niclosamide. In the event that the consideration received by us in connection with the sale or license of adrulipase or niclosamide consists of securities or other non-cash consideration, the Representative will have the right to elect either to receive its payment in such form of consideration or to cause the licensee or acquirer to assume the obligations described herein. In the event of a “Company Sale” (as defined in the November 2022 Settlement Agreement), the Representative is entitled to receive a pro rata share of the total consideration received by us or our stockholders up to $4.0 million (plus any unpaid Payments whether or not then due) based on a formula set forth in the November 2022 Settlement Agreement. In certain circumstances, the Representative has the right to treat a “Company Sale” as a sale of adrulipase or niclosamide, as applicable, and to treat the Company Sale as a sale of the related asset and to receive the consideration with respect thereto described herein.

In the event that we are not able to meet our obligations under the Merger Agreement or the November 2022 Settlement Agreement, we may have to further curtail our operations or take other actions to preserve our capital, including the filing of a petition for protection under applicable bankruptcy law.

Consolidated Results of Operations for the Years Ended December 31, 2022 and 2021

The following table summarizes our consolidated results of operations for the periods indicated:

	Years Ended December 31, 2022	2021	Increase (decrease)
Operating expenses:			
Research and development expenses	$ 8,776,302	$ 16,994,828	$ (8,218,526)
Research and development (recovery) expenses - intellectual property acquired	(8,085,045)	21,325,527	(29,410,572)
General and administrative expenses	11,986,809	18,384,545	(6,397,736)
Intangible asset impairment	—	2,351,988	(2,351,988)
Total operating expenses	12,678,066	59,056,888	(46,378,822)
Other expenses (income)	240,205	(519,039)	759,244
Loss on dissolution of foreign subsidiary	1,711,371	—	1,711,371
Net loss	$ 14,629,642	$ 58,537,849	$ (43,908,207)

Revenues

We have not yet achieved revenue-generating status from any of our product candidates. Since inception, we have devoted substantially all of our time and efforts to acquiring and developing our product candidates, including niclosamide and adrulipase. As a result, we did not have any revenue during the years ended December 31, 2022 and 2021, respectively.

Research and Development Expenses

Total research and development expenses for the year ended December 31, 2022 totaled approximately $0.7 million, a decrease of approximately $37.6 million, or 186%, over the approximately $38.3 million recorded for the year ended December 31, 2021. Excluding research and development expenses for intellectual property acquired in connection with the acquisition of FWB, research and development expenses for the year ended December 31, 2022 totaled approximately $8.8 million, a decrease of approximately $8.2 million, or 48% over the approximately $17.0 million recorded for the year ended December 31, 2021.

The decrease of approximately $8.2 million in research and development expenses, excluding expenses related to the acquired intellectual property, was primarily attributable to decreases of approximately $3.0 million in milestone payments to FWB related to the development of niclosamide, approximately $2.9 million in clinical trial related expenses in connection with the FW-COV and FW-UP niclosamide studies and completion of the OPTION 2 and Combination studies for adrulipase, approximately $1.0 million in personnel related costs, approximately $0.528 million in amortization expense, and approximately $0.467 million in CMC related costs.

The decrease of approximately $29.4 million in research and development expenses for acquired intellectual property was primarily attributable to $8.1 million of recovery recorded in 2022 related to the acquisition of our niclosamide drug candidates through the Term Sheet entered into on July 29, 2022, as compared to $21.3 million recorded in 2021 from the Merger agreement entered into on September 13, 2021.

General and Administrative Expense

General and administrative expenses for the year ended December 31, 2022 totaled approximately $12.0 million, a decrease of approximately $6.4 million, or 35%, over the approximately $18.4 million recorded for the year ended December 31, 2021.

The decrease in total general and administrative expenses was due primarily to decreases in costs associated with being a publicly reporting company, including investor relations and corporate communications of approximately $2.6 million, personnel related costs of approximately $1.4 million, business development and advisory fees of approximately $1.1 million, and legal and professional fees of approximately $1.1 million.

Impairment of Intangible Assets

We reviewed our definite-lived intangible assets for impairment as there were indicators that their carrying value of our patents might not be recoverable in December 2021. We used a qualitative approach to compare their carrying value to their fair value, and because this evaluation indicated that the carrying value of our definite-lived intangible assets was not recoverable, we performed an impairment test of these assets. Based on these analyses, we recognized an impairment charge of approximately $2.4 million for the year ended December 31, 2021 to reduce the carrying amounts of our patents to their fair value.

Other Expense (Income)

Other expenses (income) for the year ended December 31, 2022 totaled approximately $2.0 million, an increase of approximately $2.5 million over the approximately $(0.5) million recorded for the year ended December 31, 2021. During the year ended December 31, 2022, we recorded a loss of approximately $1.7 million due the dissolution of our foreign subsidiary, as well as an expense of approximately $0.2 million for Waiver fees paid. During the year ended December 31, 2021, we recorded income of approximately $(0.5) million related to the extinguishment of a $3.0 million liability in connection with FWB License Agreement pursuant to the issuance of Series C Preferred Stock with a fair value of approximately $2.5 million.

Net Loss

As a result of the factors above, our net loss for the year ended December 31, 2022 totaled approximately $14.6 million, a decrease of approximately $43.9 million, or 75%, over the net loss of approximately $58.5 million recorded for the year ended December 31, 2021.

Cash Flows for the Years Ended December 31, 2022 and 2021

The following table summarizes our cash flows for the periods indicated:

	Years Ended December 31,	
	2022	2021
Net cash (used in) provided by:		
Operating activities	$ (22,344,079)	$ (32,288,218)
Investing activities	—	(10,319,488)
Financing activities	15,739,531	44,763,493
Net (decrease) increase in cash and cash equivalents	$ (6,604,548)	$ 2,155,787

Operating Activities

Net cash used in operating activities during the year ended December 31, 2022 of approximately $22.3 million was primarily attributable to our net loss of approximately $14.6 million, a decrease in the payable related to the FWB acquisition of approximately $8.1 million, and decreases in accounts payable and accrued expenses of approximately $2.1 million. These were partially offset by addbacks for non-cash expenses of approximately $2.8 million mainly related to the dissolution of our foreign subsidiary of approximately $1.7 million, stock-based compensation expense of approximately $0.8 million and Common Stock granted to consultants of approximately $0.2 million.

Net cash used in operating activities during the year ended December 31, 2021 of approximately $32.3 million was primarily attributable to our net loss of approximately $58.5 million adjusted for addbacks of non-cash expenses of approximately $9.7 million, mostly related to common stock issued for intellectual property acquired of approximately $4.0 million, intangible asset impairment of approximately $2.4 million, Common Stock granted to consultants of approximately $1.6 million, stock-based compensation of approximately $1.4 million, change in fair value of liability of $0.5 million, and depreciation and amortization of approximately $0.5 million, partially offset by a change in asset and liability balances of approximately $17.1 million.

Investing Activities

Net cash used in investing activities during the year ended December 31, 2021 was approximately $10.3 million consisting of approximately $10.3 million in payments made related to the FWB license agreement, as well as the purchase of office furniture and equipment.

Financing Activities

Net cash provided by financing activities of approximately $15.7 million for the year ended December 31, 2022 was primarily due to the issuance of common stock under our ATM Agreement for net proceeds of approximately $7.7 million and the issuance of Common Stock, pre-funded warrants and warrants for net proceeds of approximately $15.4 million, partially offset by approximately $6.9 million in cash payments related to the FWB Acquisition under the November 2022 Settlement Agreement.

Net cash provided by financing activities of approximately $44.8 million for the year ended December 31, 2021 was primarily due to: (i) the issuance of common stock under our ATM Agreement for net proceeds of approximately $18.5 million; (ii) the issuance of Series C Preferred Stock and warrants for net proceeds of approximately $7.1 million; (iii) the issuance of Common Stock, pre-funded warrants and warrants in a registered direct offering for net proceeds of approximately $9.1 million; (iv) the issuance of Common Stock in an underwritten offering in July 2021 for net proceeds of approximately $5.1 million; and (v) cash proceeds from warrant exercises of approximately $4.9 million.

Critical Accounting Policies and Significant Judgements and Estimates

Our management's discussion and analysis of financial condition and results of operations is based on our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States ("*GAAP*"). The preparation of our consolidated financial statements and related disclosures requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities, costs and expenses and related disclosures during the reporting periods. On an ongoing basis, we evaluate our estimates and judgments, including those described below. We base our estimates on historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are more fully described in Note 2 of the notes to our consolidated financial statements appearing elsewhere in this document, management has identified the following as "Critical Accounting Policies and Estimates": Stock-Based Compensation, Debt and Equity Instruments, Intangible Assets and Goodwill. We believe that the estimates and assumptions involved in these accounting policies may have the greatest potential impact on our financial statements.

Stock-Based Compensation

We account for share-based payment awards issued to employees and members of our Board by measuring the fair value of the award on the date of grant and recognizing this fair value as stock-based compensation using a straight-line basis over the requisite service period, generally the vesting period. For awards issued to non-employees, the measurement date is the date when the performance is complete or when the award vests, whichever is the earliest. Accordingly, non-employee awards are remeasured at each reporting period until the final measurement date. The fair value of the award is recognized as stock-based compensation over the requisite service period, generally the vesting period.

Intangible Assets

We did not have any definite-lived intangible assets at December 31, 2022 and 2021. In testing for impairment of our definite-lived intangible assets during the year ended December 31, 2021, we determined that the carrying value of our patents exceeded their fair value. Based on this analysis, we recognized an impairment charge of approximately $2.4 million on our patents acquired in the Mayoly APA in the year ended December 31, 2021.

Goodwill

Goodwill relates to the acquisition of ProteaBio Europe SAS during 2014 and represents the excess of the total purchase consideration over the fair value of acquired assets and assumed liabilities, using the purchase method of accounting. Goodwill is not amortized but is subject to periodic review for impairment. As a result, the amount of goodwill is directly impacted by the estimates of the fair values of the assets acquired and liabilities assumed.

In addition, goodwill will be reviewed annually, and whenever events or changes in circumstances indicate that the carrying amount of the goodwill might not be recoverable. Judgment is used in determining when these events and circumstances arise. We perform our review of goodwill on our one reporting unit. If we determine that the carrying value of the assets may not be recoverable, judgment and estimates are used to assess the fair value of the assets and to determine the amount of any impairment loss.

The carrying value of goodwill was approximately $1.7 million and $1.9 million, at December 31, 2022 and 2021, respectively. Historically, goodwill was denominated in a foreign currency and translated to U.S. dollars at period end exchange rates. Effective with the dissolution of AzurRx SAS in October 2022, goodwill is carried on the U.S. books denominated in U.S. dollars. During the year ended December 31, 2022, we recognized a loss of approximately $1.7 million related to foreign translation adjustments associated with the dissolution. If actual results are not consistent with our estimates or assumptions, we may be exposed to an impairment charge that could be material.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Not applicable.

ITEM 8. FINANCIAL STATEMENTS

The audited consolidated financial statements of First Wave BioPharma, Inc., including the notes thereto, together with the report thereon of Mazars USA LLP, our independent registered public accounting firm, are included in this Annual Report as a separate section beginning on page F-1.

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

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of disclosure controls and procedures.

We maintain disclosure controls and procedures that are designed to ensure that information required to be disclosed in the reports that we file or submit under the Securities Exchange Act of 1934, as amended (the "*Exchange Act*") is (1) recorded, processed, summarized, and reported within the time periods specified in the SEC's rules and forms and (2) accumulated and communicated to our management, including our principal executive officer and principal financial officer, to allow timely decisions regarding required disclosure.

As of December 31, 2022, our senior management, with the participation of our principal executive officer and principal financial officer, evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act). Our senior management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives, and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Our principal executive officer and principal financial officer have concluded based upon the evaluation described above that, as of December 31, 2022 our disclosure controls and procedures were effective at the reasonable assurance level.

Management's Annual Report on Internal Control over Financial Reporting.

Our management is responsible for establishing and maintaining adequate internal control over financial reporting as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f). Our internal control over financial reporting is a process designed under the supervision of our principal executive officer and principal financial officer to provide reasonable assurance regarding the reliability of financial reporting and preparation of our financial statements for external purposes in accordance with generally accepted accounting principles.

Due to its inherent limitations, internal control over financial reporting may not prevent or detect misstatements and, even when determined to be effective, can only provide reasonable, not absolute, assurance with respect to financial statement preparation and presentation. Projections of any evaluation of effectiveness to future periods are subject to risk that controls may become inadequate as a result of changes in conditions or deterioration in the degree of compliance.

Under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework in Internal Control — Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission ("*COSO*") issued in May 2013 and related COSO guidance. Based on our evaluation under this framework, management has concluded that, as of December 31, 2022, our internal control over financial reporting was effective based upon those criteria.

This report does not include an attestation report of our independent registered public accounting firm regarding internal control over financial reporting.

Changes in Internal Controls over Financial Reporting.

There were no significant changes in our internal control over financial reporting identified in management's evaluation pursuant to Rules 13a-15(d) or 15d-15(d) of the Exchange Act during the period covered by this Annual Report on Form 10-K that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

Not applicable.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

Directors

The following section sets forth certain information regarding our directors. There are no family relationships between any of the directors and our Named Executive Officers.

Director, Title	Age
James Sapirstein – President, Chief Executive Officer, Chairman and Non-Independent Director	61
Edward J. Borkowski – Lead Independent Director	63
Charles J. Casamento – Independent Director	77
Alastair Riddell, MSc., MBChB., DSc. – Independent Director	73
David Hoffman – Independent Director	62
Terry Coelho – Independent Director	61

James Sapirstein was appointed to the Board on October 8, 2019 and as our President and Chief Executive Officer effective that same day. Mr. Sapirstein was appointed Chair of the Board effective February 19, 2021. Prior to joining us, Mr. Sapirstein served as Chief Executive Officer and as a director of ContraVir Pharmaceuticals, Inc. (now known as Hepion Pharmaceuticals, Inc.) from March 2014 to October 2018. Previously, Mr. Sapirstein was the Chief Executive Officer of Alliqua Therapeutics from October 2012 to February 2014. He founded and served as Chief Executive Officer of Tobira Therapeutics from October 2006 to April 2011 and served as Executive Vice President, Metabolic and Endocrinology for Serono Laboratories from June 2002 to May 2005. Mr. Sapirstein's earlier career included a number of senior level positions in the area of marketing and commercialization, including as Global Marketing Lead for Viread (tenofovir) while at Gilead Sciences and as Director of International Marketing of the Infectious Disease Division at Bristol Myers Squibb. Mr. Sapirstein is currently the Chair Emeritus of BioNJ, the New Jersey affiliate of the Biotechnology Innovation Organization, and also serves on the Emerging Companies and Health Section Boards of the Biotechnology Innovation Organization. Mr. Sapirstein received his bachelor's degree in pharmacy from Rutgers University and holds an MBA degree in management from Fairleigh Dickinson University.

Mr. Sapirstein's nearly 36 years of pharmaceutical industry experience which spans areas such as drug development and commercialization, including participation in 23 product launches, six of which were global launches led by him makes him a valuable asset to the Board and in his oversight and execution of our business plan.

Edward J. Borkowski was appointed to the Board in May 2015, and currently serves as our Lead Independent Director. Mr. Borkowski served as Chair of the Board from 2015 through his resignation effective as of February 19, 2021. Mr. Borkowski is a healthcare executive who currently serves as Executive Vice President for Therapeutics MD. He served as Executive Vice President of MiMedx Group, Inc. (Nasdaq: MDGX) from April 2018 until December 2019. Mr. Borkowski also served as a director for Co-Diagnostics, Inc. (Nasdaq: CODX), from May 2017 until June 2019. Previously, he served as the Chief Financial Officer of Aceto Corporation (Nasdaq: ACET) from February 2018 to April 2018, and has held several executive positions with Concordia International, an international specialty pharmaceutical company, between May 2015 to February 2018. Mr. Borkowski has also served as Chief Financial Officer of Amerigen Pharmaceuticals, a generic pharmaceutical company with a focus on oral, controlled release products and as the Chief Financial Officer and Executive Vice President of Mylan N.V. In addition, Mr. Borkowski previously held the position of Chief Financial Officer with Convatec, a global medical device company focused on wound care and ostomy, and Carefusion, a global medical device company for which he helped lead its spin-out from Cardinal Health into an independent public company. Mr. Borkowski has also served in senior financial positions at Pharmacia and American Home Products (Wyeth). He started his career with Arthur Andersen & Co. after receiving his MBA in accounting from Rutgers University subsequent to having earned his degree in Economics and Political Science from Allegheny College. Mr. Borkowski is currently a Trustee and a member of the Executive Committee of Allegheny College.

Mr. Borkowski's extensive healthcare and financial expertise, together with his public company experience provides the Board and management with valuable insight in the growth of our business plan.

Charles J. Casamento was appointed to the Board in March 2017. Since 2007, Mr. Casamento has been executive director and principal of The Sage Group, a health care advisory group. Prior to that, Mr. Casamento was president and Chief Executive Officer of Osteologix, a startup company which he oversaw going public, from October 2004 until April 2007. Mr. Casamento was the founder of Questcor Pharmaceuticals where he was President, Chief Executive Officer and Chair from 1999 through 2004. During his time at Questcor, the company acquired Acthar, a product with sales that would eventually exceed $1.0 billion. Mr. Casamento also served as President, Chief Executive Officer and Chair of RiboGene Inc. until 1999 when RiboGene was merged another company to form Questcor. He was also the Co-Founder, President and Chief Executive Officer of Indevus (formerly Interneuron Pharmaceuticals) and has held senior management positions at Genzyme Corporation, where he was Senior Vice President, American Hospital Supply, where he was Vice President of Business Development for the Critical Care division, Johnson & Johnson, Hoffmann-LaRoche and Sandoz. He currently serves as Chairman of the Board of Directors of Relmada Therapeutics (OTCQB: RLMD), serves on the Board of Directors of Eton Pharmaceuticals (Nasdaq: ETON), and serves on the Board of Directors of PaxMedica, Inc. (Nasdaq: PXMD), and was previously a Director and Vice Chair of the Catholic Medical Missions Board, a large not for profit international organization. Mr. Casamento holds a bachelor's degree in Pharmacy from Fordham University and an MBA from Iona College.

Mr. Casamento's expertise and knowledge of the financial community combined with his experience in the healthcare sector makes him a valued member of the Board.

Dr. Alastair Riddell was appointed to the Board in September 2015. From June 2016 to February 2023, Dr. Riddell served as Chair and Director of Nemesis Biosciences Ltd and previously Chair of Feedback plc (LON: FDBK). He has also served as Chair of the South West Academic Health Science network in the UK since January 2016. Since his appointment in December 2015, Dr. Riddell has served as Non-Executive Director of Cristal Therapeutics in The Netherlands. From September 2012 to February 2016, he served as Chair of Definigen Ltd., and from November 2013 to September 2015 as Chair of Silence Therapeutics Ltd., and from October 2009 to November 2012 as Chair of Procure Therapeutics. Between 2007 to 2009, Dr. Riddell served as the Chief Executive Officer of Stem Cell Sciences plc. and between 2005 to 2007, served at Paradigm Therapeutics Ltd. as the Chief Executive Officer. Between 1998 to 2005, Dr. Riddell also served as the Chief Executive Officer of Pharmagene plc. Dr. Riddell began his career as a doctor in general practice in a variety of hospital specialties and holds a Master of Science and a Bachelor of Medicine and Surgery degrees. He was awarded a Doctorate of Science, Honoris Causa by Aston University in 2016.

Dr. Riddell's medical background coupled with his expertise in the life sciences industry, directing all phases of clinical trials, before moving to sales, marketing and general management, makes him a well-qualified member of the Board.

David Hoffman was appointed to the Board on April 27, 2022. Mr. Hoffman has served as Managing Partner of Miliardi Capital LLC, a venture capital firm specializing in consulting and principle investing in financial and insurance entities, since March 2021. Prior to his current role, Mr. Hoffman served as Senior Vice President for ED&F Man Capital Markets, Inc. ("ED&F"), a global broker dealer and current consulting client of Miliardi Capital LLC, from March 2019 through December 2021. In his role as Senior Vice President at ED&F, Mr. Hoffman ran a software startup called OptionsLive, which provided traders around the world with trading and analytical software to trade options. Mr. Hoffman remains the founder and Head of Sales for OptionsLive. Previous to his role at ED&F, Mr. Hoffman served as Managing Director and Head of Proprietary Trading for Nomura Securities Co., Ltd. ("Nomura") in New York from October 2015 through January 2019. In his role at Nomura Securities, Mr. Hoffman supervised a team of professionals who traded Nomura's capital in foreign exchange and fixed income markets. Mr. Hoffman also served in various roles at First Wave Bio, Inc., which was acquired by First Wave BioPharma, Inc. in September 2021, including as President and Treasurer from December 2015 through September 2021, as a member of the board of directors from December 2015 through September 2021, and as chair of the board of directors from December 2015 through September 2018. Mr. Hoffman received a bachelor's degree in Economics from Rutgers College and earned an MBA in Finance from Columbia University.

Mr. Hoffman was designated for appointment as a director by the former stockholders of First Wave Bio, Inc. pursuant to the Agreement and Plan and Merger, dated as of September 13, 2021, by and among the Company, Alpha Merger Sub, Inc. and First Wave Bio, Inc., and his extensive financial and investing background and management experience makes him a qualified member of the Board.

On January 27, 2023, Mr. Hoffman filed a complaint in the Court of Chancery of the State of Delaware against the Company seeking advancement of his reasonable attorneys' fees and expenses relating to certain aspects of his service of a director of the Company (the "Complaint"). The Complaint alleges that Mr. Hoffman is entitled to reimbursement of approximately $115,000 of expenses. We are currently pursuing settlement discussions with Mr. Hoffman and do not expect that the terms of any settlement will have a material adverse effect on our financial condition or results of operations.

Terry Coelho was appointed to the Board on August 11, 2021. Ms. Coelho served as the Executive Vice President, Chief Financial Officer & Chief Business Development Officer of CinCor Pharma, Inc. (NASDAQ: CINC), a clinical stage cardiorenal therapeutics company from November 2021 to November 2022. Prior to this, Ms. Coelho served as Executive Vice President and Chief Financial Officer at BioDelivery Sciences International, Inc. (NASDAQ: BDSI), a commercial-stage specialty pharmaceutical company, since January 2019. Prior to her tenure at BDSI, Ms. Coelho served as Chief Financial Officer and Treasurer at Balchem Corporation (NASDAQ: BCPC) from October 2017 to October 2018. Previous to her role at Balchem she served as Chief Operating Officer for Diversey, Inc., a multi-billion-dollar global private equity carve-out from Sealed Air Corporation. She additionally held senior finance positions at Diversey Care, including that of Division Chief Financial Officer and VP of Global Commercial Excellence, from October 2014 through August 2017. Ms. Coelho has also served in senior finance and operational leadership roles of increasing responsibility with leading global organizations, including Mars, Incorporated, and Novartis Pharmaceuticals from 2007 to 2014, including serving as Global Head of Oncology Development Finance. Ms. Coelho will be a member of the board of directors of HOOKIPA Pharma Inc. (NASDAQ: HOOK) effective April 3, 2023, and will be serving on the board's audit and compensation committees. Ms. Coelho earned an MBA in Finance from IBMEC in Brazil and a Bachelor of Arts degree in both Economics and International Relations, summa cum laude, from The American University School of International Service in Washington, DC. She has led Women's Networking ERGs and is a founding Steering Committee Member of the CFO Leadership Council – Charlotte, North Carolina, chapter.

Ms. Coelho was selected as a director due to her financial background and experience as a senior financial officer of public companies.

Executive Officers

The following table sets forth information regarding our current executive officers as appointed by the Board, each to serve in such position until their respective successors have been duly appointed and qualified or until their earlier death, resignation or removal from office. Our executive officers are appointed by and serve at the discretion of the Board, subject to the terms of any employment agreements they may have with us. The following is a brief description of the qualifications and business experience of each of our current executive officers.

Executive Officer	Age	Title
James Sapirstein	61	President, Chief Executive Officer, Chairman and Non-Independent Director
Sarah Romano	43	Chief Financial Officer

Our executive officers are appointed by and serve at the discretion of the Board, subject to the terms of any employment agreements they may have with us. The following is a brief description of the qualifications and business experience of each of our current executive officers.

James Sapirstein. Please see Mr. Sapirstein's biography under the "Directors" section of this Annual Report.

Sarah Romano was appointed to serve as our Chief Financial Officer on March 1, 2022. Ms. Romano previously served as Chief Financial Officer of Kiora Pharmaceuticals, Inc. (NASDAQ: KPRX) (formerly EyeGate Pharmaceuticals, Inc.), a clinical-stage specialty pharmaceutical company developing products for treating ophthalmic diseases, from February 2017 through February 2022 and as its Corporate Controller from August 2016 to January 2017. Prior to joining Kiora, Ms. Romano served as Assistant Controller at TechTarget from June 2015 through August 2016 and Corporate Controller at Bowdoin Group, a healthcare-focused executive recruiting firm, from September 2013 through May 2015. Previously, she held financial reporting positions of increasing responsibility at SoundBite Communications from 2008 until its acquisition by Genesys in 2013, and at Cognex Corporation from 2004 through 2008. Ms. Romano began her career as an auditor in the Boston office of PricewaterhouseCoopers. A licensed CPA in Massachusetts, she holds a Bachelor of Arts in Accounting from College of the Holy Cross and a Master of Accounting from Boston College.

Section 16(a) Beneficial Ownership Reporting Compliance

Delinquent Section 16(a) Reports

Section 16(a) of the Exchange Act, requires our officers, directors, and persons who beneficially own more than 10% of our Common Stock to file reports of ownership and changes in ownership with the SEC. Officers, directors, and greater-than-ten-percent stockholders are also required by the SEC to furnish us with copies of all Section 16(a) forms that they file.

Based solely upon a review of these forms that were furnished to us, we believe that all reports required to be filed by these individuals and persons under Section 16(a) were filed during the year ended December 31, 2022 and that such filings were timely.

Code of Business Conduct and Ethics

The Board adopted a code of business conduct and ethics (the "*Code*") that applies to our directors, officers and employees. A copy of this Code is available on our website at www.firstwavebio.com/investors. We intend to disclose on our website any amendments to and waivers of the Code that apply to our principal executive officer, principal financial officer, principal accounting officer, controller, or persons performing similar functions.

Director Nomination Process

The Corporate Governance and Nominating Committee identifies director nominees by first considering those current members of the Board who are willing to continue service. Current members of the Board with skills and experience that are relevant to our business and are willing to continue their service as a director are considered for re-election, balancing the value of continuity of service by existing members of the Board with that of obtaining a new perspective. Nominees for director are selected by a majority of the members of the Board. Although we do not have a formal diversity policy, in considering the suitability of director nominees, the Corporate Governance and Nominating Committee considers such factors as it deems appropriate to develop a Board and its committees that are diverse in nature and comprised of experienced and seasoned advisors. Factors considered by the Corporate Governance and Nominating Committee include sound judgment, knowledge, skill, diversity, integrity, experience with businesses and other organizations of comparable size, including experience in the biopharma industry, clinical studies, FDA compliance, intellectual property, business, finance, administration or public service, the relevance of a candidate's experience to our needs and experience of other Board members, experience with accounting rules and practices, the desire to balance the considerable benefit of continuity with the periodic injection of the fresh perspective provided by new members, and the extent to which a director candidate would be a desirable addition to the Board and its committees.

Nominations of persons for election to the Board may be made at an annual meeting of stockholders only (a) pursuant to our notice of meeting, (b) by or at the direction of the Board or any committee thereof or (c) by any stockholder of the Company who was a stockholder of record of the Company at the time the notice is delivered by such stockholder to the secretary of the Company, who is entitled to vote at the meeting upon such election of directors or upon such other business, as the case may be, and who complies with the notice procedures set forth in our bylaws. For any nominations to be properly brought before an annual meeting by a stockholder, the stockholder must have given timely notice, which must be delivered to the secretary of the Company at our principal executive offices not later than the close of business on the 90th day, nor earlier than the close of business on the 120th day, prior to the first anniversary of the preceding year's annual meeting; provided however, that in the event that the date of the annual meeting is more than 30 days before or more than 70 days after such anniversary date, notice by the stockholder must be so delivered not earlier than the close of business on the 120th day prior to such annual meeting and not later than the close of business on the later of the 90th day prior to such annual meeting or the 10th day following the day on which public announcement of the date of such meeting is first made by the Company. In no event shall the public announcement of an adjournment, postponement or recess of an annual meeting commence a new time period (or extend any time period) for the giving of a stockholder's notice as described above. The number of nominees a stockholder may nominate for election at the annual meeting (or in the case of a stockholder giving the notice on behalf of a beneficial owner, the number of nominees a stockholder may nominate for election at the annual meeting on behalf of such beneficial owner) shall not exceed the number of directors to be elected at such annual meeting.

To be in proper form, such stockholder's notice shall set forth: (a) as to each person whom the stockholder proposes to nominate for election as a director (i) the name, age, business and residence address, and principal occupation or employment of the nominee, (ii) and all other information relating to such nominee that is required to be disclosed in solicitations of proxies for election of directors in an election contest, or is otherwise required, in each case pursuant to and in accordance with Section 14(a) of the Exchange Act, and the rules and regulations promulgated thereunder, (iii) a reasonably detailed description of any compensatory, payment or other financial agreement, arrangement or understanding that such nominee has with any other person or entity other than the Company including the amount of any payment or payments received or receivable thereunder, in each case in connection with candidacy or service as a director of the Company, (iv) such person's written consent to being named in the Company's proxy statement and associated proxy card as a nominee of the stockholder and to serving as a director if elected and (v) all information with respect to such nominee that would be required to be set forth in a stockholder's notice if such nominee were the stockholder giving notice hereunder and (b) as to the stockholder giving the notice and the beneficial owner, if any, on whose behalf the nomination or proposal is made (i) the name and address of such stockholder, as they appear on the Company's books, and of such beneficial owner, (ii) the class or series and number of shares of capital stock of the Company which are, directly or indirectly, owned beneficially (within the meaning of Rule 13d-3 under the Exchange Act) or of record by such stockholder and such beneficial owner (provided, that such stockholder and the beneficial owner, if any, on whose behalf the nomination or proposal is made shall in all events be deemed to beneficially own any shares of any class or series and number of shares of capital stock of the Company as to which such stockholder or beneficial owner, if any, has a right to acquire beneficial ownership at any time in the future), (iii) a description of any agreement, arrangement or understanding with respect to the nomination between or among such stockholder and/or such beneficial owner, any of their respective affiliates or associates, and any others acting in concert with any of the foregoing (including their names), including the nominee, (iv) a description of any agreement, arrangement or understanding (including any derivative or short positions, profit interests, options, warrants, convertible securities, stock appreciation or similar rights, hedging transactions, and borrowed or loaned shares) that has been entered into as of the date of the stockholder's notice by, or on behalf of, such stockholder and such beneficial owners, whether or not such instrument or right shall be subject to settlement in underlying shares of capital stock of the Company, the effect or intent of which is to mitigate loss to, manage risk or benefit of share price changes for, or increase or decrease the voting power of, such stockholder or such beneficial owner, with respect to securities of the Company, (v) a representation that the stockholder is a holder of record of stock of the Company entitled to vote at such meeting upon such business or nomination, as the case may be, and intends to appear in person or by proxy at the meeting to propose such business or nomination, (vi) a representation as to whether the stockholder or the beneficial owner, if any, intends or is part of a group which intends (a) to deliver a proxy statement and/or form of proxy to holders of at least the percentage of the Company's outstanding capital stock required to elect the nominee and/or (b) otherwise to solicit proxies or votes from stockholders in support of such nomination, and (vii) any other information relating to such stockholder and beneficial owner, if any, required to be disclosed in a proxy statement or other filings required to be made in connection with solicitations of proxies for the election of directors in an election contest pursuant to and in accordance with Section 14(a) of the Exchange Act and the rules and regulations promulgated thereunder. The Company may require any proposed nominee to furnish such other information as the Company may reasonably require to determine the eligibility of such proposed nominee to serve as a director of the Company. If requested by the Company, the information required on such nominee shall be supplemented by such stockholder and any such beneficial owner not later than 10 days after the record date for the meeting to disclose such information as of the record date. In addition, a stockholder seeking to nominate a director candidate shall promptly provide any other information reasonably requested by the Company.

Provided that stockholders provide the information above required for candidates recommended by stockholders, the Corporate Governance and Nominating Committee will evaluate those candidates by following substantially the same process, and applying substantially the same criteria, as for candidates submitted by members of the Board or other persons, as described above and as set forth in its charter.

Board Committees

The standing committees of the Board consist of the Audit Committee, Compensation Committee, and Corporate Governance and Nominating Committee. Our Board has adopted written charters for each of these committees, copies of which are available on our website at www.firstwavebio.com/investors. Our Board may establish other committees as it deems necessary or appropriate from time to time.

Audit Committee

The duties and responsibilities of the Audit Committee include but are not limited to:

- appointing, compensating, retaining, evaluating, terminating, and overseeing our independent registered public accounting firm;
- discussing with our independent registered public accounting firm the independence of its members from its management;
- reviewing with our independent registered public accounting firm the scope and results of their audit;
- approving all audit and permissible non-audit services to be performed by our independent registered public accounting firm;
- overseeing the financial reporting process and discussing with management and our independent registered public accounting firm the interim and annual financial statements that are filed with the SEC;
- reviewing and monitoring our accounting principles, accounting policies, financial and accounting controls, and compliance with legal and regulatory requirements;
- coordinating oversight of the Code and our disclosure controls and procedures on behalf of the Board;
- establishing procedures for the confidential and/or anonymous submission of concerns regarding accounting, internal controls or auditing matters; and
- reviewing and approving related-person transactions.

The rules of Nasdaq require our Audit Committee to consist of at least three directors, all of whom must be deemed to be independent directors under Nasdaq rules. The Board has affirmatively determined that Ms. Coelho and Messrs. Borkowski and Casamento, each meet the definition of "independent director" for purposes of serving on an Audit Committee under Nasdaq rules. Additionally, the Board has determined that Ms. Coelho and Messrs. Borkowski and Casamento each qualify as an "audit committee financial expert," as such term is defined in Item 407(d)(5) of Regulation S-K.

Compensation Committee

The duties and responsibilities of the Compensation Committee include but are not limited to:

- reviewing key employee compensation goals, policies, plans and programs;
- reviewing and approving the compensation of our directors and executive officers;
- reviewing and approving employment agreements and other similar arrangements between us and our executive officers; and
- appointing and overseeing any compensation consultants or advisors to the Company.

The rules of Nasdaq require our Compensation Committee to consist entirely of independent directors. The Board has affirmatively determined that Ms. Coelho and Messer. Riddell meet the definition of "independent director" for purposes of serving on the Compensation Committee under Nasdaq rules.

Corporate Governance and Nominating Committee

The duties and responsibilities of the Corporate Governance and Nominating Committee include but are not limited to:

- assisting the Board in identifying qualified individuals to become members of the Board;
- determining the composition of the Board and monitoring the activities of the Board to assess overall effectiveness; and
- developing and recommending to our Board corporate governance guidelines applicable to the Company and advising our Board on corporate governance matters.

ITEM 11. EXECUTIVE COMPENSATION

Summary Compensation

The table set forth below reflects certain information regarding the compensation paid or accrued during the years ended December 31, 2022 and 2021 to our Chief Executive Officer and our executive officers, other than our Chief Executive Officer, who were serving as an executive officer as of December 31, 2022, and whose annual compensation exceeded $100,000 during such year (collectively the "*Named Executive Officers*").

Executive Compensation

Named Executive Officers	Year	Salary	Bonus	Equity Awards	All Other Compensation	Total
James Sapirstein	2022	$ 480,000	$ — (3)	$ 165,720 (5)	$ —	$ 645,720
President and Chief Executive Officer	2021	$ 480,000	$ 186,000 (4)	$ 628,380 (6)	$ —	$ 1,294,380
Sarah Romano	2022	$ 304,166	$ — (3)	$ 135,503 (5)	$ —	$ 439,670
Chief Financial Officer	2021	$ —	$ — (4)	$ — (6)	$ —	$ —
James Pennington (1)	2022	$ 204,599	$ — (3)	$ 8,286 (5)	$ —	$ 212,885
Chief Medical Officer	2021	$ 370,000	$ 49,406 (4)	$ 63,181 (6)	$ —	$ 482,587
Daniel Schneiderman (2)	2022	$ 47,500	$ — (3)	$ 11,037 (5)	$ —	$ 58,537
Chief Financial Officer	2021	$ 285,000	$ 48,592 (4)	$ 199,348 (6)	$ —	$ 532,940

(1) Mr. Pennington's employment with us as Chief Medical Officer terminated effective May 14, 2022 due to his resignation.

(2) Mr. Schneiderman's employment with us as Chief Financial Officer terminated effective February 28, 2022 due to his resignation.

(3) Represents accrued and unpaid bonuses during 2022, as of December 31, 2022.

(4) Represents accrued and unpaid bonuses during 2021, as of December 31, 2021.

(5) Represents the grant date fair value of stock options issued during the year ended December 31, 2022, calculated in accordance with ASC Topic 718. The assumptions used in the calculation of these amounts are included in Note 11 of the notes to the consolidated financial statements contained in this Annual Report.

(6) Represents the grant date fair value of restricted stock and stock options issued during the year ended December 31, 2021, calculated in accordance with ASC Topic 718. The assumptions used in the calculation of these amounts are included in Note 11 of the notes to the consolidated financial statements contained in the Company's Annual Report, filed with the SEC on March 31, 2022.

Employment Arrangements and Potential Payments upon Termination or Change of Control

Current Named Executive Officers

Sapirstein Employment Agreement. Effective October 8, 2019, we entered into an employment agreement with Mr. Sapirstein to serve as our President and Chief Executive Officer for a term of three years, subject to further renewal upon agreement of the parties. The employment agreement with Mr. Sapirstein originally provided for a base salary of $450,000 per year, which was subsequently increased to $480,000 per year during the year ended December 31, 2020. In addition to the base salary, Mr. Sapirstein is eligible to receive (i) a bonus of up to 40% of his base salary on an annual basis, based on certain milestones that are yet to be determined; (ii) 1% of net fees received by us upon entering into license agreements with any third-party with respect to any product currently in development or upon the sale of all or substantially all of our assets; (iii) a grant of 666 restricted shares of our Common Stock which are subject to vesting as follows (a) 333 upon the first commercial sale of adrulipase in the U.S., and (b) 333 upon our total market capitalization exceeding $1.0 billion for 20 consecutive trading days; (iv) a grant of 1,000 10-year stock options to purchase shares of our Common Stock which are subject to vesting as follows (a) 167 upon us initiating our next Phase 2 clinical trial in the U.S. for adrulipase, (b) 167 upon us completing our next or subsequent Phase 2 clinical trial in the U.S. for adrulipase, (c) 333 upon us initiating a Phase 2 clinical trial in the U.S. for adrulipase, and (d) 333 upon us initiating a Phase 1 clinical trial in the U.S. for any product other than adrulipase. Mr. Sapirstein is entitled to receive 20 days of paid vacation, participate in full employee health benefits and receive reimbursement for all reasonable expenses incurred in connection with his services to us.

In the event that Mr. Sapirstein's employment is terminated by us for Cause, as defined in his employment agreement, or by Mr. Sapirstein voluntarily, then will not be entitled to receive any payments beyond amounts already earned, and any unvested equity awards will terminate. In the event that Mr. Sapirstein's employment is terminated as a result of an Involuntary Termination Other than for Cause, as defined in the Agreement, Mr. Sapirstein will be entitled to receive the following compensation: (i) severance in the form of continuation of his salary (at the Base Salary rate in effect at the time of termination, but prior to any reduction triggering Good Reason) for a period of 12 months following the termination date; (ii) payment of Executive's premiums to cover COBRA for a period of 12 months following the termination date; and (iii) a prorated annual bonus.

Romano Employment Agreement. Effective March 1, 2022, we entered into an employment agreement with Ms. Romano to serve as our Chief Financial Officer for a term of three years, subject to further renewal upon agreement of the parties. The employment agreement with Ms. Romano provides for a base salary of $365,000 per year. In addition to the base salary, Ms. Romano is eligible to receive an annual milestone cash bonus based on certain milestones that will be established by our Board or the Compensation Committee. On March 1, 2022, Ms. Romano was granted stock options to purchase 5,000 shares of Common Stock on March 1, 2022, with an exercise price of $35.40 per share, which shall vest in over a term of three years pursuant to her employment agreement. Ms. Romano is entitled to receive 20 days of paid vacation, participate in full employee health benefits and receive reimbursement for all reasonable expenses incurred in connection with her service to us. We may terminate Ms. Romano's employment agreement at any time, with or without Cause, as such term is defined in her employment agreement.

In the event that Ms. Romano's employment is terminated by us for Cause, as defined in Ms. Romano's employment agreement, or by Ms. Romano voluntarily, she will not be entitled to receive any payments beyond amounts already earned, and any unvested equity awards will terminate. If we terminate her employment agreement without Cause, not in connection with a Change of Control, as such term is defined in Ms. Romano's employment agreement, she will be entitled to (i) all salary owed through the date of termination; (ii) any unpaid annual milestone bonus; (iii) severance in the form of continuation of her salary for the greater of a period of six months following the termination date or the remaining term of the employment agreement; (iv) payment of premiums to cover COBRA for a period of six months following the termination date; (v) a prorated annual bonus equal to the target annual milestone bonus, if any, for the year of termination multiplied by the formula set forth in the agreement. If we terminate Ms. Romano's employment agreement without Cause, in connection with a Change of Control, she will be entitled to the above and immediate accelerated vesting of any unvested options or other unvested awards.

Former Named Executive Officers

Schneiderman Employment Agreement. On January 2, 2020, we entered into an employment agreement with Mr. Schneiderman to serve as our Chief Financial Officer for a term of three years, subject to further renewal upon agreement of the parties. The employment agreement with Mr. Schneiderman provided for a base salary of $285,000 per year. In addition to the base salary, Mr. Schneiderman was eligible to receive (a) an annual milestone cash bonus based on certain milestones that will be established by our Board or the Compensation Committee, (b) grants of stock options to purchase such number of shares equal to one and a quarter percent (1.25%) of the issued and outstanding Common Stock on January 2, 2020, or 33,500 shares of Common Stock with an exercise price of $10.30 per share, which shall vest in over a term of three years. Mr. Schneiderman was entitled to receive 20 days of paid vacation, participate in full employee health benefits and receive reimbursement for all reasonable expenses incurred in connection with his service to us. Mr. Schneiderman's employment agreement was terminable by us at any time, with or without Cause, as such term is defined in his employment agreement. Effective July 16, 2020, our Board approved an amended and restated option grant to Mr. Schneiderman, amending and restating the grant previously made on January 2, 2020, to reduce the amount of shares issuable upon exercise of such option to be the maximum number of shares Mr. Schneiderman was eligible to receive under the Amended and Restated 2014 Omnibus Equity Incentive Plan (the "2014 Plan") on the original grant date (or 30,000 shares), due to the 2014 Plan provisions relating to Section 162(m) limitations. On June 30, 2021, our Board rescinded and cancelled the option grant previously made to Mr. Schneiderman on July 16, 2020 covering an aggregate of 28,500 shares under the 2014 Plan and granted new stock options covering an aggregate of 28,600 shares under our Amended and Restated 2020 Omnibus Equity Incentive Plan (the "2020 Plan") on substantially similar terms to the rescinded stock options.

In the event that Mr. Schneiderman's employment was terminated by us for Cause, as defined in Mr. Schneiderman's employment agreement, or by Mr. Schneiderman voluntarily, then he would not have been entitled to receive any payments beyond amounts already earned, and any unvested equity awards will terminate. If we terminated his employment agreement without Cause, not in connection with a Change of Control, as such term is defined in Mr. Schneiderman's employment agreement, he would have been entitled to (i) all salary owed through the date of termination; (ii) any unpaid annual milestone bonus; (iii) severance in the form of continuation of his salary for the greater of a period of six months following the termination date or the remaining term of the employment agreement; (iv) payment of premiums to cover COBRA for a period of six months following the termination date; (v) a prorated annual bonus equal to the target annual milestone bonus, if any, for the year of termination multiplied by the formula set forth in the agreement. If we terminated Mr. Schneiderman's employment agreement without Cause, in connection with a Change of Control, he would have been entitled to the above and immediate accelerated vesting of any unvested options or other unvested awards.

Mr. Schneiderman resigned from his position as our Chief Financial Officer effective February 28, 2022. Pursuant to the settlement agreement and release by and between the Company and Mr. Schneiderman, Mr. Schneiderman received: (i) all salary owed through February 28, 2022; (ii) his annual milestone bonus earned for the year ended December 31, 2021; (iii) a lump sum severance payment in an amount equal to six months of his base salary; (iv) payment of premiums to cover COBRA for a period of six months following February 28, 2022; (v) vesting of all unvested equity awards and extension of the period of time that Mr. Schneiderman may exercise any vested equity awards until the termination of such awards.

Pennington Employment Agreement. On May 28, 2018, we entered into an employment agreement with Mr. Pennington to serve as our Chief Medical Officer. The employment agreement with Dr. Pennington provided for a base annual salary of $250,000 which was subsequently increased to $425,000 per year during the year ended December 31, 2021. In addition to his salary, Dr. Pennington was eligible to receive an annual milestone bonus, awarded at the sole discretion of the Board based on his attainment of certain financial, clinical development, and/or business milestones established annually by the Board or Compensation Committee. The employment agreement was terminable by either party at any time. In the event of termination by us other than for cause, Dr. Pennington would have been entitled to three months' severance payable over such period. In the event of termination by us other than for cause in connection with a Change of Control, Dr. Pennington would have received six months' severance payable over such period.

Dr. Pennington retired from his position as our Chief Medical Officer on May 14, 2022 and transitioned to a consulting role.

Outstanding Equity Incentive Awards at Fiscal Year-End

The following table sets forth information regarding unexercised options, stock that has not vested and equity incentive awards held by each of the Named Executive Officers outstanding as of December 31, 2022:

Name	Grant Date	Number of Securities underlying unexercised options (#) exercisable	Number of underlying unexercised unearned options (#)	Option exercise price ($)	Option expiration date	Number of Shares or units of stock that have not vested (#)	Market value of shares or units of stock that have not vested ($)	Number of unearned shares, units or other rights that have not vested (#)	Market or payout value of unearned shares, units or other rights that have not vested ($)
Named Executive Officers									
James Sapirstein	10/08/2019	95	47 (1)	$ 1,176.00	10/07/2029	—	$ —	—	$ —
	10/08/2019	—	—	—	10/07/2029	—	$ —	95 (2)	$ 112,000
	07/16/2020	143	—	$ 1,785.00	07/15/2030	—	$ —	—	$
	06/30/2021	254	173 (3)	$ 1,785.00	07/15/2030	—	$ —	—	$ —
	01/03/2022	238	475 (4)	$ 304.50	01/02/2032	—	$ —	—	$ —
Sarah Romano	03/01/2022	—	714 (5)	$ 247.80	02/28/2032				
Former Named Executive Officers									
James Pennington	06/28/2018	—	—	$ 212.80	06/27/2023	—	$ —	—	$ —
	06/13/2019	—	—	$ 122.50	06/12/2024	—	$ —	—	$ —
	07/16/2020	—	—	$ 59.50	07/15/2030	—	$ —	—	$ —
	07/09/2021	—	—	$ 52.50	07/08/2030	—	$ —	—	$ —
	01/03/2022	—	—	$ 304.50	01/02/2032	—	$ —	—	$
Daniel Schneiderman	01/02/2020	159	— (6)	$ 2,163.00	01/01/2030	—	$ —	—	$ —
	06/30/2021	119	— (7)	$ 1,785.00	07/15/2030	—	$ —	—	$ —
	06/30/2021	16	— (7)	$ 1,785.00	07/15/2030	—	$ —	—	$ —
	01/03/2022	47	— (8)	$ 304.50	01/02/2032	—	$ —	—	$ —

(1) Represents stock options issued to Mr. Sapirstein on October 8, 2019 under the terms of his employment agreement, which options will vest as follows: (i) as to 47 shares upon our initiating a Phase 3 clinical trial in the U.S. for adrulipase.

(2) Represents the restricted stock unit ("*RSU*") award issued to Mr. Sapirstein on October 8, 2019 under the terms of his employment agreement, which RSU will vest as follows: (i) as to 48 shares upon the first commercial sale in the U.S. of adrulipase, and (ii) as to 47 shares upon our total market capitalization exceeding $1.0 billion for 20 consecutive trading days.

(3) On June 30, 2021, the Board rescinded and cancelled certain stock option awards previously made under the 2014 Plan (the "*Prior Sapirstein Awards*") to Mr. Sapirstein and issued new stock options awards (the "*New Sapirstein Awards*") under the 2020 Plan in an equivalent amount and with equivalent exercise price, vesting and expiration terms to the Prior Sapirstein Awards. The terms of the New Sapirstein Awards covering 427 shares of the Common Stock at an exercise price of $1,785.00 per share comprised of (i) stock options to purchase 142 shares of Common Stock that vest over a term of 18 months in 18 equal monthly installments starting on February 16, 2022, (ii) stock options to purchase 95 shares of Common Stock that vested immediately upon the grant of such stock options, and (iii) stock options to purchase 190 shares of Common Stock subject to milestone-based vesting based upon the achievement of certain strategic milestones specified by the Board.

(4) Represents stock options issued to Mr. Sapirstein on January 3, 2022, which options will vest over a term of three years, in 36 equal monthly installments on each monthly anniversary of January 3, 2022.

(5) Represents stock options issued to Ms. Romano on March 1, 2022, which options will vest over a term of three years, in three equal annual installments on each yearly anniversary of March 1, 2022.

(6) During the year ended December 31, 2020, the Board approved an amended and restated option grant to Mr. Schneiderman, amending and restating a grant previously made on January 2, 2020, to reduce the amount of shares issuable upon exercise of such option to be the maximum number of shares Mr. Schneiderman was eligible to receive under the 2014 Plan on the original grant date, or 143 shares (on a post-split basis), due to the 2014 Plan provisions relating to the Section 162(m) limitations. The Board also approved the issuance of a replacement option covering the balance of shares intended to be issued at that time, or 16 shares. The original stock option has an exercise price of $2,163.00, the closing sale price of Common Stock on January 2, 2020, which was the date of its original grant, and the replacement stock option has an exercise price of $1,785.00, the closing sale price of the Common Stock on its date of grant. Both the original stock option and the replacement stock option vest over a term of three years, in 36 equal monthly installments on each monthly anniversary of January 2, 2020.

(7) On June 30, 2021, the Board rescinded and cancelled certain stock option awards previously made under the 2014 Plan (the "*Prior Schneiderman Awards*") to Mr. Schneiderman and issued new stock options awards (the "*New Schneiderman Awards*") under the 2020 Plan in an equivalent amount and with equivalent exercise price, vesting and expiration terms to the Prior Schneiderman Awards. The terms of the New Schneiderman Awards covering 135 shares of the Common Stock at an exercise price of $1,785.00 per share comprised of (i) stock options to purchase 119 shares of Common Stock, of which options to purchase 38 shares of Common Stock vested immediately upon the grant of such options and the remaining options to purchase 81 shares of Common Stock will vest over a term of 2 years and 1 month in 25 equal monthly installments, and (ii) options to purchase 16 shares of Common Stock, of which options to purchase 8 shares of Common Stock vested immediately upon the grant of such options and the remaining options to purchase 8 shares of Common Stock vest over a term of 19 months in 19 equal monthly installments.

(8) Represents stock options issued to Mr. Schneiderman on January 3, 2022, which options will vest over a term of three years, in 36 equal monthly installments on each monthly anniversary of January 3, 2022.

Non-Executive Director Compensation

Effective September 1, 2021, our Board adopted an updated Non-Executive Director Compensation Policy under which each of our non-executive directors is entitled to receive the following cash compensation for their service on the Board (paid quarterly): (i) an annual retainer of $60,000; (ii) the chair of the Audit Committee is entitled to receive an additional annual retainer in the amount of $12,500, (iii) each non-chairperson member of the Audit Committee is entitled to receive an additional annual retainer in the amount of $5,000, (iv) the chair of the Compensation Committee is entitled to receive an additional annual retainer in the amount of $10,000, (v) each non-chairperson member of the Compensation Committee is entitled to receive an additional annual retainer in the amount of $5,000, (vi) the chair of the Corporate Governance and Nominating Committee is entitled to receive an additional annual retainer in the amount of $10,000, and (viii) each non-chairperson member of the Corporate Governance and Nominating Committee is entitled to receive an additional annual retainer in the amount of $5,000. Additionally, under this policy, each of our non-executive directors is entitled to receive an annual grant of 34,602 stock options for their service on the Board to purchase $50,000 of shares of Common Stock at a strike price equal to the closing price of the Common Stock on December 31, 2021, or $1.445 per share, which vest in equal quarterly installments.

Effective October 1, 2022, following an independent review of external benchmarks, our Board adopted an updated Non-Executive Director Compensation Policy under which each of our non-executive directors is entitled to receive the following cash compensation for their service on the Board (paid quarterly): (i) an annual retainer of $60,000, (ii) the lead independent director an annual retainer of $20,000, (iii) the chair of the Audit Committee is entitled to receive an additional annual retainer in the amount of $15,000, (iv) each non-chairperson member of the Audit Committee is entitled to receive an additional annual retainer in the amount of $7,500, (v) the chair of the Compensation Committee is entitled to receive an additional annual retainer in the amount of $12,500, (vi) each non-chairperson member of the Compensation Committee is entitled to receive an additional annual retainer in the amount of $6,000, (vii) the chair of the Corporate Governance and Nominating Committee is entitled to receive an additional annual retainer in the amount of $10,000, and (viii) each non-chairperson member of the Corporate Governance and Nominating Committee is entitled to receive an additional annual retainer in the amount of $5,000. Additionally, under this policy, each of our non-executive directors is entitled to receive an annual grant, effective on the date of the Company's annual meeting of stockholders, of restricted stock unit awards for their service on the Board equivalent to $75,000, which vests in equal quarterly installments.

Our Board will review the Non-Executive Director Compensation Policy on an annual basis prior to September 1 of each year.

The following table provides information regarding compensation paid to non-employee directors for the year ended December 31, 2022. Mr. Sapirstein did not receive compensation for his service on the Board as employee director for the year ended December 31, 2022. Information regarding executive compensation paid to Mr. Sapirstein during 2022 is reflected in the Summary Compensation table under "*Executive Compensation*."

Non-Executive Directors	Fees Earned or Paid in Cash(3)	Stock Award	Option Award (4)	All Other Compensation	Total
Edward J. Borkowski	$ 75,625	$ —	$ 38,049	$ —	$ 113,674
Charles J. Casamento	$ 65,625	$ —	$ 38,049	$ —	$ 103,674
Alastair Riddell	$ 70,000	$ —	$ 38,049	$ —	$ 108,049
David Hoffman (1)	$ 40,000	$ —	$ —	$ —	$ 40,000
Terry Coelho	$ 81,250	$ —	$ 38,049	$ —	$ 119,299
Gregory Oakes (2)	$ 37,500	$ —	$ —	$ —	$ 37,500

(1) Mr. Hoffman was appointed to the board effective April 27, 2022.

(2) Mr. Oakes resigned from the board effective June 16, 2022.

(3) Represents amounts of accrued and unpaid cash compensation for board services through December 31, 2022.

(4) Represents the aggregate grant date fair value of 164 stock options issued to each of Messrs. Borkowski, Casamento, Riddell, and Coelho on January 3, 2022, our non-employee directors, calculated in accordance with ASC Topic 718.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

Securities Authorized for Issuance Under Equity Compensation Plans

The following table provides information as of December 31, 2022 regarding equity compensation plans approved by our security holders and equity compensation plans that have not been approved by our security holders:

Plan category	Number of securities to be issued upon exercise of outstanding options, warrants and rights	Weighted-average exercise price of outstanding options, warrants and rights	Number of securities remaining available for future issuance under equity compensation plans reflected in column (a)
	(a)	(b)	(c)
Equity compensation plans approved by security holders (1) (2)	3,936	957.93	6,827
Equity compensation plans not approved by security holders	—	—	—
Total	**3,936**	**957.93**	**6,827**

(1) Excludes 283 shares of Common Stock reserved under the 2014 Plan as of December 31, 2022, subject to the issuance of restricted stock and RSUs.

(2) Represents outstanding stock options granted to our current or former employees, directors and consultants pursuant to the 2014 Omnibus Equity Incentive Plan (the "*2014 Plan*" and 2020 Omnibus Equity Incentive Plan (the "*2020 Plan*").

Summary of Amended and Restated 2014 Omnibus Equity Incentive Plan

The Board and stockholders adopted and approved the 2014 Plan, which took effect on May 12, 2014, and the 2020 Plan, which took effect on September 11, 2020. From the effective date of the 2020 Plan, no new awards have been or will be made under the 2014 Plan.

Stock Options. The 2014 Plan permitted the grant of "incentive stock options" ("*ISOs*"), which are intended to meet the requirements for special federal income tax treatment under the Code, and "nonqualified stock options" ("*NQSOs*") that do not meet the requirements of Section 422 of the Code. No stock option may be transferred other than by will or by the laws of descent and distribution, and during a recipient's lifetime a stock option may be exercised only by the recipient. However, the Compensation Committee may permit the holder of a stock option, SAR or other award to transfer the stock option, right or other award to immediate family members or a family trust for estate planning purposes. The Compensation Committee will determine the extent to which a holder of a stock option may exercise the option following termination of service with us.

Restricted Stock Awards and Restricted Stock Unit Awards. A restricted stock award is a grant or sale of Common Stock to the participant, subject to our right to repurchase all or part of the shares at their purchase price (or to require forfeiture of such shares if issued to the participant at no cost) in the event that conditions specified by the Compensation Committee in the award are not satisfied prior to the end of the time period during which the shares subject to the award may be repurchased by or forfeited to us. A restricted stock unit entitles the participant to receive a cash payment equal to the fair market value of a share of Common Stock for each restricted stock unit subject to such restricted stock unit award, if the participant satisfies the applicable vesting requirement. The Compensation Committee will determine the restrictions and conditions applicable to each award of restricted stock award or restricted stock unit award, which may include performance-based conditions.

Unrestricted Stock Awards. An unrestricted stock award is a grant or sale of shares of our Common Stock to the participant that is not subject to transfer, forfeiture or other restrictions, in consideration for past services rendered to us or an affiliate or for other valid consideration.

Change-in-Control Provisions. In connection with the grant of an award, the Compensation Committee may provide that, in the event of a change in control, such award will become fully vested and immediately exercisable.

Potential Limitation on Company Deductions

Section 162(m) of the Code generally disallows a tax deduction for compensation in excess of $1 million paid in a taxable year by a publicly held corporation to its chief executive officer and certain other "covered employees." Effective for taxable years beginning prior to January 1, 2018, an exception to this deduction limit applied to "performance-based compensation" that satisfied certain criteria. Under regulations issued by the Internal Revenue Service under Section 162(m), stock options and stock appreciation rights were treated as performance-based compensation if, among other things, an annual limit was placed on issuing such awards to a single individual. In order to comply with the foregoing exception to the $1 million deduction limit under Section 162(m), the 2014 Plan previously contained an annual limit on issuing awards of stock options and stock appreciation rights to a single individual, which was intended to allow us to deduct such awards granted as performance-based compensation. Pursuant to the Tax Cut and Jobs Act of 2017, however, the exception for performance-based compensation under Section 162(m) of the Code was repealed. As a result, the annual limit in the 2014 Plan was no longer effective to allow us to claim this deduction. Accordingly, effective July 16, 2020, our Board approved an amendment to the 2014 Plan that removed this annual limit.

Summary of the 2020 Omnibus Equity Incentive Plan

The Board and stockholders have adopted and approved the 2020 Plan, which is a comprehensive incentive compensation plan under which we can grant equity-based and other incentive awards to our officers, employees, directors, consultants and advisers. The purpose of the 2020 Plan is to help us attract, motivate and retain such persons with awards under the 2020 Plan and thereby enhance stockholder value.

Administration. The 2020 Plan is administered by the Compensation Committee of the Board, which consists of two members of the Board, each of whom is a "non-employee director" within the meaning of Rule 16b-3 promulgated under the Securities Exchange Act of 1934, as amended (the "*Exchange Act*"). The Compensation Committee may grant stock options, stock appreciation rights ("*SARs*"), performance stock awards, performance unit awards, dividend equivalent right awards, restricted stock awards, restricted stock unit awards, unrestricted stock awards, incentive bonus awards and other cash-based awards and other stock-based awards to our non-employee directors, officers, employees and nonemployee consultants or our affiliates. Among other things, the Compensation Committee has complete discretion, subject to the express limits of the 2020 Plan, to determine the directors, employees and individual consultants to be granted an award, the type of award to be granted, the terms and conditions of the award, the form of payment to be made and/or the number of shares of Common Stock subject to each award, the exercise price of each option and base price of each SAR, the term of each award, the vesting schedule for an award, whether to accelerate vesting, the value of the Common Stock underlying the award, and the required withholding, if any. Except as prohibited by applicable law or stock exchange rules, the Compensation Committee may delegate administrative functions under the 2020 Plan and may authorize a Reporting Person (as defined in the Exchange Act) to make certain awards under the 2020 Plan. Subject to the terms of the Plan, the Compensation Committee shall have the authority to amend the terms of an award in any manner that is not inconsistent with the Plan (including to extend the post-termination exercisability period of options and SARs), provided that no such action (except an action relating to a change of control) shall materially and adversely impair the rights of an award recipient with respect to such an outstanding award without the consent of the award recipient. The Compensation Committee is also authorized to construe the award agreements and may prescribe rules relating to the 2020 Plan.

Eligibility. Employees, directors and individual consultants of the Company or an affiliate as well as prospective employees, directors and individual consultants of the Company or an affiliate are eligible to participate in the 2020 Plan. The 2020 Plan allows for grants to employees, directors and individual consultants of the Company or an affiliate who are non-US persons. Currently, we have nine employees (including one executive director), five non-executive directors and approximately ten non-employee consultants.

Shares Subject to the 2020 Plan. The maximum aggregate number of shares of Common Stock that may be issued under the 2020 Plan shall be 4,761 shares. The 2020 Plan allows for 7,142 shares to be issued as ISOs. In addition, the 2020 Plan contains an "evergreen provision" providing for an annual increase in the number of shares of our Common Stock available for issuance under the 2020 Plan on January 1 of each year for a period of ten years, commencing on January 1, 2021 and ending on (and including) January 1, 2030, in an amount equal to the lesser of (i) ten percent of the total number of shares of Common Stock outstanding on December 31st of the preceding calendar year or (ii) such number of shares determined by the Board.

If any award expires, is cancelled, or terminates unexercised or is forfeited, the number of shares subject thereto is again available for grant under the 2020 Plan. The maximum number of shares of Common Stock that may be subject to awards to outside directors, in the aggregate, during any calendar year is 1,190.

The number of shares authorized for issuance under the 2020 Plan and each of the preceding share limitations are subject to customary adjustments for stock splits, stock dividends, recapitalization, reorganization, merger, combination, exchange or similar transactions.

Stock Options. The 2020 Plan provides for either ISOs, which are intended to meet the requirements for special federal income tax treatment under the Code, or NQSOs that do not meet the requirements of Section 422 of the Code. Stock options may be granted on such terms and conditions as the Compensation Committee may determine; *provided, however*, that the per share exercise price under a stock option may not be less than the fair market value of a share of Common Stock on the date of grant and the term of the stock option may not exceed 10 years (110% of such value and five years in the case of an ISO granted to an employee who owns (or is deemed to own) more than 10% of the total combined voting power of all classes of our capital stock or our parent or subsidiary). ISOs may only be granted to employees. In addition, the aggregate fair market value of Common Stock covered by one or more ISOs (determined at the time of grant), which are exercisable for the first time by an employee during any calendar year may not exceed $100,000. Any excess is treated as a NQSO. Stock options granted under the 2020 Plan will be exercisable at such time or times as the Compensation Committee prescribes at the time of grant and recipients will be permitted to pay the exercise price as set forth by the Compensation Committee in the applicable option agreement. No stock option may be transferred other than by will or by the laws of descent and distribution, and during a recipient's lifetime a stock option may be exercised only by the recipient. However, the Compensation Committee may permit the holder of a stock option, SAR or other award to transfer the stock option, right or other award to immediate family members or a family trust for estate planning purposes. The Compensation Committee will determine the extent to which a holder of a stock option may exercise the option following termination of service with us.

Stock Appreciation Rights. A SAR entitles the participant, upon exercise, to receive an amount, in cash or stock or a combination thereof, equal to the increase in the fair market value of the underlying Common Stock between the date of grant and the date of exercise. SARs may be granted in tandem with, or independently of, stock options granted under the 2020 Plan. A SAR granted in tandem with a stock option (i) is exercisable only at such times, and to the extent, that the related stock option is exercisable in accordance with the procedure for exercise of the related stock option; (ii) terminates upon termination or exercise of the related stock option (likewise, the Common Stock option granted in tandem with a SAR terminates upon exercise of the SAR); (iii) is transferable only with the related stock option; and (iv) if the related stock option is an ISO, may be exercised only when the value of the stock subject to the stock option exceeds the exercise price of the stock option. A SAR that is not granted in tandem with a stock option is exercisable at such times as the Compensation Committee may specify. The Compensation Committee will determine the other terms applicable to SARs. The exercise price per share of a SAR will be determined by the Compensation Committee but will not be less than 100% of the fair market value of a share of our Common Stock on the date of grant, as determined by the Compensation Committee. The maximum term of any SAR granted under the 2020 Plan is ten years from the date of grant. Generally, each SAR will entitle a participant upon exercise to an amount equal to: (i) the excess of the fair market value on the exercise date of one share of our Common Stock over the exercise price, *multiplied by* (ii) the number of shares of Common Stock covered by the SAR. Payment may be made in shares of our Common Stock, in cash, or partly in Common Stock and partly in cash, all as determined by the Compensation Committee.

Performance Shares and Performance Unit Awards. Performance share and performance unit awards entitle the participant to receive cash or shares of Common Stock upon the attainment of specified performance goals. In the case of performance units, the right to acquire the units is denominated in cash values. The Compensation Committee will determine the restrictions and conditions applicable to each award of performance shares and performance units.

Dividend Equivalent Right Awards. A dividend equivalent right award entitles the participant to receive bookkeeping credits, cash payments and/or Common Stock distributions equal in amount to the distributions that would have been made to the participant had the participant held a specified number of shares of Common Stock during the period the participant held the dividend equivalent right. A dividend equivalent right may be awarded as a component of another award under the 2020 Plan, where, if so awarded, such dividend equivalent right will expire or be forfeited by the participant under the same conditions as under such other award.

Restricted Stock Awards and Restricted Stock Unit Awards. A restricted stock award is a grant or sale of Common Stock to the participant, subject to our right to repurchase all or part of the shares at their purchase price (or to require forfeiture of such shares if issued to the participant at no cost) in the event that conditions specified by the Compensation Committee in the award are not satisfied prior to the end of the time period during which the shares subject to the award may be repurchased by or forfeited to us. Restricted stock units entitle the participant to receive a cash payment equal to the fair market value of a share of Common Stock for each restricted stock unit subject to such restricted stock unit award, if the participant satisfies the applicable vesting requirement. The Compensation Committee will determine the restrictions and conditions applicable to each award of restricted stock award or restricted stock unit award, which may include performance-based conditions.

Unrestricted Stock Awards. An unrestricted stock award is a grant or sale of shares of our Common Stock to the participant that is not subject to transfer, forfeiture or other restrictions, in consideration for past services rendered to us or an affiliate or for other valid consideration.

Other Cash-Based Awards and Other Stock-Based Awards. The Compensation Committee may award other types of cash-based or equity-based awards under the 2020 Plan, including the grant or offer for sale of shares of unrestricted shares and the right to receive one or more cash payments subject to satisfaction of such conditions as the Compensation Committee may impose.

Incentive Bonus Awards. Incentive bonus awards may be awarded to the participant based upon the attainment of specified levels of our performance as measured by pre-established, objective performance criteria determined at the discretion of the Compensation Committee.

Change-of-Control Provisions. The Compensation Committee may, at the time of the grant of an award, provide for the effect of a change of control (as defined in the 2020 Plan) on an award, including (i) accelerating or extending the time periods for exercising, vesting in, or realizing gain from any award, (ii) eliminating or modifying the performance or other conditions of an award, or (iii) providing for the cash settlement of an award for an equivalent cash value, as determined by the Compensation Committee. The Compensation Committee may, in its discretion and without the need for the consent of any recipient of an award, also take one or more of the following actions contingent upon the occurrence of a change of control: (a) cause any or all outstanding stock options and SARs to become immediately exercisable, in whole or in part; (b) cause any other awards to become non-forfeitable, in whole or in part; (c) cancel any stock option or SAR in exchange for a substitute option; (d) cancel any award of restricted stock, restricted stock units, performance shares or performance units in exchange for a similar award of the capital stock of any successor corporation; (e) redeem any restricted stock, restricted stock unit, performance share or performance unit for cash and/or other substitute consideration with a value equal to the fair market value of an unrestricted share of our Common Stock on the date of the change of control; (f) cancel any stock option or SAR in exchange for cash and/or other substitute consideration based on the value of our Common Stock on the date of the change in control, and cancel any stock option or SAR without any payment if its exercise price exceeds the value of our Common Stock on the date of the change of control; or (g) make such other modifications, adjustments or amendments to outstanding awards as the Compensation Committee deems necessary or appropriate.

Amendment and Termination. The Compensation Committee may adopt, amend and rescind rules relating to the administration of the 2020 Plan, and amend, suspend or terminate the 2020 Plan, provided, that (a) to the extent necessary and desirable to comply with any applicable law, regulation, or stock exchange rule, we shall obtain stockholder approval of any 2020 Plan amendment in such a manner and to such a degree as required, and (b) stockholder approval is required for any amendment to the 2020 Plan that (i) increases the number of shares available for issuance under the 2020 Plan, or (ii) changes the persons or class of persons eligible to receive awards.

Security Ownership of Certain Beneficial Owners and Management

The following table sets forth information regarding shares of our Common Stock beneficially owned as of March 16, 2023 by:

- each of our officers and directors;
- all officers and directors as a group; and
- each person known by us to beneficially own five percent or more of the outstanding shares of our Common Stock. Percentage of ownership is calculated based on 1,549,581 shares of Common Stock outstanding as of March 16, 2023.

Name and Address of Beneficial Owner (1)	Number of Shares (2)	Percent Ownership of Class (3)
Current Named Executive Officers and Directors		
James Sapirstein, President, Chief Executive Officer and Chairman (4)	11,717	* %
Sarah Romano, Chief Financial Officer (5)	5,595	*
Edward J. Borkowski, Director (6)	3,896	*
Charles J. Casamento, Director (7)	3,317	*
Alastair Riddell, Director (8)	3,338	*
Terry Coelho, Director (9)	3,195	*
David Hoffman, Director	3,888	*
All directors and executive officer as a group (8 persons)	34,944	2.2 %

* Less than 1%.

(1) Unless otherwise indicated, the address of such individual is c/o First Wave BioPharma, Inc., 777 Yamato Rd., Suite 502, Boca Raton, FL 33431.

(2) Beneficial ownership is determined in accordance with the rules of the SEC and generally includes voting or investment power with respect to securities. All entries exclude beneficial ownership of shares issuable pursuant to warrants, options or other derivative securities that have not vested or that are not otherwise exercisable as of the date hereof or which will not become vested or exercisable within 60 days.

(3) Percentages are rounded to nearest tenth of a percent. Percentages are based on 1,549,581 shares of Common Stock outstanding. Warrants, options or other derivative securities that are presently exercisable or exercisable within 60 days are deemed to be beneficially owned by the person holding such securities for the purpose of computing the percentage ownership of that person but are not treated as outstanding for the purpose of computing the percentage of any other person.

(4) Includes (i) 896 shares of Common Stock issuable upon exercise of vested options; (ii) 10,714 shares of Common Stock issuable upon vested Restricted Stock Units ("*RSUs*"); (iii) 77 shares of Common Stock issuable upon conversion of approximately 13.53 shares of Series B Preferred Stock, which includes accrued and unpaid dividends through March 16, 2023; and (iv) 30 shares of Common Stock issuable upon exercise of warrants. Excludes (i) 529 shares of Common Stock issuable upon exercise of unvested options and (ii) 32,238 shares of Common Stock issuable upon unvested RSUs. Pursuant to the Series B Exchange Right, Mr. Sapirstein has the right to exchange the stated value, plus accrued and unpaid dividends, of the shares of Series B Preferred Stock beneficially owned by him for shares of Series C Preferred Stock and Investor Warrants, or shares of Common Stock on a dollar-for-dollar basis.

(5) Includes (i) 238 shares of Common Stock issuable upon exercise of vested options and (ii) 5,357 shares of Common Stock issuable upon vested RSUs. Excludes (i) 476 shares of Common Stock issuable upon exercise of unvested options and (ii) 16,071 shares of Common Stock issuable upon unvested RSUs.

(6) Includes (i) 195 shares of Common Stock; (ii) 145 shares of Common Stock issuable upon the exercise of warrants; (iii) 249 shares of Common Stock issuable upon exercise of vested options; (iv) 3,027 shares of Common Stock issuable upon vested RSUs; (v) 274 shares of Common Stock issuable upon conversion of approximately 48.043 shares of Series B Preferred Stock, which includes accrued and unpaid dividends through March 16, 2023; and (vi) 6 shares of Common Stock held by Mr. Borkowski's spouse. Excludes 9,101 unvested and unissued restricted shares of Common Stock and RSUs. Pursuant to the Series B Exchange Right, Mr. Borkowski has the right to exchange the stated value, plus accrued and unpaid dividends, of the shares of Series B Preferred Stock beneficially owned by him for shares of Series C Preferred Stock and Investor Warrants, or shares of Common Stock on a dollar-for-dollar basis.

(7) Includes (i) 51 shares of Common Stock; (ii) 235 shares of Common Stock issuable upon exercise of vested options; (iii) 3,027 shares of Common Stock issuable upon vested RSUs; and (iv) 4 shares of Common Stock held by La Jolla Lenox Trust, a family trust of which the Trustee is someone other than Mr. Casamento. Mr. Casamento and members of his immediate family are the sole beneficiaries of the trust. Excludes 9,080 shares of Common Stock issuable upon unvested RSUs.

(8) Includes (i) 62 shares of Common Stock; (ii) 249 shares of Common Stock issuable upon exercise of vested options; and (iii) 3,027 shares of Common Stock issuable upon vested RSUs. Excludes (i) 9,094 unvested restricted shares of Common Stock and RSUs.

(9) Includes (i) 168 shares of Common Stock issuable upon exercise of vested options and (ii) 3,027 shares of Common Stock issuable upon vested RSUs. Excludes 9,080 shares of Common Stock issuable upon unvested RSUs.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

As part of the acquisition of FWB on September 13, 2021, Mr. Hoffman received approximately 847 shares of the Company's common stock in exchange for the securities of FWB that were owned by Mr. Hoffman at the time of the merger.

On November 21, 2021, as part of the November 2021 Settlement Agreement with the Representative, the Company paid the former stockholders of FWB $2.0 million and made periodic installments of $500,000 per month from January 2022 through April 2022. On July 29, 2023, the Company entered into a binding term sheet with the Representative pursuant to which the Company paid the former stockholders of FWB a total of $3.5 million. Mr. Hoffman, as a former stockholder of FWB received a share of the above payment amounts equal to his proportional ownership of FWB at the time of the merger.

As of May 12, 2022, Messrs. Sapirstein and Borkowski have entered into waiver agreements with the Company pursuant to which they have agreed to permanently waive the exchange right related to their Series B Preferred Stock for any offering by the Company of its securities for cash consideration occurring on or after January 1, 2022.

Policy and Procedures Governing Related Party Transactions

The Board is committed to upholding the highest legal and ethical conduct in fulfilling its responsibilities and recognizes that related party transactions can present a heightened risk of potential or actual conflicts of interest.

The SEC rules define a related party transaction to include any transaction, arrangement or relationship which: (i) we are a participant; (ii) the amount involved exceeds $120,000; and (iii) executive officer, director or director nominee, or any person who is known to be the beneficial owner of more than 5% of our Common Stock, or any person who is an immediate family member of an executive officer, director or director nominee or beneficial owner of more than 5% of our Common Stock had or will have a direct or indirect material interest.

Although we do not maintain a formal written procedure for the review and approval of transactions with such related persons, it is our policy for the disinterested members of our Board to review all related party transactions on a case-by-case basis. To receive approval, a related-party transaction must have a legitimate business purpose for us and be on terms that are fair and reasonable to us and our stockholders and as favorable to us and our stockholders as would be available from non-related entities in comparable transactions.

All related party transactions must be disclosed in our applicable filings with the SEC as required under SEC rules.

Director Independence

The Board has determined that all of its members, other than Mr. Sapirstein, our President, Chief Executive Officer and Chair of our Board and Mr. Hoffman are "independent" within the meaning of Nasdaq Listing Rule 5605(a)(2) under the rules of the Nasdaq Stock Market ("*Nasdaq*"), and the Securities and Exchange Commission ("*SEC*") rules regarding independence.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

Set forth below are fees billed or expected to be billed to us by our independent registered public accounting firm Mazars USA LLP for the years ended December 31, 2022 and 2021 for the professional services performed for us. Marcum LLP was engaged for the quarterly review of the period ended March 31, 2022.

Audit Fees

The following table presents fees for professional services billed by Mazars USA LLP for the fiscal years ended December 31, 2022 and December 31, 2021.

	For the years ended December 31,	
	2022	2021
Audit fees [1]	$ 152,700	$ 117,640
Audit-related fees [2]	154,236	114,315
Tax fees [3]	—	13,090
All other fees [4]	16,104	25,880
Total	$ 323,040	$ 270,925

(1) Professional services rendered by Mazars USA LLP for the audit of our annual financial statements and review of financial statements included in our Form 10-Q's.

(2) The aggregate fees billed for assurance and related services by Mazars USA LLP that are reasonably related to the performance of the audit or review of our financial statements and are not reported under Note 1 above, principally related to registration statement filings.

(3) The aggregate fees billed for professional services rendered by Mazars USA LLP (when also acting as auditor) for tax compliance, tax advice, and tax planning.

(4) The aggregate fees billed for products and services provided by Mazars USA LLP other than the services reported in Notes 1 through 3 above.

Audit Committee Pre-Approval Policies and Procedures

The Audit Committee has the sole authority for the appointment, compensation, and oversight of the work of our independent auditors. The Audit Committee has established a policy regarding pre-approval of all auditing services and the terms thereof and non-audit services (other than non-audit services prohibited under Section 10A(g) of the Exchange Act or the applicable rules of the SEC or the Public Company Accounting Oversight Board) to be provided to us by the independent auditor. However, the pre-approval requirement may be waived with respect to the provision of non-audit services for us if the "de minimus" provisions of Section 10A(i)(1)(B) of the Exchange Act are satisfied.

The Audit Committee has considered whether the provision of audit-related fees, tax fees, and all other fees as described above is compatible with maintaining Mazars USA LLP's independence and has determined that such services for fiscal year 2022 were compatible. All such services were approved by the Audit Committee pursuant to Rule 2-01 of Regulation S-X under the Exchange Act to the extent that rule was applicable.

The Audit Committee is responsible for reviewing and discussing the audited financial statements with management, discussing with the independent registered public accountants the matters required in Auditing Standards No. 16, receiving written disclosures from the independent registered public accountants required by the applicable requirements of the Public Company Accounting Oversight Board regarding the independent registered public accountants' communications with the Audit Committee concerning independence and discussing with the independent registered public accountants their independence, and recommending to our board of directors that the audited financial statements be included in our annual report on Form 10-K.

PART IV

ITEM 15. EXHIBITS

Exhibit No.	Description
2.1#	Agreement and Plan of Merger dated September 13, 2021, by and among the Company, Alpha Merger Sub, Inc., and Fortis Advisors LLC, as shareholder representative (incorporated by reference to Exhibit 2.1 of the Company's Current Report on Form 8-K filed with the SEC on September 13, 2021). ##
3.1*	Amended and Restated Certificate of Incorporation of the Registrant, as amended.
3.2	Amended and Restated Bylaws of the Registrant (incorporated by reference to Exhibit 3.2 of the Company's Quarterly Report on Form 10-Q filed with the SEC on August 15, 2022).
4.1	Form of Common Stock Certificate (incorporated by reference to Exhibit 4.1 of the Company's Registration Statement on Form S-1, filed with the SEC on July 29, 2016).
4.2	Form of Investor Warrant (incorporated by reference to Exhibit 4.2 of the Company's Registration Statement on Form S-1 filed with the SEC on July 13, 2016).
4.3	Form of Underwriter Warrant (incorporated by reference to Exhibit 4.3 to the Company's Registration Statement on Form S-1, filed with the SEC on July 29, 2016).
4.4	Form of Series A Warrant, dated April 11, 2017 between the Company and Lincoln Park Capital Fund, LLC (incorporated by reference to Exhibit 10.3 filed with the Company's Current Report on Form 8-K filed with the SEC on April 12, 2017).
4.5	Form of Series A Warrant, dated June 5, 2017 (incorporated by reference to Exhibit 10.3 filed with the Company's Current Report on Form 8-K filed with the SEC on June 9, 2017).
4.6	Form of Series A-1 Warrant, dated June 5, 2017 (incorporated by reference to Exhibit 10.4 filed with the Company's Current Report on Form 8-K filed with the SEC on June 9, 2017).
4.7	Form of Underwriter Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on May 4, 2018).
4.8	Form of Selling Agent Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on April 3, 2019).
4.9	Form of Selling Agent Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on May 14, 2019).
4.10	Form of Wainwright Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on July 22, 2019).
4.11	Form of Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on July 20, 2020).
4.12	Form of Warrant for Convertible Notes Offering (incorporated by reference to Exhibit 4.2 of the Company's Registration Statement on Form S-3 filed with the SEC on July 27, 2020).
4.13	Form of Pre-funded Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on January 4, 2021).
4.14	Form of Private Placement Warrant (incorporated by reference to Exhibit 4.2 of the Company's Current Report on Form 8-K filed with the SEC on January 4, 2021).
4.15	Form of Wainwright Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on January 8, 2021).
4.16	Form of Pre-Funded Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on March 10, 2021).
4.17	Form of Warrant (incorporated by reference to Exhibit 4.2 of the Company's Current Report on Form 8-K filed with the SEC on March 10, 2021).
4.18	Form of Wainwright Warrant (incorporated by reference to Exhibit 4.3 of the Company's Current Report on Form 8-K filed with the SEC on March 10, 2021).
4.19	Form of Wainwright Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on July 27, 2021).
4.20	Form of Pre-Funded Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on March 1, 2022).
4.21	Form of Series C Warrant (incorporated by reference to Exhibit 4.2 of the Company's Current Report on Form 8-K filed with the SEC on March 1, 2022).

4.22	Form of Placement Agent Warrant (incorporated by reference to Exhibit 4.3 of the Company's Current Report on Form 8-K filed with the SEC on March 1, 2022).
4.23	Form of Warrant Amendment Agreement (incorporated by reference to Exhibit 4.4 of the Company's Current Report on Form 8-K filed with the SEC on March 1, 2022).
4.24	Form of Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on July 18, 2022).
4.25	Form of Placement Agent Warrant (incorporated by reference to Exhibit 4.2 of the Company's Current Report on Form 8-K filed with the SEC on July 18, 2022).
4.26	Form of Pre-Funded Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on October 12, 2022).
4.27	Form of Warrant (incorporated by reference to Exhibit 4.2 of the Company's Current Report on Form 8-K filed with the SEC on October 12, 2022).
4.28	Form of Pre-Funded Warrant (incorporated by reference to Exhibit 4.1 of the Company's Current Report on Form 8-K filed with the SEC on November 22,2022).
4.29	Form of Warrant (incorporated by reference to Exhibit 4.2 of the Company's Current Report on Form 8-K filed with the SEC on November 22, 2022).
4.30	Form of Warrant Amendment Agreement (incorporated by reference to Exhibit 4.3 of the Company's Current Report on Form 8-K filed with the SEC on November 22, 2022).
4.31*	Description of Capital Stock.
10.1	Stock Purchase Agreement dated May 21, 2014 between the Registrant, Protea Biosciences Group, Inc. and its wholly-owned subsidiary, Protea Biosciences, Inc (incorporated by reference to Exhibit 10.1 of the Company's Registration Statement on Form S-1 filed with the SEC on July 13, 2016).
10.2†	Amended and Restated AzurRx BioPharma, Inc. 2014 Omnibus Equity Incentive Plan (incorporated by reference to Exhibit 10.3 of the Company's Registration Statement on Form S-1 filed with the SEC on July 13, 2016).
10.3	Securities Purchase Agreement dated April 11, 2017 between the Registrant and Lincoln Park Capital Fund, LLC (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on April 12, 2017).
10.4	Registration Rights Agreement dated April 11, 2017 between the Registrant and Lincoln Park Capital Fund, LLC (incorporated by reference to Exhibit 10.4 of the Company's Current Report on Form 8-K filed with the SEC on April 12, 2017).
10.5	Form of Securities Purchase Agreement dated June 5, 2017 (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on June 9, 2017).
10.6	Form of Registration Rights Agreement dated June 5, 2017 (incorporated by reference to Exhibit 10.2 of the Company's Current Report on Form 8-K filed with the SEC on April 12, 2017).
10.7	Sublicense Agreement dated August 7, 2017 by and between the Registrant and TransChem, Inc. (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on August 11, 2017).
10.8	Asset Sale and Purchase Agreement, dated December 7, 2018, by and between Protea Biosciences Group, Inc., Protea Biosciences, Inc. and AzurRx Biopharma, Inc. (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on December 13, 2018).
10.9	Registration Rights Agreement, dated February 14, 2019 (incorporated by reference to Exhibit 10.6 of the Company's Current Report on Form 8-K filed with the SEC on February 20, 2019).
10.10	Asset Purchase Agreement, by and between AzurRx BioPharma, Inc., AzurRx BioPharma SAS and Laboratoires Mayoly Spindler SAS, dated March 27, 2019 (incorporated by reference to Exhibit 10.25 of the Company's Annual Report on Form 10-K filed with the SEC on April 1, 2019).
10.11	Patent License Agreement, by and between AzurRx BioPharma, Inc. and Laboratoires Mayoly Spindler SAS, dated March 27, 2019 (incorporated by reference to Exhibit 10.26 of the Company's Annual Report on Form 10-K filed with the SEC on April 1, 2019).
10.12†	Employment Agreement by and between AzurRx BioPharma, Inc. and James Sapirstein, dated October 8, 2019 (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on October 11, 2019).
10.13	Securities Purchase Agreement, dated November 13, 2019 (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on November 14, 2019).
10.14	Registration Rights Agreement, dated November 13, 2019 (incorporated by reference to Exhibit 10.2 of the Company's Current Report on Form 8-K filed with the SEC on November 14, 2019).

10.15	Form of Note Purchase Agreement (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on December 30, 2019).
10.16	Form of Warrant (incorporated by reference to Exhibit 10.3 of the Company's Current Report on Form 8-K filed with the SEC on December 30, 2019).
10.17	Form of Registration Rights Agreement (incorporated by reference to Exhibit 10.4 of the Company's Current Report on Form 8-K filed with the SEC on December 30, 2019).
10.18†	Employment Agreement by and between AzurRx BioPharma, Inc. and Daniel Schneiderman, dated January 1, 2020 (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on January 6, 2020).
10.19	Form of Purchase Agreement, by and among the Company and the investors set forth on the signature pages thereto, including the form of Exchange Addendum (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on July 20, 2020).
10.20	Form of Registration Rights Agreement, by and among the Company and the investors set forth on the signature page thereto (incorporated by reference to Exhibit 10.2 of the Company's Current Report on Form 8-K filed with the SEC on July 20, 2020).
10.21†	First Amendment to 2014 Omnibus Equity Incentive Plan (incorporated by reference as Exhibit 10.3 of the Company's Current Report on Form 8-K filed with the SEC on July 20, 2020).
10.22†	2020 Omnibus Equity Incentive Plan (incorporated by reference to Exhibit 10.4 of the Company's Quarterly Report on Form 10-Q filed with the SEC on November 16, 2020).
10.23	Form of Purchase Agreement (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on January 4, 2021).
10.24	Form of Registration Rights Agreement (incorporated by reference to Exhibit 10.2 of the Company's Current Report on Form 8-K filed with the SEC on January 4, 2021).
10.25	First Wave Purchase Agreement (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on January 8, 2021).
10.26#	First Wave License Agreement (incorporated by reference to Exhibit 10.1 filed with the Company's Current Report on Form 8-K filed with the SEC on January 13, 2021).
10.27	Form of Purchase Agreement (incorporated by reference to Exhibit 10.1 filed with the Company's Current Report on Form 8-K filed with the SEC on March 10, 2021).
10.28	At The Market Offering Agreement, dated May 26, 2021, by and between AzurRx BioPharma, Inc. and H.C. Wainwright & Co., LLC (incorporated by reference to Exhibit 1.2 of the Company's Registration Statement on Form S-3 filed with the SEC on May 26, 2021).
10.29	Settlement Agreement, by and between the Company and Fortis Advisors LLC, dated November 15, 2021 (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on November 16, 2021).
10.30	Form of Waiver (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on February 7, 2022).
10.31†	Employment Agreement by and between First Wave BioPharma, Inc. and Sarah Romano, dated February 14, 2022 (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on February 17, 2022).
10.32	Form of Purchase Agreement (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on March 1, 2022).
10.33	Form on Indemnification Agreement (incorporated by referenced to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on May 5, 2022).
10.34	Form of Waiver Agreement (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on May 13, 2022).
10.35	Form of Purchase Agreement (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on July 18, 2022).
10.36	Form of Registration Rights Agreement (incorporated by reference to Exhibit 10.2 of the Company's Current Report on Form 8-K filed with the SEC on July 18, 2022).
10.37#	Form of Term Sheet by and between the Representative and the Company, dated July 29, 2022 (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on July 29, 2022).
10.38	Form of Purchase Agreement (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on October 12, 2022).
10.39	Form of Purchase Agreement (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on November 22, 2022).

10.40	Form of Registration Rights Agreement (incorporated by reference to Exhibit 10.2 of the Company's Current Report on Form 8-K filed with the SEC on November 22, 2022).
10.41#	Form of Settlement Agreement, by and between the Representative and the Company, dated November 30, 2022) (incorporated by reference to Exhibit 10.1 of the Company's Current Report on Form 8-K filed with the SEC on December 2, 2022).
16.1	Letter from Mazars USA LLP to the U.S. Securities and Exchange Commission, dated May 3, 2022 (incorporated by reference to Exhibit 16.1 of the Company's Current Report on Form 8-K filed with the SEC on May 3, 2022).
16.2	Letter from Marcum LLP to the U.S. Securities and Exchange Commission, dated July 7, 2022 (incorporated by reference to Exhibit 16.1 of the Company's Current Report on Form 8-K filed with the SEC on July 7, 2022).
21.1*	Subsidiaries of the Registrant.
23.1*	Consent of Mazars USA LLP.
31.1*	Certification of CEO as Required by Rule 13a-14(a) or Rule 15d-14(a).
31.2*	Certification of CFO as Required by Rule 13a-14(a) or Rule 15d-14(a).
32.1*	Certification of CEO and CFO as Required by Rule 13a-14(a) and Rule 15d-14(b) (17 CFR 240.15d-14(b)) and Section 1350 of Chapter 63 of Title 18 of the United States Code.
101.INS*	Inline XBRL Instance Document (the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document).
101.SCH*	Inline XBRL Taxonomy Extension Schema.
101.CAL*	Inline XBRL Taxonomy Extension Calculation Linkbase.
101.DEF*	Inline XBRL Taxonomy Extension Definition Linkbase.
101.LAB*	Inline XBRL Taxonomy Extension Label Linkbase.
101.PRE*	Inline XBRL Taxonomy Extension Presentation Linkbase.
104*	Cover Page Interactive Data File (formatted as inline XBRL and contained in Exhibit 101).

* Filed herewith.

Certain portions of this exhibit (indicated by "[*****]") have been omitted as we have determined (1) it is not material and (2) is the type that the Company treats as private or confidential.

Schedules and exhibits have been omitted pursuant to Item 601(b)(2) of Regulation S-K. The Company hereby undertakes to furnish supplementally copies of any of the omitted schedules upon request by the SEC.

† Indicates a management contract or compensation plan, contract or arrangement.

ITEM 16: FORM 10-K SUMMARY

None.

SIGNATURES

In accordance with Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this Report to be signed on its behalf by the undersigned, there unto duly authorized.

FIRST WAVE BIOPHARMA, INC.

March 20, 2023

By: /s/ James Sapirstein
Name: James Sapirstein
Title: President and Chief Executive Officer

By: /s/ Sarah Romano
Name: Sarah Romano
Title: Chief Financial Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, this Report has been signed by the following persons on behalf of the registrant and in the capacities held on the dates indicated.

Signature	Title	Date
/s/ James Sapirstein James Sapirstein	President, Chief Executive Officer and Chair of the Board of Directors (principal executive officer)	March 20, 2023
/s/ Sarah Romano Sarah Romano	Chief Financial Officer (principal financial officer and accounting officer)	March 20, 2023
/s/ Edward J. Borkowski Edward J. Borkowski	Director	March 20, 2023
/s/ Charles J. Casamento Charles J. Casamento	Director	March 20, 2023
/s/ Terry Coelho Terry Coelho	Director	March 20, 2023
/s/ David Hoffman David Hoffman	Director	March 20, 2023
/s/ Alastair Riddell Alastair Riddell	Director	March 20, 2023

First Wave BioPharma, Inc.

Index to Consolidated Financial Statements

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Shareholders and the Board of Directors of First Wave BioPharma, Inc.

Opinion on the Consolidated Financial Statements

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

Emphasis of a Matter

The accompanying consolidated financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 1 to the consolidated financial statements, the Company has incurred significant operating losses and negative cash flows from operations since inception. The Company also had an accumulated deficit of approximately $168.5 million at December 31, 2022. The Company is dependent on obtaining additional working capital funding from the sale of equity and/or debt securities in order to continue to execute its development plans and continue operations. These conditions raise substantial doubt about its ability to continue as a going concern. Management's plans regarding those matters also are described in Note 1. The consolidated financial statements do not include any adjustments that might result from the outcome of this uncertainty.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's consolidated financial statements based on our audits. We are a public accounting firm registered with the Public 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 consolidated financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform an audit of the Company's internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

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

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the consolidated financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Impairment Assessment

Critical Audit Matter Description

As discussed in Note 2 to the consolidated financial statements, the Company's goodwill arose as a result of the excess fair value over book value from prior business combinations. Goodwill is tested for impairment at least annually. The determination of the fair value requires management to make significant estimates and assumptions related to forecasts of future revenues and expenses and discount rates.

Considering the significant estimation, judgement, and subjectivity required by management in determining the future cash flows and current fair value of assets, our audit of the impairment assessment of goodwill required a high degree of auditor judgement and subjectivity.

How the Critical Matter Was Addressed in the Audit

Our audit procedures related to the intangible asset impairment included the following, among others:

- Evaluated and verified the events and circumstances described in management's qualitative analyses of goodwill impairment.
- Tested and assessed the reasonableness and appropriateness of assumptions used in management's analyses including sales volumes, sales prices, operating margins, discount rate, and growth rates.
- Tested and verified the mechanical and clerical accuracy of management's projections and calculations.
- Tested the completeness, accuracy, and relevance of underlying data used by management in the discounted cash flow model.

Equity Classification and Valuation

Critical Audit Matter Description

As discussed in Notes 9, 10, and 11 to the consolidated financial statements, the Company issued convertible preferred stock, options, and warrants. The classification between debt and equity of these instruments requires management to make significant and complex judgements in evaluating the characteristics of these instruments including the redemption features, voting rights, collateral requirements, covenant provisions, creditor and liquidation rights, dividends, conversion rights, and exchange rights. The valuation of these new instruments requires management to make significant estimates and complex judgements in determining the fair value of and relative fair value allocation amongst the original instruments, conversion options, and beneficial conversion features. Considering the significant judgement and estimation required by management in determining the proper classification and valuation of these equity instruments, our audit of the new equity instruments required a high degree of auditor judgement and subjectivity.

How the Critical Matter Was Addressed in the Audit

Our audit procedures related to the equity structures included the following, among others:

- We tested the Company's determination of the fair value for the equity transactions, as well as the respective relative fair value allocations for instruments that required bifurcation. Our testing included recalculating the fair value and allocations and assessing the reasonableness of certain assumptions used by the Company, as well as the completeness and accuracy of the data utilized.
- We verified management's records of new equity instruments by reading the original agreements for the equity instruments and assessing the terms relating to the technical accounting guidance.
- We evaluated management's conclusions regarding the balance sheet classification and valuation of the complex equity instruments.

- We assessed the required financial statement disclosures related to the transactions for completeness and accuracy.

/s/ Mazars USA LLP

We have served as the Company's auditor since 2015.

New York, New York

March 20, 2023

FIRST WAVE BIOPHARMA, INC.
Consolidated Balance Sheets

	December 31, 2022	December 31, 2021
ASSETS		
Current Assets:		
Cash and cash equivalents	$ 1,362,910	$ 8,248,684
Other receivables	93,014	—
Prepaid expenses	1,956,831	1,176,268
Total Current Assets	3,412,755	9,424,952
Property, equipment, and leasehold improvements, net	43,839	73,110
Other Assets:		
Restricted cash	21,513	—
Goodwill	1,684,182	1,911,705
Operating lease right-of-use assets	259,261	336,197
Deposits	18,149	44,012
Total Other Assets	1,983,105	2,291,914
Total Assets	$ 5,439,699	$ 11,789,976
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current Liabilities:		
Accounts payable	$ 720,040	$ 2,707,731
Accrued expenses	320,176	393,253
Accrued dividend payable	761,488	465,361
Note payable	603,494	641,236
Operating lease liabilities - current	66,151	77,989
Payable related to acquisition – current	—	8,000,000
Other current liabilities	12,138	14,818
Total Current Liabilities	2,483,487	12,300,388
Payable related to acquisition - non-current	—	7,000,000
Operating lease liabilities – non-current	214,060	311,138
Total Liabilities	2,697,547	19,611,526
Stockholders' Equity:		
Series B preferred stock- Par value $0.0001 per share; 5,194.81 shares authorized; 550.17 and 662.25 shares issued and outstanding at December 31, 2022 and 2021, respectively.	—	—
Series C preferred stock- Par value $0.0001 per share; 75,000 shares authorized; 0 shares issued and outstanding at December 31, 2022 and 2021.	—	—
Series D preferred stock- Par value $0.0001 per share; 150 shares designated; 0 shares issued and outstanding at December 31, 2022 and 2021.	—	—
Series E preferred stock- Par value $0.0001 per share; 150 shares designated; 0 shares issued and outstanding at December 31, 2022 and 2021.	—	—
Series F preferred stock- Par value $0.0001 per share; 7,000 shares designated; 0 shares issued and outstanding at December 31, 2022 and 2021.	—	—
Common stock - Par value $0.0001 per share; 50,000,000 shares authorized; 995,003 and 70,742 shares issued and outstanding at December 31, 2022 and 2021, respectively.	100	7
Additional paid-in capital	171,275,741	147,306,625
Accumulated deficit	(168,533,689)	(153,904,047)
Accumulated other comprehensive loss	—	(1,224,135)
Total Stockholders' Equity	2,742,152	(7,821,550)
Total Liabilities and Stockholders' Equity	$ 5,439,699	$ 11,789,976

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIRST WAVE BIOPHARMA, INC.
Consolidated Statements of Operations and Comprehensive Loss

	Years Ended December 31,	
	2022	2021
Operating expenses:		
Research and development expenses	$ 8,776,302	$ 16,994,828
Research and development (recovery) expenses - intellectual property acquired	(8,085,045)	21,325,527
General and administrative expenses	11,986,809	18,384,545
Intangible asset impairment	—	2,351,988
Total operating expenses	12,678,066	59,056,888
Loss from operations	(12,678,066)	(59,056,888)
Other (expenses) income:		
Interest expense	(15,879)	(11,235)
Interest income	8,415	1,173
Loss on dissolution of foreign entity	(1,711,371)	—
Change in fair value of liability	—	532,353
Other (expense) income	(232,741)	(3,252)
Total other (expenses) income	(1,951,576)	519,039
Net loss	$ (14,629,642)	$ (58,537,849)
Other comprehensive loss:		
Dissolution of foreign entity	1,711,371	—
Foreign currency translation adjustment	(487,236)	(111,589)
Total comprehensive loss	$ (13,405,507)	$ (58,649,438)
Net loss	$ (14,629,642)	$ (58,537,849)
Deemed dividend on preferred stock	—	(4,507,125)
Deemed dividend on preferred stock exchanges	—	(21,008,253)
Deemed dividend on warrant modifications	(47,300)	—
Preferred stock dividends	(296,127)	(465,361)
Net loss applicable to common shareholders	$ (14,973,069)	$ (84,518,588)
Basic and diluted weighted average shares outstanding	718,249	42,503
Loss per share applicable to common shareholders - basic and diluted	$ (21.00)	$ (1,988.53)

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIRST WAVE BIOPHARMA, INC.
Consolidated Statements of Changes in Stockholders' Equity

	Series E Convertible Preferred Stock		Series D Convertible Preferred Stock		Series C Convertible Preferred Stock		Series B Convertible Preferred Stock		Common Stock		Additional Paid In Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Deficit
	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount				
Balance, January 1, 2022	**—**	**$ —**	**—**	**$ —**	**—**	**$ —**	**662**	**$ —**	**70,742**	**$ 7**	**$ 147,306,625**	**$ (153,904,047)**	**$ (1,224,135)**	**$ (7,821,550)**
Issuance of Series D preferred stock and warrants, net of offering costs	—	—	150	—	—	—	—	—	—	—	178,336	—	—	178,336
Issuance of Series E preferred stock, net of offering costs	150	—	—	—	—	—	—	—	—	—	20,663	—	—	20,663
Issuance of common stock, pre-funded warrants and warrants in registered direct offering, net of issuance costs	—	—	—	—	—	—	—	—	7,857	1	7,971,930	—	—	7,971,931
Issuance of common stock, pre-funded warrants and warrants in public offering, net of issuance costs	—	—	—	—	—	—	—	—	76,913	8	5,185,558	—	—	5,185,566
Issuance of pre-funded warrants and warrants in private placement, net of issuance costs	—	—	—	—	—	—	—	—	—	—	2,199,586	—	—	2,199,586
Issuance of common stock at-the-market for cash, net of offering costs	—	—	—	—	—	—	—	—	217,036	21	7,691,200	—	—	7,691,221
Issuance of common stock from the conversion of Series D preferred stock	—	—	(150)	—	—	—	—	—	4,761	1	(1)	—	—	—
Issuance of common stock from the conversion of Series E preferred stock	(150)	—	—	—	—	—	—	—	4,761	1	(1)	—	—	—
Exercise of pre-funded warrants into common stock	—	—	—	—	—	—	—	—	603,138	60	48,359	—	—	48,419
Deemed dividend of Series B preferred stock	—	—	—	—	—	—	—	—	—	—	(296,127)	—	—	(296,127)
Warrant modification	—	—	—	—	—	—	—	—	—	—	47,300	—	—	47,300
Deemed dividend on warrant modification	—	—	—	—	—	—	—	—	—	—	(47,300)	—	—	(47,300)
Conversion of Series B preferred shares into common stock	—	—	—	—	—	—	(112)	—	2,234	—	—	—	—	—
Effect of cancelled shares from the 30-for-1 reverse stock split	—	—	—	—	—	—	—	—	(12)	—	—	—	—	—
Common stock issued to consultants	—	—	—	—	—	—	—	—	7,573	1	200,489	—	—	200,490
Stock-based compensation	—	—	—	—	—	—	—	—	—	—	769,124	—	—	769,124
Dissolution of foreign entity	—	—	—	—	—	—	—	—	—	—	—	—	1,711,371	1,711,371
Foreign currency translation adjustment	—	—	—	—	—	—	—	—	—	—	—	—	(487,236)	(487,236)
Net loss	—	—	—	—	—	—	—	—	—	—	—	(14,629,642)	—	(14,629,642)
Balance, December 31, 2022	**—**	**$ —**	**—**	**$ —**	**—**	**$ —**	**550**	**$ —**	**995,003**	**$ 100**	**$ 171,275,741**	**$ (168,533,689)**	**$ —**	**$ 2,742,152**

	Series C Convertible Preferred Stock		Series B Convertible Preferred Stock		Common Stock		Additional Paid In Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Deficit
	Shares	Amount	Shares	Amount	Shares	Amount				
Balance, January 1, 2021	**—**	**$ —**	**2,774**	**$ —**	**14,833**	**$ 1**	**$ 93,838,050**	**$ (95,366,198)**	**$ (1,112,546)**	**$ (2,640,693)**
Issuance of Series C preferred stock and warrants for cash, net of offering costs	10,667	1	—	—	—	—	7,105,167	—	—	7,105,168
Issuance of Series C preferred stock to for license acquired	3,290	1	—	—	—	—	2,467,648	—	—	2,467,649
Beneficial conversion feature of Series C preferred stock	—	—	—	—	—	—	4,507,125	—	—	4,507,125
Deemed dividend of Series C preferred stock	—	—	—	—	—	—	(4,507,125)	—	—	(4,507,125)
Issuance of Series C preferred stock upon exchange of Series B preferred stock	19,140	1	(1,839)	—	—	—	(1,430)	—	—	(1,429)
Warrants issued in connection with exchange of Series B preferred stock	—	—	—	—	—	—	21,009,683	—	—	21,009,683
Deemed dividend related to exchange of Series B preferred stock	—	—	—	—	—	—	(21,008,253)	—	—	(21,008,253)
Issuance of common stock upon exchange of Series B preferred stock			(14)	—	159	—	—	—	—	—
Common stock issued upon conversion of Series B preferred stock	—	—	(259)	—	1,229	—	—	—		—
Dividends on preferred stock	—	—	—	—	—	—	(465,361)	—	—	(465,361)
Common stock and pre-funded warrants issued upon conversion of Series C preferred stock	(33,097)	(3)	—	—	14,883	1	2	—	—	—
Issuance of common stock, pre-funded warrants and warrants for cash, net of offering costs	—	—	—	—	7,741	1	14,156,049	—	—	14,156,050
Effect of cancelled shares from the 10-for-1 reverse stock split	—	—	—	—	(5)	—	—	—	—	—
Issuance of common stock at-the-market for cash, net of offering costs	—	—	—	—	25,396	3	18,506,811	—	—	18,506,814
Common stock issued for intellectual property acquired, net	—	—	—	—	2,971	—	4,000,000			4,000,000
Common stock cancelled in connection with acquisition of First Wave Bio, Inc.	—	—	—	—	(1,585)	—	—			—
Common stock issued upon exercise of warrants and pre-funded warrants	—	—	—	—	4,503	1	4,906,629	—	—	4,906,630
Common stock and warrants issued to consultants	—	—	—	—	582	—	1,326,062	—	—	1,326,062
Issuance of common stock in connection with settlement with former investment bank	—	—	—	—	35	—	94,498	—	—	94,498
Stock-based compensation	—	—	—	—	—	—	1,371,070	—	—	1,371,070
Foreign currency translation adjustment	—	—	—	—	—	—	—	—	(111,589)	(111,589)
Net loss	—	—	—	—	—	—	—	(58,537,849)	—	(58,537,849)
Balance, December 31, 2021	**—**	**$ —**	**662**	**$ —**	**70,742**	**$ 7**	**$ 147,306,625**	**$ (153,904,047)**	**$ (1,224,135)**	**$ (7,821,550)**

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIRST WAVE BIOPHARMA, INC.
Consolidated Statements of Cash Flows

	Years Ended December 31,	
	2022	2021
Cash flows from operating activities:		
Net loss	$ (14,629,642)	$ (58,537,849)
Adjustments to reconcile net loss to net cash used in operating activities:		
Intangible asset impairment	—	2,351,988
Depreciation	29,271	14,707
Amortization	—	527,548
Change in right-of-use assets	76,936	(4,855)
Change in fair value of liability	—	(532,353)
Stock-based compensation	769,124	1,371,070
Realized foreign currency translation loss from dissolution of subsidiary	1,711,371	—
Common stock issued for intellectual property acquired, net	—	4,000,000
Common stock and warrants granted to consultants and former placement agent	200,490	1,420,561
Changes in operating assets and liabilities:		
Other receivables	(93,014)	551,489
Prepaid expenses	(177,069)	79,886
Lease liabilities	(108,916)	(257,104)
Deposits	25,863	(16,092)
Accounts payable	(1,987,691)	1,415,381
Accrued expenses	(73,077)	—
Payable related to acquisition	(8,085,045)	15,000,000
Other liabilities	(2,680)	327,405
Net cash used in operating activities	(22,344,079)	(32,288,218)
Cash flows from investing activities:		
Payment related to license agreement	—	(10,250,000)
Purchase of property and equipment	—	(69,488)
Net cash used in investing activities	—	(10,319,488)
Cash flows from financing activities:		
Proceeds from issuance of preferred stock, net	198,999	7,105,168
Proceeds from issuance of common stock, pre-funded warrants and warrants, net of offering costs	15,357,083	14,156,050
Proceeds from exercise of warrants	48,419	4,906,630
Issuance of common stock at-the-market for cash, net of offering costs	7,691,221	18,506,814
Payment related to acquisition	(6,914,955)	—
(Repayment) issuance of note payable	(641,236)	88,831
Net cash provided by financing activities	15,739,531	44,763,493
(Decrease) increase in cash and cash equivalents	(6,604,548)	2,155,787
Effect of exchange rate changes on cash	(259,713)	30,756
Cash, cash equivalents and restricted cash, beginning balance	8,248,684	6,062,141
Cash, cash equivalents and restricted cash, ending balance	$ 1,384,423	$ 8,248,684
Supplemental disclosures of cash flow information:		
Cash paid for interest	$ 15,879	$ 11,235
Non-cash investing and financing activities:		
Deemed dividend on preferred stock issuances	$ —	$ (4,507,125)
Deemed dividend on preferred stock exchanges	$ —	$ (21,008,253)
Deemed dividend on warrant modifications	$ (47,300)	$ —
Accrued dividends on preferred stock	$ (296,127)	$ (465,361)
Issuance of series C preferred stock to settle liability related to license agreement	$ —	$ 2,467,649
Common stock issued upon conversion of preferred stock	$ (2)	$ —

The accompanying notes are an integral part of these Consolidated Financial Statements.

FIRST WAVE BIOPHARMA, INC.
Notes to Consolidated Financial Statements
December 31, 2022 and 2021

Note 1 - The Company and Basis of Presentation

The Company

First Wave BioPharma, Inc. ("*First Wave*") and its wholly-owned subsidiary, First Wave Bio, Inc. ("*FWB*"), are collectively referred to as the "Company". Effective October 26, 2022, the Company's wholly-owned subsidiary, AzurRx SAS, was dissolved. The Company is engaged in the research and development of targeted, non-systemic therapies for the treatment of patients with gastrointestinal ("*GI*") diseases. Non-systemic therapies are non-absorbable drugs that act locally, i.e., in the intestinal lumen, skin or mucosa, without reaching an individual's systemic circulation.

On September 13, 2021, the Company consummated its acquisition of FWB, a clinical-stage biotechnology company developing novel gut-targeted small molecules for inflammatory bowel disease ("*IBD*") and other serious GI conditions.

The Company is currently focused on developing its pipeline of gut-restricted GI clinical drug candidates, including the biologic adrulipase (formerly MS1819), a recombinant lipase enzyme designed to enable the digestion of fats and other nutrients, and niclosamide, an oral small molecule with anti-viral and anti-inflammatory properties. The Company's adrulipase programs are focused on the development of an oral, non-systemic, biologic capsule for the treatment of exocrine pancreatic insufficiency ("*EPI*") in patients with cystic fibrosis ("*CF*") and chronic pancreatitis ("*CP*"). The Company's niclosamide programs leverage proprietary oral and topical formulations to address multiple GI conditions, including IBD indications and viral diseases.

The Company is developing its product candidates for a host of GI diseases where there are significant unmet clinical needs and limited therapeutic options, resulting in painful, life threatening and discomforting consequences for patients. Since its inception, the Company has devoted substantially all its efforts to research and development, business development, and raising capital, and has financed its operations through issuance of common stock, convertible preferred stock, convertible debt, and other debt/equity instruments.

Since its inception, the Company has devoted substantially all of its efforts to research and development, business development, and raising capital, and has financed its operations through issuance of common stock, convertible preferred stock, convertible debt and other debt/equity instruments. The Company is subject to risks and uncertainties common to early-stage companies in the biotechnology industry, including, but not limited to, development and regulatory success, development by competitors of new technological innovations, dependence on key personnel, protection of proprietary technology, compliance with government regulations, and ability to secure additional capital to fund operations.

Historically, the Company's major sources of cash have been comprised of proceeds from various public and private offerings of its capital stock. As of December 31, 2022, the Company had approximately $1.4 million in cash and cash equivalents. The Company has incurred recurring losses, has experienced recurring negative operating cash flows and requires significant cash resources to execute its business plans. The Company has an accumulated deficit of approximately $168.5 million as of December 31, 2022.

In addition, the Company is subject to other challenges and risks specific to its business and ability to execute on its strategy, as well as risks and uncertainties common to companies in the pharmaceutical industry with development and commercial operations, including, without limitation, risks and uncertainties associated with: obtaining regulatory approval of its product candidates; delays or problems in the manufacture and supply of its product candidates, loss of single source suppliers or failure to comply with manufacturing regulations; identifying, acquiring or in-licensing additional products or product candidates; pharmaceutical product development and the inherent uncertainty of clinical success; and the challenges of protecting and enhancing its intellectual property rights; complying with applicable regulatory requirements. In addition, to the extent the ongoing COVID-19 pandemic adversely affects the Company's business and results of operations, it may also have the effect of heightening many of the other risks and uncertainties discussed above.

Going Concern Uncertainty

The accompanying consolidated financial statements have been prepared as if the Company will continue as a going concern. The Company has incurred significant operating losses and negative cash flows from operations since inception. On December 31, 2022, the Company had cash and cash equivalents of approximately $1.4 million, and an accumulated deficit of approximately $168.5 million. Subsequent to December 31, 2022, the Company has raised aggregate gross proceeds of approximately $4.0 million from the March 2023 Private Placement. The Company has incurred recurring losses, has experienced recurring negative operating cash flows, and requires significant cash resources to execute its business plans. Historically, the Company's major sources of cash have been comprised of proceeds from various public and private offerings of its capital stock. The Company is dependent on obtaining additional working capital funding from the sale of equity and/or debt securities in order to continue to execute its development plans and continue operations.

Basis of Presentation and Principles of Consolidation

The accompanying consolidated financial statements have been prepared in accordance with generally accepted accounting principles in the United States of America ("*GAAP*") and include the accounts of First Wave, its wholly owned subsidiary, First Wave Bio, Inc., and its former wholly-owned subsidiary, AzurRx SAS, which was dissolved effective October 26, 2022. Intercompany transactions and balances have been eliminated upon consolidation.

On January 18, 2023, the Company effected a reverse stock split, whereby every seven shares of the Company's issued and outstanding common stock were converted automatically into one issued and outstanding share of common stock, but without any change in the number of authorized shares of common stock and the par value per share. On August 26, 2022, the Company effected a reverse stock split, whereby every thirty shares of the Company's issued and outstanding common stock were converted automatically into one issued and outstanding share of common stock, but without any change in the number of authorized shares of common stock and the par value per share. On September 13, 2021, the Company effected a reverse stock split, whereby every ten shares of the Company's issued and outstanding common stock were converted automatically into one issued and outstanding share of common stock, with a corresponding 1-for-10 reduction in the number of authorized shares of common stock, but without any change in the par value per share.

All share and per share amounts have been retroactively restated to reflect the reverse stock splits referenced above.

Without adequate working capital, the Company may not be able to meet its obligations and continue as a going concern. These conditions raise substantial doubt about the Company's ability to continue as a going concern. The financial statements do not include any adjustments that might result from the outcome of this uncertainty.

Note 2 - Significant Accounting Policies and Recent Accounting Pronouncements

Use of Estimates

The accompanying consolidated financial statements are prepared in conformity with GAAP and include certain estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements (including goodwill), and the reported amounts of revenue and expense during the reporting period, including contingencies. Accordingly, actual results may differ from those estimates.

Reverse Stock Split

On January 18, 2023, the Company effected a reverse stock split, whereby every seven shares of the Company's issued and outstanding common stock was converted automatically into one issued and outstanding share of common stock, but without any change in the number of authorized shares of common stock and the par value per share.

On August 26, 2022, the Company effected a reverse stock split, whereby every thirty shares of the Company's issued and outstanding common stock was converted automatically into one issued and outstanding share of common stock, but without any change in the number of authorized shares of common stock and the par value per share.

On September 13, 2021, the Company effected a reverse stock split, whereby every ten shares of the Company's issued and outstanding common stock was converted automatically into one issued and outstanding share of common stock, with a corresponding 1-for-10 reduction in the number of authorized shares of common stock, but without any change in the par value per share.

All share and per share amounts have been retroactively restated to reflect the reverse stock splits referenced above.

Reclassifications

Certain prior period balance sheet amounts have been reclassified to conform to the fiscal 2022 presentation.

Cash and Cash Equivalents and Restricted Cash

The Company considers all highly liquid investments with maturities of three months or less from date of purchase to be cash equivalents. All cash and cash equivalent balances were highly liquid at December 31, 2022 and 2021, respectively. As of December 31, 2022 and December 31, 2021, the Company has classified approximately $0.022 million and $0 million, respectively, as restricted cash.

Concentrations of Credit Risk

Financial instruments that potentially expose the Company to concentrations of credit risk consist of cash. The Company primarily maintains its cash balances with financial institutions in federally insured accounts in the U.S. The Company may from time to time have cash in banks in excess of FDIC insurance limits. At December 31, 2022 and 2021, the Company had approximately $0.9 million and $7.6 million, respectively, in one account in the U.S. in excess of these limits. The Company has not experienced any losses to date resulting from this practice. The Company mitigates its risk by maintaining the majority of its cash and equivalents with high quality financial institutions.

Equity-Based Payments to Non-Employees

Equity-based payments to non-employees are measured at fair value on the grant date per ASU No. 2018-07, Improvements to Nonemployee Share-Based Payment Accounting.

Fair Value Measurements

The Company follows Accounting Standards Codification ("*ASC*") Topic 820-10, Fair Value Measurements and Disclosures ("*ASC 820*"), which among other things, defines fair value, establishes a consistent framework for measuring fair value and expands disclosure for each major asset and liability category measured at fair value on either a recurring or nonrecurring basis. Fair value is an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability.

As a basis for considering such assumptions, a three-tier fair value hierarchy has been established, which prioritizes the inputs used in measuring fair value as follows:

Level 1: Observable inputs such as quoted prices (unadjusted) in active markets for identical assets or liabilities;
Level 2: Inputs, other than the quoted prices in active markets, that are observable either directly or indirectly; and
Level 3: Unobservable inputs in which there is little or no market data, which require the reporting entity to develop its own assumptions, which reflect those that a market participant would use.

In certain cases, the inputs used to measure fair value may fall into different levels of the fair value hierarchy. In such cases, an instrument's level within the fair value hierarchy is based on the lowest level of input that is significant to the overall fair value measurement. The Company's assessment of the significance of a particular input to the fair value measurement in its entirety requires judgment and considers factors specific to the financial instrument.

The Company recognizes transfers between levels as if the transfers occurred on the last day of the reporting period.

Foreign Currency Translation

For foreign subsidiaries with operations denominated in a foreign currency, assets and liabilities were translated to U.S. dollars, which is the functional currency, at period end exchange rates. Income and expense items were translated at average rates of exchange prevailing during the periods presented. Gains and losses from translation adjustments were accumulated in a separate component of stockholders' equity up until the dissolution of AzurRx SAS in October 2022, at which time cumulative translation adjustments were recognized as a loss for the year ended December 31, 2022.

Goodwill and Intangible Assets

Goodwill represents the excess of the purchase price of the acquired business over the fair value of amounts assigned to assets acquired and liabilities assumed. Goodwill and other intangible assets with indefinite useful lives are reviewed for impairment annually or more frequently if events or circumstances indicate impairment may be present. Any excess in carrying value over the estimated fair value is charged to results of operations. The Company has not recognized any impairment charges through December 31, 2022 related to goodwill.

Intangible assets subject to amortization consist of in patents, process research and development and licenses, reported at the fair value at date of the acquisition less accumulated amortization. Amortization expense is provided using the straight-line method over their estimated useful lives. The carrying amounts of finite-lived intangible assets are evaluated for recoverability whenever events or changes in circumstances indicate that the Company may be unable to recover the asset's carrying amount. Given changes in the projected usage of the patents, the Company recognized impairment charges of approximately $2.4 million at December 31, 2021.

Impairment of Long-Lived Assets

The Company periodically evaluates its long-lived assets for potential impairment in accordance with ASC Topic 360, Property, Plant and Equipment *("ASC 360")*. Potential impairment is assessed when there is evidence that events or changes in circumstances indicate that the carrying amount of an asset may not be recovered. Recoverability of these assets is assessed based on undiscounted expected future cash flows from the assets, considering a number of factors, including past operating results, budgets and economic projections, market trends and product development cycles. If impairments are identified, assets are written down to their estimated fair value. The Company has not recognized any impairment charges through December 31, 2022.

Income Taxes

Income taxes are recorded in accordance with ASC 740, Accounting for Income Taxes ("*ASC 740*"), which provides for deferred taxes using an asset and liability approach. The Company recognizes deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements or tax returns. The Company determines its deferred tax assets and liabilities based on differences between financial reporting and tax bases of assets and liabilities, which are measured using the enacted tax rates and laws that will be in effect when the differences are expected to reverse. Valuation allowances are provided if, based upon the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized.

The Company accounts for uncertain tax positions in accordance with the provisions of ASC 740. When uncertain tax positions exist, the Company recognizes the tax benefit of tax positions to the extent that the benefit will more likely than not be realized. The determination as to whether the tax benefit will more likely than not be realized is based upon the technical merits of the tax position as well as consideration of the available facts and circumstances. At December 31, 2022 and 2021, the Company does not have any significant uncertain tax positions.

Leases

Leases are recorded on the balance sheet as right of use assets and lease obligations.

Loss Per Share

Basic loss per share ("*EPS*") is computed by dividing the loss attributable to common shareholders by the weighted average number of shares of Common Stock outstanding. Diluted EPS reflects the potential dilution that could occur from shares of Common Stock issuable through the exercise or conversion of stock options, restricted stock awards, warrants and convertible securities. In certain circumstances, the conversion of options is excluded from diluted EPS if the effect of such inclusion would be anti-dilutive.

The dilutive effect of stock options is determined using the treasury stock method. Stock options to purchase shares of Common Stock of the Company during fiscal 2022 and 2021 were not included in the computation of diluted EPS because the Company has incurred a loss for the years ended December 31, 2022 and 2021 and the effect would be anti-dilutive.

Research and Development

Research and development costs are charged to operations when incurred and are included in operating expense, except for goodwill related to patents. Research and development costs consist principally of compensation of employees and consultants that perform the Company's research activities, payments to third parties for preclinical and non-clinical activities, expenses with clinical research organizations ("*CROs*"), investigative sites, consultants and contractors that conduct or provide other services relating to clinical trials, costs to acquire drug product, drug supply and clinical trial materials from contract development and manufacturing organization ("*CDMOs*") and third-party contractors relating to chemistry, manufacturing and controls ("*CMC*") efforts, the fees paid for and to maintain the Company's licenses, amortization of intangible assets related to the acquisition of adrulipase and research and development costs related to niclosamide.

Research and Development – Intellectual Property Acquired

The Company records intellectual property in asset acquisitions that have not reached technological feasibility and which have no alternative future use, as an expense at the acquisition date. On December 31, 2020, the Company entered into a license agreement (the "*FWB License Agreement*") with FWB, pursuant to which FWB granted the Company an exclusive license to certain patents and patent applications related to a proprietary formulation of niclosamide for use in the fields of ICI-AC and COVID-19 GI infections. The acquisition of intellectual property and patents for the worldwide, exclusive right to develop, manufacture, and commercialize proprietary formulations of niclosamide for the fields of treating ICI-AC and COVID-19 in humans was accounted for as an asset acquisition and initial liabilities of approximately $13.3 million in connection with the license acquisition were recorded as research and development expense, because it was determined to have no alternative future uses and therefore no separate economic value, which included cash payments totaling approximately $10.3 million and the issuance of approximately $3.0 million worth of preferred stock (see Note 12). Upon consummation of the Merger (see Note 4) on September 13, 2021, the FWB License Agreement was effectively canceled and the total purchase price of $22.0 million was recorded as an expense at the Merger date.

On July 29, 2022, the Company reached an agreement to restructure its obligations to the former FWB stockholders (the "*July 2022 Term Sheet*"). The Company agreed to pay: (i) $1.5 million in cash on July 29, 2022; (2) $1.0 million in cash no later than September 29, 2022 (the "*Second Payment*"); and (iii) $2.0 million on the earlier of November 30, 2022 or the completion of one or more qualifying equity offerings. As of December 31, 2022, the Company made payments to the former FWB stockholders of $4.5 million consisting of the upfront payment of $1.5 million, the Second Payment of $1.0 million, and the third payment of $2.0 million. In accordance with the terms of the July 2022 Term Sheet, effective upon the Second Payment, the approximately $10.1 million of remaining fixed payment obligations previously owed to the former FWB shareholders was settled, which was recorded as a decrease to expense in the year ended December 31, 2022. The $2.0 million payment owed by November 30, 2022 was recorded as an expense upon execution of the July 2022 Term Sheet (see Note 4).

Stock-Based Compensation

The Company's board of directors (the "*Board*") and stockholders have adopted and approved the Amended and Restated 2014 Omnibus Equity Incentive Plan (the "*2014 Plan*") which took effect on May 12, 2014, and the 2020 Omnibus Equity Incentive Plan, which took effect on September 11, 2020 (the "*2020 Plan*"). From the effective date of the 2020 Plan, no new awards have been or will be made under the 2014 Plan. The Company accounts for its stock-based compensation awards to employees and Board members in accordance with ASC Topic 718, Compensation-Stock Compensation ("*ASC 718*"). ASC 718 requires all stock-based payments to employees and Board members, including grants of employee stock options, to be recognized in the statements of operations by measuring the fair value of the award on the date of grant and recognizing this fair value as stock-based compensation using a straight-line method over the requisite service period, generally the vesting period.

For awards with performance conditions that affect their vesting, such as the occurrence of certain transactions or the achievement of certain operating or financial milestones, recognition of fair value of the award occurs when vesting becomes probable.

The Company estimates the grant date fair value of stock option awards using the Black-Scholes option-pricing model. The use of the Black-Scholes option-pricing model requires management to make assumptions with respect to the expected term of the option, the expected volatility of the Common Stock consistent with the expected life of the option, risk-free interest rates and expected dividend yields of the Common Stock.

Recent Accounting Pronouncements

In August 2020, the Financial Accounting Standards Board (the "*FASB*") issued accounting pronouncement ASU 2020-06 – Accounting for Convertible Instruments and Contracts in an Entity's Own Equity ("*ASU 2020-06*") related to the measurement and disclosure requirements for convertible instruments and contracts in an entity's own equity. The pronouncement simplifies and adds disclosure requirements for the accounting and measurement of convertible instruments and the settlement assessment for contracts in an entity's own equity. As a smaller reporting company, as defined by the U.S. Securities and Exchange Commission (the "*SEC*"), this pronouncement is effective for fiscal years, and for interim periods within those fiscal years, beginning after December 15, 2023. Early adoption is permitted, but no earlier than fiscal years beginning after December 15, 2020, including interim periods within those fiscal years. The Company early adopted ASU 2020-06 effective January 1, 2022.

In June 2016, the FASB issued accounting pronouncement ASU 2016-13 – Measurement of Credit Losses on Financial Statements ("*ASU 2016-13*"). The new standard requires that expected credit losses relating to financial assets measured on an amortized cost basis and available-for-sale debt securities be recorded through an allowance for credit losses. It also limits the amount of credit losses to be recognized for available-for-sale debt securities to the amount by which carrying value exceeds fair value and also requires the reversal of previously recognized credit losses if fair value increases. In November 2019, the FASB issued ASU 2019-10 – Financial Instruments – Credit Losses (Topic 326), Derivatives and Hedging (Topic 815), and Leases (Topic 842): Effective Dates, which amended the effective date for certain companies. The standard is effective for public companies eligible to be smaller reporting companies for annual and interim periods beginning after December 15, 2022. The Company adopted ASU 2016-13 effective for the year ended December 31, 2022 and its adoption did not have a material effect on its financial statements and related disclosures.

In June 2022, the FASB issued ASU 2022-03 - Fair Value Measurement, or Topic 820: Fair Value Measurement of Equity Securities Subject to Contractual Sale Restrictions ("*ASU 2022-03*"). This new standard clarifies the guidance in Topic 820 when measuring the fair value of an equity security subject to contractual restrictions that prohibit the sale of an equity security and introduces new disclosure requirements for equity securities subject to contractual sale restrictions that are measured at fair value in accordance with Topic 820. The Company has assessed the impact of the update and determined it does not have a material impact on the accompanying financial statements and disclosures.

The Company has evaluated other recently issued accounting pronouncements and has concluded that the impact of recently issued standards that are not yet effective will not have a material impact on the Company's financial position or results of operations upon adoption.

Note 3 - Fair Value Disclosures

Fair value is the price that would be received from the sale of an asset or paid to transfer a liability assuming an orderly transaction in the most advantageous market at the measurement date. GAAP establishes a hierarchical disclosure framework that prioritizes and ranks the level of observability of inputs used in measuring fair value.

The fair value of the Company's financial instruments are as follows:

	Carrying Amount	Fair Value Measured at Reporting Date Using Level 1	Level 2	Level 3	Fair Value
December 31, 2022:					
Money market funds	$ 509,890	$ 509,890	$ —	$ —	$ 509,890
Note payable	603,494	—	603,494	—	603,494
December 31, 2021:					
Money market funds	501,607	501,607	—	—	551,489
Note payable	$ 641,236	$	$ 641,236	$ —	$ 641,236

At December 31, 2022 and 2021, the Company had no other assets or liabilities that are subject to fair value methodology and estimation in accordance with U.S. GAAP.

Note 4 – Asset Acquisition

The Asset Acquisition

On September 13, 2021, the Company completed its acquisition of FWB, in accordance with the terms of an Agreement and Plan of Merger dated as of September 13, 2021 (the "*Merger Agreement*") by and among the Company, Alpha Merger Sub, Inc., a Delaware corporation and wholly-owned subsidiary of the Company ("*Merger Sub*"), and FWB. On September 13, 2021, pursuant to the Merger Agreement, Merger Sub was merged with and into FWB (the "*Merger*"), with FWB being the surviving corporation and becoming a wholly-owned subsidiary of the Company. In connection with the Merger, AzurRx changed its name to First Wave BioPharma, Inc.

At the effective time of the Merger, the former FWB stockholders received an applicable pro rata share of (i) $3.0 million in cash and (ii) 2,971 shares of the Common Stock (equivalent to cash of $4.0 million). The remaining non-contingent purchase price was payable to the former FWB stockholders on a pro rata basis upon the Company's payment of (i) $8.0 million in cash, payable within 45 days of the Merger, and (ii) $7.0 million in cash, payable by March 31, 2022 for a total purchase price of $22.0 million.

The former FWB stockholders were entitled to up to a total of $207 million of cash milestone payments contingent upon the achievement of specified development, regulatory and sales goals relating to the use of the acquired assets. All milestone payments were payable in cash, provided that 25% of the milestone payments attributable to certain IBD indications could be payable in Common Stock, at the option of the Company. In addition, the former FWB stockholders were entitled to 10% of certain specified revenue received by the Company from any third-party with a pre-existing niclosamide development program relating to COVID.

On October 29, 2021, Fortis Advisors LLC, the hired representative (in such capacity, the "*Representative*") of the former stockholders of FWB, in connection with the Merger Agreement filed a complaint against the Company in the Court of Chancery of the State of Delaware, seeking to enforce rights to payment of $8.0 million due October 28, 2021, pursuant to the Merger Agreement and the $2.0 million milestone payment for initiation of the FW-UP Part 2 trial.

On November 15, 2021, the Company reached an agreement (the "*November 2021 Settlement Agreement*") with the Representative of the former stockholders of FWB to substantially reduce the immediate payment obligations of the Company and defer certain remaining milestone and other payment obligations over time. The November 2021 Settlement Agreement called for an immediate payment of $2.0 million related to the FW-UP milestone payment. Additionally, it called for periodic installments of the up-front cash payments due of $500,000 per month payable from January 2022 through August 2022, $1.0 million per month payable from September 2022 through July 2023, and payment of 10% in excess of $10.0 million in financing transactions consummated by the Company after the effective date of the November 2021 Settlement Agreement until an aggregate of $15.0 million is paid. In addition, the Company cancelled 332,913 shares of Common Stock held by FWB immediately prior to the Merger for no additional consideration, which shares of Common Stock are authorized and unissued.

During the year ended December 31, 2022, the Company paid an aggregate of $6.9 million in cash towards the purchase price. During the year ended December 31, 2021, the Company paid an aggregate of $7.0 million (in cash and shares) towards the purchase price and $2.0 million in milestone payments.

On May 19, 2022, the Representative filed a complaint against the Company in the Court of Chancery in the State of Delaware (the "*FWB Action*") for breach of contract and anticipatory repudiation or for unjust enrichment. The FWB Action sought specific performance of the Company's obligations under the Merger Agreement and the November 2021 Settlement Agreement, including all payments then owed and to be owed to the Representative, and damages at the maximum amount permitted by law. On July 29, 2022, the Company reached an agreement with the Representative to settle the FWB Action and to restructure the Company's obligations to the former FWB stockholders (the "*July 2022 Term Sheet*"). The Company agreed to pay the Representative: (i) $1.5 million in cash on July 29, 2022; (2) $1.0 million in cash no later than September 29, 2022 (the "*Second Payment*"); and (iii) $2.0 million on the earlier of November 30, 2022 and the completion by the Company of one or more qualifying equity offerings (collectively, the "*Payments*"). The Representative is also entitled to receive future cash payments conditioned on the achievement of certain development milestones for adrulipase and to a percentage of any consideration received by the Company in the event of a license or sale of adrulipase, subject to a cap. The Representative also is entitled receive a percentage of the consideration received by the Company in the event of a license or sale of niclosamide and will retain its existing milestone payment rights with respect to niclosamide. In the event that the consideration received by the Company in connection with the sale or license of adrulipase or niclosamide consists of securities or other non-cash consideration, the Representative will have the right to elect either to receive its payment in such form of consideration or to cause the licensee or acquirer to assume the obligations described herein. In the event of a "Company Sale" (as defined in the July 2022 Term Sheet), the Representative is entitled to receive a pro rata share of the total consideration received by the Company or its stockholders up to $4.0 million (plus any unpaid Payments whether or not then due) based on a formula set forth in the July 2022 Term Sheet. In certain circumstances, the Representative has the right to treat a "Company Sale" as a sale of ardulipase or niclosamide, as applicable, and to treat the Company Sale as a sale of the related asset and to receive the consideration with respect thereto described herein.

In the July 2022 Term Sheet, the Representative agreed to stay the FWB Action for a period of 90 days and to eliminate the Company's obligation to pay a portion of any offering proceeds to the Representative. In addition, the Company's obligation to use commercially reasonable efforts to develop niclosamide will be deferred for a period of 24 months from the date of the July 2022 Term Sheet. Effective upon the Second Payment, the Representative dismissed the FWB Action with prejudice and extinguished the remaining fixed payment obligations owed to the former FWB shareholders. On November 30, 2022, the Company entered into a formal settlement agreement with the Representative on substantially the same terms as the July 2022 Term Sheet. (the "*November 2022 Settlement Agreement*").

Accounting Treatment

The Company concluded that the Merger should be accounted for as an asset acquisition under ASC 805 because substantially all the fair value of the assets being acquired are concentrated in a single asset - intellectual property, which does not constitute a business. Because the acquired intellectual property has not received regulatory approval, the $21.3 million non-contingent purchase price was immediately expensed in the Company's statements of operations as research and development – intellectual property acquired in the year ended December 31, 2021. The $0.9 million of transaction expenses paid at closing were classified in general and administrative expenses in the year ended December 31, 2021. The Common Stock issued for the asset acquisition was valued at $4.0 million, which is equal to the 2,971 common shares issued multiplied by $1,346.10 per share.

Under the July 2022 Term Sheet, the $1.5 million in cash due and paid on July 29, 2022, as well as the Second Payment due and paid in September 2022, were recorded as a reduction to current liabilities for the year ended December 31, 2022. Effective upon the Second Payment, the approximately $10.1 million of remaining fixed payment obligations previously owed to the former FWB shareholders was settled. The third payment obligation of $2.0 million due and paid by November 30, 2022 was recorded as research and development expense in the year ended December 31, 2022.

The remaining unachieved potential milestone payments and revenue share are not yet considered probable, therefore have not been accrued as of December 31, 2022. Depending on the status of development at the time a contingent payment is recognized, the Company may determine that the payment should be expensed as research and development or be capitalized as an intangible asset. This determination will be based on the facts and circumstances that exist at the time a contingent payment is recognized.

Note 5 – Property, Equipment and Leasehold Improvements

Property, equipment and leasehold improvements consisted of the following:

	December 31,	
	2022	2021
Computer equipment and software	$ 11,540	$ 11,540
Office equipment	48,278	48,278
Leasehold improvements	28,000	28,000
Total property, plant, and equipment	87,818	87,818
Less accumulated depreciation	(43,979)	(14,708)
Property, plant and equipment, net	$ 43,839	$ 73,110

Depreciation expense was approximately $29,000 for the year ended December 31, 2022 and $15,000 for the year ended December 31, 2021.

Note 6 – Intangible Assets and Goodwill

Patents

Pursuant to the Mayoly APA entered into in March 2019 (see Note 12), in which the Company purchased all remaining rights, title and interest in and to adrulipase from Mayoly, the Company recorded Patents in the amount of approximately $3.8 million as follows:

Common stock issued at signing to Mayoly	$ 1,740,959
Due to Mayoly at December 31, 2019	449,280
Due to Mayoly at December 31, 2020	393,120
Assumed Mayoly liabilities and forgiveness of Mayoly debt	1,219,386
	$ 3,802,745

Intangible assets are as follows:

	December 31,	
	2022	2021
Patents	$ —	$ 3,802,745
Less accumulated amortization	—	(1,450,757)
Intangible asset impairment	—	(2,351,988)
Patents, net	$ —	$ —

Amortization expense was approximately $528,000 for the year ended December 31, 2021.

During the year ended December 31, 2021, the Company recorded impairment charges of approximately $2.4 million related to patents that the Company determined were no longer sufficient for the commercialization of adrulipase.

Goodwill was reinstated on the Company's books in U.S. dollars due to the dissolution of AzurRx SAS in October 2022. Going forward, there will no longer be a foreign translation adjustment. Goodwill is as follows:

	Goodwill
Balance on January 1, 2021	$ 2,054,048
Foreign currency translation	(142,343)
Balance on December 31, 2021	1,911,705
Foreign currency translation	(227,523)
Balance on December 31, 2022	$ 1,684,182

Note 7 - Accrued Expenses

Accrued expenses consisted of the following:

	December 31, 2022	December 31, 2021
Professional fees	$ 309,867	$ 15,000
Clinical trials	5,340	—
Consulting	4,969	104,100
Payroll and benefits	—	274,153
Total accrued expenses	$ 320,176	$ 393,253

Note 8 – Note Payable

Directors and Officer's and Other Liability Insurances

On November 30, 2022, the Company entered into 9-month financing agreements for its directors and officer's liability insurance, as well as other corporate insurances, in the amount of approximately $677,000 that bears interest at an annual rate of 6.79%. Monthly payments, including principal and interest, of approximately $77,000 per month. The balance due under these financing agreements was approximately $603,000 at December 31, 2022.

On November 30, 2021, the Company entered into a 9-month financing agreement for its directors and officer's liability insurance in the amount of approximately $957,000 that bears interest at an annual rate of 3.99%. Monthly payments, including principal and interest, of approximately $81,000 per month. The balance due under this financing agreement was approximately $641,000 at December 31, 2021.

Note 9 – Capital Stock

Our certificate of incorporation, as amended and restated (the "*Charter*") authorized the issuance of up to 50,000,000 shares of Common Stock, par value $0.0001 per share, and 10,000,000 shares of preferred stock, par value $0.0001 per share.

On January 18, 2023, the Company effected a reverse stock split, whereby every seven shares of the Company's issued and outstanding common stock was converted automatically into one issued and outstanding share of common stock, but without any change in the number of authorized shares of common stock and the par value per share.

On August 26, 2022, the Company effected a reverse stock split, whereby every thirty shares of the Company's issued and outstanding common stock was converted automatically into one issued and outstanding share of common stock, but without any change in the number of authorized shares of common stock and the par value per share.

On September 13, 2021, the Company effected a reverse stock split, whereby every ten shares of the Company's issued and outstanding common stock was converted automatically into one issued and outstanding share of common stock, with a corresponding 1-for-10 reduction in the number of authorized shares of common stock, but without any change in the par value per share.

All share and per share amounts have been retroactively restated to reflect the reverse stock splits referenced above.

Common Stock

The Company had 995,003 and 70,742 shares of its Common Stock issued and outstanding at December 31, 2022 and 2021, respectively.

Each holder of Common Stock is entitled to one vote for each share of Common Stock held on all matters submitted to a vote of the stockholders. The Company's Charter and Amended and Restated Bylaws (the "*Bylaws*") do not provide for cumulative voting rights.

In addition, the holders of the Company's Common Stock will be entitled to receive ratably such dividends, if any, as may be declared by the Board out of legally available funds; however, the current policy of the Board is to retain earnings, if any, for operations and growth. Upon liquidation, dissolution or winding-up, the holders of the Company's Common Stock will be entitled to share ratably in all assets that are legally available for distribution.

Holders of the Company's Common Stock have no preemptive, conversion or subscription rights, and there are no redemption or sinking fund provisions applicable to the Common Stock. The rights, preferences and privileges of the holders of Common Stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of the Company's preferred stock that it may designate and issue in the future.

Preferred Stock

The Board is authorized to divide the preferred stock into any number of series, fix the designation and number of each such series, and determine or change the designation, relative rights, preferences, and limitations of any series of preferred stock. The Board of may increase or decrease the number of shares initially fixed for any series, but no decrease may reduce the number below the shares then outstanding and duly reserved for issuance.

On July 16, 2020, the Company designated approximately 5,194.81 shares as Series B Preferred Stock. As of December 31, 2022 and 2021, 550.17 and 662.25 shares of Series B Preferred Stock were issued and outstanding, respectively. Approximately 2,282.23 shares of Series B Preferred Stock remain authorized but undesignated and unissued.

On January 5, 2021, the Company designated 75,000 shares as Series C Preferred Stock. Shares of Series C Preferred Stock converted into Common Stock (or Prefunded Warrants, as applicable) or redeemed shall be canceled and shall not be reissued. As of December 31, 2022 and 2021, 0 shares of Series C Preferred Stock were issued and outstanding, with approximately 41,903 shares of Series C Preferred Stock remaining authorized but unissued.

On July 15, 2022, the Company designated 150 shares as Series D Preferred Stock and had 0 shares of Series D Preferred Stock issued and outstanding on December 31, 2022 and 2021.

On July 15, 2022, the Company designated 150 shares as Series E Preferred Stock and had 0 shares of Series E Preferred Stock issued and outstanding on December 31, 2022 and 2021.

On November 28, 2022, the Company designated 7,000 shares as Series F Preferred Stock and had 0 shares of Series F Preferred Stock issued and outstanding on December 31, 2022 and 2021.

At December 31, 2022, the Company had approximately 9,999,449.83 shares of preferred stock remaining authorized but unissued.

Series B Convertible Preferred Stock

Pursuant to the Certificate of Designation of Rights and Preferences of the Series B Preferred Stock (the "*Series B Certificate of Designation*"), the Series B Preferred Stock will rank senior to the Common Stock with respect to distributions of assets upon the liquidation, dissolution or winding up of the Company. Each share of Series B Preferred Stock has a stated value of $7,700 (the "*Series B Stated Value*"). Each holder of shares of Series B Preferred Stock, in preference and priority to the holders of all other classes or series of stock of the Company, is entitled to receive dividends, commencing from the date of issuance. Such dividends may be paid by the Company only when, as and if declared by the Board, out of assets legally available therefor, semiannually in arrears on the last day of June and December in each year, commencing December 31, 2020, at the dividend rate of 9.0% per year, which is cumulative and continues to accrue on a daily basis whether or not declared and whether or not the Company has assets legally available therefor. The Company may pay such dividends at its option either in cash or in kind in additional shares of Series B Preferred Stock (rounded down to the nearest whole share), provided the Company must pay in cash the fair value of any such fractional shares in excess of $100.00. At December 31, 2022 and 2021, aggregate dividends payable amounted to approximately $761,000 and $465,000, respectively.

Under the Certificate of Designations, each share of Series B Preferred Stock carries a liquidation preference equal to the Series B Stated Value (as adjusted thereunder) plus accrued and unpaid dividends thereon (the "*Liquidation Preference*"). If the Company voluntarily or involuntarily liquidates, dissolves or winds up its affairs, each holder of the Series B Preferred Stock will be entitled to receive out of the Company's assets available for distribution to stockholders, after satisfaction of liabilities to creditors, if any, but before any distribution of assets is made on the Common Stock or any of the Company's shares of stock ranking junior as to such a distribution to the Series B Preferred Stock, a liquidating distribution in the amount of the Stated Value of all such holder's Series B Preferred Stock plus all accrued and unpaid dividends thereon. At December 31, 2022 and 2021, the value of the liquidation preference of the Series B Preferred stocks aggregated to approximately $5.0 million and $5.6 million, respectively.

Each share of Series B Preferred Stock will be convertible at the holder's option at any time, into Common Stock at a conversion rate equal to the quotient of (i) the Series B Stated Value divided by (ii) the conversion price of $1,617.00. In addition, at any time after the six month anniversary of the Series B Closing Date, if the closing sale price per share of Common Stock exceeds 250% of the conversion price, or $4,042.50, for 20 consecutive trading days, then all of the outstanding shares of Series B Preferred Stock will automatically convert (the "*Automatic Conversion*") into such number of shares of Common Stock as is obtained by multiplying the number of shares of Series B Preferred Stock to be so converted, plus the amount of any accrued and unpaid dividends thereon, by the Series B Stated Value per share and dividing the result by the then applicable conversion price. The Series B Preferred Stock contains limitations that prevent the holder thereof from acquiring shares of Common Stock upon conversion (including pursuant to the Automatic Conversion) that would result in the number of shares beneficially owned by such holder and its affiliates exceeding 9.99% of the total number of shares of Common Stock outstanding immediately after giving effect to the conversion, which percentage may be increased or decreased at the holder's election not to exceed 19.99%.

The holders of the Series B Preferred Stock, voting as a separate class, will have customary consent rights with respect to certain corporate actions of the Company. The Company may not take the following actions without the prior consent of the holders of at least a majority of the Series B Preferred Stock then outstanding: (a) authorize, create, designate, establish, issue or sell an increased number of shares of Series B Preferred Stock or any other class or series of capital stock ranking senior to or on parity with the Series B Preferred Stock as to dividends or upon liquidation; (b) reclassify any shares of Common Stock or any other class or series of capital stock into shares having any preference or priority as to dividends or upon liquidation superior to or on parity with any such preference or priority of Series B Preferred Stock; (c) amend, alter or repeal the Certificate of Incorporation or Bylaws of the Company and the powers, preferences, privileges, relative, participating, optional and other special rights and qualifications, limitations and restrictions thereof, which would adversely affect any right, preference, privilege or voting power of the Series B Preferred Stock; (d) issue any indebtedness or debt security, other than trade accounts payable, insurance premium financings and/or letters of credit, performance bonds or other similar credit support incurred in the ordinary course of business, or amend, renew, increase, or otherwise alter in any material respect the terms of any such indebtedness existing as of the date of first issuance of shares of Series B Preferred Stock; (e) redeem, purchase, or otherwise acquire or pay or declare any dividend or other distribution on (or pay into or set aside for a sinking fund for any such purpose) any capital stock of the Company; (f) declare bankruptcy, dissolve, liquidate, or wind up the affairs of the Company; (g) effect, or enter into any agreement to effect, a Change of Control (as defined in the Certificate of Designations); or (h) materially modify or change the nature of the Company's business.

Most Favored Nations Exchange Right and Waiver Agreements

In the event the Company effects any issuance by the Company or any of its subsidiaries of Common Stock or Common Stock equivalents for cash consideration, or a combination of units thereof (a "*Subsequent Financing*"), each holder of the Series B Preferred Stock had the right, subject to certain exceptions set forth in the Series B Certificate of Designations, at its option, to exchange (in lieu of cash subscription payments) all or some of the Series B Preferred Stock then held (with a value per share of Series B Preferred Stock equal to the stated value of each share of Series B Preferred Stock, or $7,700.00, plus accrued and unpaid dividends thereon, of the Series B Preferred Stock (the "*Exchange Amount*")) for any securities or units issued in a Subsequent Financing on dollar-for-dollar basis (the "*Series B Exchange Right*").

Between February 1, 2022 and February 7, 2022, the Company entered into waiver agreements (the "*Waiver*") with certain holders of Series B Preferred Stock, pursuant to which the Company agreed to pay a cash waiver fee equal to ten percent of the stated value of the shares of Series B Preferred Stock held by such holder (other than holders who are insiders who did not receive a cash waiver fee) and such holder agreed to irrevocably waive its Series B Exchange Right with respect to any Subsequent Financing that occurred from and after the date of the Waiver until December 31, 2022.

During the year ended December 31, 2022, the Company entered into Waivers with holders of approximately $2.88 million of stated value of Series B Preferred Stock. The Company also entered into Waivers with Company insiders holding approximately $0.047 million of stated value of Series B Preferred Stock for which the Company did not pay a waiver fee. The cash waivers paid of approximately $0.233 million were recorded as other expense on the Company's condensed consolidated statements of operations for the year ended December 31, 2022.

Effective May 12, 2022, the holders of 81.3% of the outstanding shares of the Series B Preferred Stock permanently waived for themselves and all other holders of the Series B Preferred Stock the Series B Exchange Right with respect to any Subsequent Financing occurring on or after January 1, 2022 (the "*Permanent Waiver*"). Holders of Series B Preferred Stock as of the April 27, 2022 record date were entitled to notice of and to consent to the Permanent Waiver (the "*Record Holders*").

Pursuant to the terms of the Series B Certificate of Designation, the written consent of the holders of at least a majority of the Series B Preferred Stock outstanding was required to consent to the Permanent Waiver (the "*Required Consent*"). The Company requested that the Record Holders consent to the Permanent Waiver by executing and delivering a joinder to the Waiver Agreement (as defined below). The execution and delivery of the joinder to the Waiver Agreement was deemed, for purposes of Section 228 of the General Corporation Law of the State of Delaware, to be an action by written consent in lieu of a meeting to approve the Permanent Waiver. The Company's solicitation of consents to the Permanent Waiver terminated in accordance with its terms at 5:00 p.m., Eastern Time, on May 12, 2022 (the "*Expiration Date*"). The Record Holders who consented to the Permanent Waiver prior to the Expiration Date are referred to herein as the "*Consenting Holders*".

The Required Consent was obtained from the Consenting Holders and the solicitation terminated in accordance with its terms as of the Expiration Date. The Permanent Waiver was effective immediately upon the Expiration Date and was binding on all holders of the Series B Preferred Stock, including those holders that did not timely consent to the Permanent Waiver prior to the Expiration Date. The Permanent Waiver will also be applicable to any future holder of Series B Preferred Stock. A notation of the Permanent Waiver was made on the books and records of the Company's transfer agent and a legend reflecting the Permanent Waiver was placed on any physical share certificate representing shares of Series B Preferred Stock.

Pursuant to the terms of a Waiver Agreement entered into by the Company and the Consenting Holders (the "*Waiver Agreement*"), the Company permanently reduced the exercise price of the Series B Warrants originally issued on July 16, 2020 (the "*Series B Warrants*") held by the Consenting Holders to $52.50 per share or, in the case of Consenting Holders who are officers and directors of the Company, $69.174 (the "*Exercise Price Reduction*"). Only Consenting Holders are entitled to the Exercise Price Reduction. Series B Warrants to purchase an aggregate of approximately 1,196 shares of Common Stock received the Exercise Price Reduction which was effective as of the Expiration Date. As a result of the Exercise Price Reduction of the Series B Warrants described above, the Company recorded a deemed dividend of approximately $0.047 million for the year ended December 31, 2022.

As of December 31, 2022, (i) holders of approximately 1,839.76 shares of Series B Preferred Stock with an aggregate Exchange Amount of approximately $14.4 million had previously elected to exercise their Series B Exchange Rights into Series C Preferred Stock, convertible into an aggregate of 9,058 shares of Common Stock (which conversion the Company has elected to make in full), and additional Investor Warrants exercisable for up to an aggregate of 9,058 shares of Common Stock, (ii) holders of approximately 94.970 shares of Series B Preferred Stock with an aggregate Exchange Amount of approximately $841,000 had previously elected to exercise their Series B Exchange Rights into 1,482 shares of Common Stock with no warrants, and (iii) holders of approximately 30.91 shares of Series B Preferred Stock with an aggregate Exchange Amount of approximately $265,000 had previously elected to exercise their Series B Exchange Rights into 909 shares of Common Stock, and additional Series C Warrants exercisable for up to an aggregate of 909 shares of Common Stock.

Series B Exchanges into the January 2021 Offerings

During the year ended December 31, 2021, pursuant to the Series B Exchange Right, the Company issued an aggregate of 19,140.14 shares of Series C Preferred Stock and warrants to purchase an aggregate of 9,058 shares of Common Stock in connection with the exchange of approximately 1,839.76 shares of Series B Preferred Stock. The Company analyzed the exchanges pursuant to the Series B Exchange Right from preferred stock to preferred stock qualitatively and determined that the exchanges resulted in a substantive change and should be accounted for as an extinguishment. As such, for the year ended December 31, 2021, the Company recognized an aggregate deemed dividend of approximately $21.0 million as calculated by the difference in the carrying value of the Series B Preferred Stock exchanged and the fair value of the Series C Preferred Stock and January 2021 Investor Warrants issued on each exchange date.

Series C Purchase Agreement

On January 5, 2021, the Company closed on a securities purchase agreement (the "*Series C Purchase Agreement*"), pursuant to which the Company agreed to sell in a registered direct offering 5,333.33 shares of Series C Preferred Stock, initially convertible into an aggregate of 2,539 shares of Common Stock, at an initial stated value of $750.00 per share and a conversion price of $1,575.00 per share (the "*January 2021 Registered Direct Offering*").

Concurrently with the January 2021 Registered Direct Offering, in a private placement offering pursuant to the Series C Purchase Agreement (the "*January 2021 Private Placement*"), the Company agreed to sell an additional 5,333.33 shares of Series C Preferred Stock at the same price as the Series C Preferred Stock offered in the January 2021 Registered Direct Offering and convertible on the same terms and warrants (the "*January 2021 Investor Warrants*") to purchase up to an aggregate of 5,079 shares of Common Stock, with an exercise price of $1,680.00 per share and a maturity date of July 6, 2026.

The net proceeds to the Company from the offerings described above (the "*January 2021 Offerings*"), after deducting the placement agent's fees and expenses, was approximately $7.1 million.

The Company also issued warrants to the placement agent (the "*January 2021 Placement Agent Warrants*") exercisable for up to 354 shares of Common Stock, which is equal to 7.0% of the amount determined by dividing the gross proceeds of the January 2021 Offerings by the offering price per share of Common Stock, or $1,575.00. The January 2021 Placement Agent Warrants have substantially the same terms as the January 2021 Investor Warrants, except they are exercisable at $1,968.75 per share, or 125% of the effective purchase price per share of the Series C Preferred Stock issued.

The proceeds from the January 2021 Offerings were allocated to the Series C Preferred Stock and the January 2021 Investor Warrants based on their relative fair values. The total proceeds of approximately $7.1 million, net of $0.9 million offering costs, were allocated as follows: approximately $4.6 million to the Series C Preferred Stock and approximately $3.4 million to the January 2021 Investor Warrants. After allocation of the proceeds, the effective conversion price of the Series C Preferred Stock was determined to be beneficial and, as a result, the Company recorded a deemed dividend of approximately $4.5 million equal to the intrinsic value of the beneficial conversion feature and recognized on the closing date and recorded as a reduction of income available to common stockholders in computing basic and diluted loss per share. The total offering costs of approximately $0.9 million were recognized in equity.

During the year ended December 31, 2021, all outstanding shares of Series C Preferred Stock were converted to Common Stock.

Series F Preferred Stock

On November 25, 2022, the board of directors of the Company declared a dividend of 0.001 of a share of Series F Preferred Stock, par value $0.0001 per share, for each outstanding share of Company common stock, par value $0.0001 per share to stockholders of record on December 5, 2022. Each share of Series F Preferred Stock entitled the holder thereof to 1,000,000 votes per share (each 0.001 of a share of Series F Preferred Stock would entitle the holder thereof to 1,000 votes).

The outstanding shares of Series F Preferred Stock voted together with the outstanding shares of Common Stock of the Company as a single class exclusively with respect to (1) any proposal to reclassify the outstanding shares of Common Stock into a smaller number of shares of Common Stock at a ratio specified in or determined in accordance with the terms of such amendment (the "*Reverse Stock Split*") and (2) any proposal to adjourn any meeting of stockholders called for the purpose of voting on the Reverse Stock Split (the "*Adjournment Proposal*"). The Series F Preferred Stock will not be entitled to vote on any other matter, except to the extent required under the Delaware General Corporation Law. The holders of Series F Preferred Stock, as such, will not be entitled to receive dividends of any kind.

The Series F Preferred Stock will rank senior to the Common Stock as to any distribution of assets upon a liquidation, dissolution or winding up of the Company, whether voluntarily or involuntarily (a "*Dissolution*"). Upon any Dissolution, each holder of outstanding shares of Series F Preferred Stock will be entitled to be paid out of the assets of the Company available for distribution to stockholders, prior and in preference to any distribution to the holders of Common Stock, an amount in cash equal to $0.0001 per outstanding share of Series F Preferred Stock.

At The Market Agreement with H.C. Wainwright

On May 26, 2021, the Company entered into an At The Market Offering Agreement (the "*ATM Agreement*") with H.C. Wainwright & Co., LLC ("*Wainwright*"), as sales agent, pursuant to which the Company may issue and sell, from time to time, through Wainwright, shares of its Common Stock, and pursuant to which Wainwright may sell its Common Stock by any method permitted by law deemed to be an "at the market offering" as defined by Rule 415(a)(4) promulgated under the Securities Act of 1933, as amended. The Company will pay Wainwright a commission of 3.0% of the aggregate gross proceeds from each sale of Common Stock. As of May 26, 2021, the Company was authorized to offer and sell up to $50 million of its Common Stock pursuant to the ATM Agreement. During the year ended December 31, 2021, the Company issued and sold an aggregate of 25,396 shares of Common Stock under the ATM Agreement for which the Company received gross proceeds of approximately $19.2 million, less issuance costs incurred of approximately $601,000. As of May 24, 2022, the Company was authorized to offer and sell up to $8.0 million of its Common Stock pursuant to the ATM Agreement. During the year ended December 31, 2022, the Company issued and sold an aggregate of 217,036 shares of Common Stock under the ATM Agreement for which the Company received gross proceeds of approximately $8.0 million less issuance costs incurred of approximately $309,000.

November 2022 Private Placement

On November 22, 2022, the Company completed a private placement (the "*November 2022 Offering*") in which the Company issued an aggregate of (i) pre-funded warrants (the "*November 2022 Pre-Funded Warrants*") to purchase up to an aggregate of 595,239 shares (the "*November 2022 Pre-Funded Warrant Shares*") of the Company's common stock, par value $0.0001 per share (the "*Common Stock*"), and (ii) common warrants (the "*November 2022 Common Warrants*" and collectively with the Pre-Funded Warrants, the "*November 2022 Warrants*"), to purchase up to an aggregate of 1,190,477 shares of Common Stock (the "*November 2022 Common Warrant Shares*" and collectively with the Pre-Funded Warrant Shares, the "*November 2022 Warrant Shares*") at a purchase price of $4.1993 per November 2022 Pre-Funded Warrant and accompanying November 2022 Common Warrant.

The issuance of the November 2022 Pre-Funded Warrant Shares in excess of 19.99% of the shares of Common Stock outstanding prior to the Offering and the issuance of the November 2022 Common Warrant Shares was subject to stockholder approval under Nasdaq rules (the "*Stockholder Approval*"), which occurred on January 13, 2023. The November 2022 Pre-Funded Warrants have an exercise price of $0.0007 per share, are exercisable immediately upon issuance and will expire when exercised in full. The November 2022 Common Warrants have an exercise price of $5.3795 per share, are exercisable upon issuance and will expire five and one-half years from the initial exercise date (see Note 10).

As compensation to Wainwright, who was the exclusive placement agent in connection with the November 2022 Offering, the Company paid Wainwright a cash fee of 7% of the aggregate gross proceeds raised and reimbursement of certain expenses and legal fees.

The Company received net proceeds of approximately $2.2 million after deducting the Placement Agent fees and other Offering expenses. The Company intends to use the net proceeds from the November 2022 Offering for working capital purposes.

October 2022 Public Offering

On October 11, 2022, the Company completed a public offering (the "*October 2022 Offering*"), priced at the market under Nasdaq rules, in which the Company issued an aggregate of (i) 36,428 shares of common stock, par value $0.0001 per share (the "*Common Stock*"), of the Company, (ii) pre-funded warrants (the "*October 2022 Pre-Funded Warrants*") to purchase up to an aggregate of 454,770 shares of Common Stock (the "*October 2022 Pre-Funded Warrant Shares*") and (iii) common warrants (the "*October 2022 Warrants*") to purchase up to an aggregate of 491,199 shares of Common Stock. The public offering price for each share of Common Stock and accompanying October 2022 Warrant to purchase one share of Common Stock was $12.215, and the public offering price for each October 2022 Pre-Funded Warrant and accompanying October 2022 Warrant to purchase one share of Common Stock was $12.2143. The October 2022 Pre-Funded Warrants have an exercise price of $0.0007 per share, are exercisable immediately and will expire when exercised in full. The October 2022 Warrants have an exercise price of $11.34 per share, are exercisable immediately and will expire five years from the initial exercise date.

As compensation to Wainwright, who was the exclusive placement agent in connection with the October 2022 Offering, the Company paid Wainwright a cash fee of 7% of the aggregate gross proceeds raised and reimbursement of certain expenses and legal fees.

The Company received net proceeds of approximately $5.2 million after deducting the Placement Agent fees and other Offering expenses. The Company intends to use the net proceeds from the Offering for working capital purposes.

July 2022 Private Placement

On July 15, 2022, the Company completed a private placement (the "*July 2022 Offering*") in which the Company issued an aggregate of (i) 150 shares of the Company's Series D Preferred Stock, with a stated value $1,000 per share, convertible into an aggregate of 4,761 shares of the Common Stock, (ii) 150 shares of the Company's Series E Preferred Stock, with a stated value $1,000 per share, convertible into an aggregate of 4,761 shares of Common Stock, and (iii) Series D Warrants to purchase up to an aggregate of 9,522 shares of Common Stock (the "*July 2022 Warrants*"). The Series D Preferred Stock are convertible into an aggregate of 4,761 shares of Common Stock at a conversion price of $31.50 per share and the Series E Preferred Shares are convertible, following the August 26, 2022 reverse stock split, into an aggregate of 4,761 shares of Common Stock at a conversion price of $31.50 per share. The July 2022 Warrants have an exercise price of $31.50 per share and will expire five years from the initial exercise date.

The Company received net proceeds of approximately $200,000 after deducting the offering expenses payable by the Company.

As compensation to Wainwright, who was the exclusive placement agent in connection with the July 2022 Offering, the Company paid Wainwright a cash fee of 7% of the aggregate gross proceeds raised and reimbursement of certain expenses and legal fees. The Company also issued to designees of Wainwright warrants (the "*Placement Agent Warrants*") to purchase up to 571 shares of Common Stock. The Placement Agent Warrants were cancelled and terminated on October 5, 2022. None of the Placement Agent Warrants were exercised prior to cancellation and termination.

During the year ended December 31, 2022, all of the Series D Preferred Shares and the Series E Preferred Shares were converted into 9,522 shares of Common Stock.

March 2022 Registered Direct Offering

On March 2, 2022, the Company completed a registered direct offering (the "*March 2022 Offering*") priced at the market under Nasdaq rules for an aggregate of 7,857 shares of Common Stock, pre-funded warrants exercisable for an aggregate of up to 23,086 shares of Common Stock (the "*March 2022 Pre-Funded Warrants*"), and Series C Warrants (the "*March 2022 Warrants*") exercisable for an aggregate of up to 30,943 shares of Common Stock. The public offering price for each share of Common Stock and accompanying March 2022 Warrant to purchase one share of Common Stock was $290.85, and the public offering price for each March 2022 Pre-Funded Warrant and accompanying March 2022 Warrant to purchase one share of Common Stock was $288.75. The total net proceeds from the March 2022 Offering were approximately $8.0 million. The March 2022 Warrants have an exercise price of $264.60 per share and will be exercisable for five years from the issuance date. The March 2022 Pre-Funded Warrants are exercisable for one share of Common Stock at an exercise price of $2.10 per share and will expire when exercised in full. Additionally, the Company issued warrants to the placement agent (the "*March 2022 Placement Agent Warrants*") to purchase 1,856 shares of Common Stock equal to 6.0% of the aggregate number of shares of Common Stock and March 2022 Pre-Funded Warrants placed in the March 2022 Offering. The March 2022 Placement Agent Warrants have a term of five years from the date of the prospectus supplement relating to the March 2022 Offering and an exercise price of $363.30 per share.

The Company received net proceeds of approximately $8.0 million after deducting the Placement Agent fees and other Offering expenses. The Company intends to use the net proceeds from the Offering for working capital purposes.

July 2021 Offering

On July 22, 2021, the Company entered into an underwriting agreement with Wainwright (the "*July 2021 Offering*") pursuant to which the Company agreed to sell, in an upsized firm commitment offering, 4,329 shares of Common Stock to Wainwright at an offering price to the public of $1,155.00 per share, less underwriting discounts and commissions. On July 27, 2021, pursuant to the terms of the underwriting agreement, Wainwright exercised its 30-day over-allotment option in full to purchase an additional 649 shares of Common Stock at the same offering price to the public, less underwriting discounts and commissions. The offering closed on July 27, 2021.

The Company received net proceeds of approximately $5.1 million after deducting the Placement Agent fees and other Offering expenses.

The Company paid Wainwright an underwriting discount equal to 8.0% of the gross proceeds of the offering, and reimbursed Wainwright for a non-accountable expense allowance of $35,000, $125,000 in legal fees and $15,950 for clearing expenses. Additionally, as partial compensation for Wainwright's services as underwriter in the offering, the Company issued to Wainwright (or its designees) warrants to purchase 348 shares of Common Stock equal to 7.0% of the aggregate number of shares of Common Stock sold in the offering (the "*Wainwright Warrants*"). The Wainwright Warrants have a term of five years from the date of the offering and an exercise price of $1,443.75 per share (equal to 125% of the offering price per share), subject to adjustments as provided in the terms of the Wainwright Warrants. The Company concluded the freestanding Wainwright Warrants did not contain any provisions that would require liability classification and therefore should be classified in stockholder's equity.

March 2021 Registered Direct Offering

On March 10, 2021, the Company completed a registered direct offering (the "*March 2021 Offering*") priced at the market under Nasdaq rules for an aggregate of 2,761 shares of Common Stock, pre-funded warrants to purchase up to 980 shares of Common Stock (the "*March 2021 Pre-Funded Warrants*"), with an exercise price of $21.00 per share and no expiration term, and warrants (the "*March 2021 Warrants*") to purchase an aggregate of 1,871 shares of Common Stock with an exercise price of $2,541.00 per share and an expiration term of five years from the date of issuance. The price per share of this offering was $2,672.25. The Company also issued warrants to the placement agent (the "*March 2021 Placement Agent Warrants*") exercisable for up to 261 shares of Common Stock, which is equal to 7.0% of the amount determined by dividing the gross proceeds of the March 2021 Offering by the offering price per share of Common Stock, or $2,672.25. The March 2021 Placement Agent Warrants have substantially the same terms as the March 2021 Warrants, except they are exercisable at $3,340.26 per share, or 125% of the effective purchase price per share of Common Stock issued.

The Company received net proceeds of approximately $9.1 million after deducting the Placement Agent fees and other Offering expenses.

Common Stock Issuances

2022 Issuances

During the year ended December 31, 2022, the Company issued 7,857 shares of Common Stock under the March 2022 Offering for which the Company received net proceeds of approximately $8.0 million.

During the year ended December 31, 2022, the Company issued an aggregate of 23,087 shares of Common Stock upon the conversion of the March 2022 Pre-Funded Warrants issued at a par value of $2.10 (See Note 10).

During the year ended December 31, 2022, the Company issued an aggregate of 9,522 shares of Common Stock upon the conversion of Series E and Series D preferred stock.

During the year ended December 31, 2022, the Company issued and sold an aggregate of 217,036 shares of Common Stock under the ATM Agreement for which the Company received net proceeds of approximately $7.7 million.

During the year ended December 31, 2022, the Company cancelled an aggregate of 12 shares of Common Stock in connection with the 30-for-1 reverse stock split on August 26, 2022.

During the year ended December 31, 2022, the Company issued 76,913 shares of Common Stock under the October 2022 Offering for which the Company received net proceeds of approximately $5.2 million.

During the year ended December 31, 2022, the Company issued an aggregate of 414,286 shares of Common Stock upon the conversion of the October 2022 Pre-Funded Warrants issued at a par value of $0.001 (See Note 10).

During the year ended December 31, 2022, the Company issued an aggregate of 165,765 shares of Common Stock upon the conversion of the November 2022 Pre-Funded Warrants issued at a par value of $0.001 (See Note 10).

During the year ended December 31, 2022, the Company issued an aggregate of 2,234 shares of Common Stock and accompanying Exchange Warrants upon the exchange of an aggregate of 112.08 shares of Series B Preferred Stock with a stated value of approximately $863,000 plus accrued dividends of approximately $129,000.

During the year ended December 31, 2022, the Company issued an aggregate of 7,573 shares of its Common Stock to consultants with a grant date fair value of approximately $200,000 for investor relations services provided, which was recorded as stock-based compensation and included as part of general and administrative expense.

2021 Issuances

During the year ended December 31, 2021, the Company issued an aggregate of 582 shares of its Common Stock to consultants with a grant date fair value of approximately $1.3 million for investor relations services provided, which was recorded as stock-based compensation and included as part of general and administrative expense.

During the year ended December 31, 2021, the Company issued an aggregate 35 shares of its Common Stock with a grant date fair value of approximately $94,000 in connection with the settlement with the Company’s former investment bank, which was recorded as stock-based compensation and included as part of general and administrative expense.

During the year ended December 31, 2021, the Company issued an aggregate of 14,883 shares of Common Stock upon the conversion of an aggregate of 33,097.10 shares of Series C Preferred Stock with a stated value of approximately $24.7 million plus accrued dividends of approximately $198,000.

During the year ended December 31, 2021, the Company issued an aggregate of 4,503 shares of Common Stock upon the exercise of an aggregate of 4,530 investor warrants, including an aggregate of 1,900 pre-funded warrants (see Note 10).

During the year ended December 31, 2021, the Company issued an aggregate of 1,229 shares of Common Stock upon the conversion of an aggregate of 258.08 shares of Series B Preferred Stock with a stated value of approximately $2.0 million plus accrued dividends of approximately $3,000.

During the year ended December 31, 2021, the Company issued an aggregate of 159 shares of Common Stock upon the exchange of 13.80 shares of Series B Preferred Stock with a stated value of approximately $0.1 million plus accrued dividends of approximately $8,000 into shares of Common Stock.

During the year ended December 31, 2021, the Company issued an aggregate of 7,741 shares of Common Stock in connection with the March 2021 Offering and July 2021 Offering.

During the year ended December 31, 2021, the Company issued and sold an aggregate of 25,396 shares of Common Stock under the ATM Agreement for which the Company received net proceeds of approximately $18.5 million.

During the year ended December 31, 2021, the Company issued a net of 1,386 shares of Common Stock related to the acquisition of FWB.

During the year ended December 31, 2021, the Company cancelled an aggregate of 5 shares of Common Stock in connection with the 10-for-1 reverse stock split on September 13, 2021.

Note 10 – Warrants

Warrant activity for the years ending December 31, 2022 and 2021 were as follows:

	Number of Warrants		Weighted Average Exercise Price Per Share	Weighted Average Remaining Term in Years
Warrants outstanding and exercisable on January 1, 2022	**26,089**	**$**	**1,992.90**	**3.95**
Issued during the period	2,757,521		3.75	5.40
Expired during the period	(674)		1,102.85	—
Exercised during the period	(603,138)		0.08	5.36
Warrants outstanding and exercisable on December 31, 2022	**2,179,798**	**$**	**19.16**	**5.50**
Warrants outstanding and exercisable on January 1, 2021	**12,254**	**$**	**2,562.00**	**4.04**
Granted during the period	18,958		1,630.83	3.89
Expired during the period	(623)		7,056.03	—
Exercised during the period	(4,500)		1,109.29	3.85
Warrants outstanding and exercisable on December 31, 2021	**26,089**	**$**	**1,992.90**	**3.95**

The weighted average fair value of warrants granted during the years ended December 31, 2022 and 2021, was $204.52 and $1,812.30 per share, respectively. The grant date fair values were calculated using the Black-Scholes model with the following weighted average assumptions:

	December 31,	
	2022	2021
Expected life (in years)	5.04	4.38
Volatility	92.0 - 101.6 %	83.8- 90.8 %
Risk-free interest rate	1.74- 4.14 %	0.36-0.90 %
Dividend yield	— %	— %

The outstanding warrants expire from 2023 through 2028.

In connection with the November 2022 Offering, the Company entered into a warrant amendment agreement (the "*Warrant Amendment Agreement*") to which the Company agreed to amend the investor's existing warrants to purchase up to 533,858 shares of Common Stock at a weighted average exercise price of $172.79 per share (the "*November Existing Warrants*"), in consideration for the purchase of $2.5 million of securities in the November 2022 Offering (the "*Purchase Commitment*"), to (i) lower the exercise price of the November Existing Warrants to $5.3795 per share and (ii) extend the termination date of the November Existing Warrants until the five and one-half year anniversary of the Stockholder Approval (the "*Warrant Amendment*"). The Warrant Amendment was effective upon the Stockholder Approval and the satisfaction of the other terms specified in the Warrant Amendment Agreement.

In connection with the March 2022 Offering, the Company entered into a warrant amendment agreement with an investor pursuant to which the Company agreed to amend the investor's existing warrants to purchase up to 5,080 shares of Common Stock at an exercise price of $1,680.00 per share issued in January 2021 and warrants to purchase up to 1,872 shares of Common stock at an exercise price of $2,541.00 per share issued in March 2021 (the "*March Existing Warrants*"), in consideration for such investor's purchase of $9.0 million of securities in the March 2022 Offering and payment of $5.901 per share for each share of common stock issuable upon exercise of the March Existing Warrants to (i) lower the exercise price of the March Existing Warrants to $264.60 per share and (ii) extend the termination date of the March Existing Warrants to March 2, 2027.

During the year ended December 31, 2022, the Company issued March 2022 Warrants, March 2022 Pre-Funded Warrants, and March 2022 Placement Agent Warrants to purchase 55,885 shares of Common Stock in connection with the March 2022 Offering, Exchange Warrants to purchase 910 shares of Common Stock in connection with a Series B Preferred Stock exchange, July 2022 Warrants to purchase 9,524 shares of Common Stock in connection with the July 2022 Offering, October 2022 Warrants and October 2022 Pre-Funded Warrants to purchase 905,486 shares of Common Stock in connection with the October 2022 Offering, and November 2022 Warrants and November 2022 Pre-Funded Warrants to purchase 1,785,716 shares of Common Stock in connection with the November 2022 Offering (See Note 9).

During the year ended December 31, 2021, the Company issued warrants, pre-funded warrants, and placement agent warrants to purchase 6,353 and 3,109 shares of the Company's Common Stock in connection with the January 2021 Offerings and the March 2021 Offering, respectively, placement agent warrants to purchase 346 shares of the Company's Common Stock in connection with the July 2021 Offering, warrants to purchase 9,055 shares of the Company's Common Stock in connection with exchanges made pursuant to the Series B Exchange Right (See Note 9), as well as warrants to purchase 571 shares of Common Stock issued to consultants.

Note 11 – Equity Incentive Plan

The Company's Board and stockholders adopted and approved the Amended and Restated 2014 Omnibus Equity Incentive Plan (the "*2014 Plan*"), which took effect on May 12, 2014. The Company's Board and stockholders adopted and approved the 2020 Omnibus Equity Incentive Plan (the "*2020 Plan*"), which took effect on September 11, 2020. From the adoption and approval of the 2020 Plan, no new awards have been or will be made under the 2014 Plan.

The 2020 Plan allows for the issuance of securities, including stock options to employees, Board members and consultants. The initial number of shares of Common Stock available for issuance under the 2020 Plan was 4,761 shares, which will, on January 1 of each calendar year, unless the Board decides otherwise, automatically increase to equal ten percent (10)% of the total number of shares of Common Stock outstanding on December 31 of the immediately preceding calendar year, calculated on an As Converted Basis. As Converted Shares include all outstanding shares of Common Stock and all shares of Common Stock issuable upon the conversion of outstanding preferred stock, warrants and other convertible securities, but will not include any shares of Common Stock issuable upon the exercise of options and other convertible securities issued pursuant to either the 2014 Plan or the 2020 Plan. The number of shares permitted to be issued as "incentive stock options" ("*ISOs*") is 7,142 under the 2020 Plan.

As of December 31, 2022, there were an aggregate of 1,477 total shares available (but un-issuable) under the 2014 Plan, of which 695 are issued and outstanding, and 283 shares are reserved subject to issuance of restricted stock and RSUs.

As of December 31, 2022, 10,068 total shares were authorized under the 2020 Plan, of which 3,241 were issued and outstanding and 6,827 shares were available for potential issuances.

As of January 1, 2023, the number of shares of Common Stock available for issuance under the 2020 Plan automatically increased by 317,498 to 324,325 under the 2020 Plan's evergreen provision.

The following table summarizes the Company's stock option activity:

	Number of Shares	Average Exercise Price	Remaining Contract Life (Years)	Intrinsic Value
Outstanding as of January 1, 2022	1,941	$ 2,470.99	7.28	$ —
Granted	3,266	288.19	7.23	—
Canceled	(555)	2,478.29	—	—
Forfeited	(716)	904.99	—	—
Outstanding as of December 31, 2022	**3,936**	**$ 958.14**	**8.22**	**$ —**
Exercisable as of December 31, 2022	**2,153**	**$ 1,354.72**	**7.70**	**$ —**
Outstanding as of January 1, 2021	1,788	$ 2,616.60	7.94	$ —
Granted	825	1,808.10	8.32	—
Canceled	(672)	2,198.70	—	—
Outstanding as of December 31, 2021	**1,941**	**$ 2,470.99**	**7.28**	**$ —**
Exercisable as of December 31, 2021	**1,340**	**$ 2,816.10**	**6.55**	**$ —**

During the year ended December 31, 2022, stock options to purchase an aggregate of 298 shares and 257 shares of Common Stock under the 2014 Plan and 2020 Plan, respectively, were canceled. During the year ended December 31, 2021, stock options to purchase an aggregate of 632 shares and 40 shares of Common Stock under the 2014 Plan and 2020 Plan, respectively, were canceled.

The fair values were estimated on the grant dates using the Black-Scholes option-pricing model with the following weighted-average assumptions:

	December 31,	
	2022	2021
Contractual term (in years)	6.5	9-10
Volatility	90.9 %	88.7 %
Risk-free interest rate	1.12 %	1.29 %
Dividend yield	— %	— %

The expected term of the options is based on expected future employee exercise behavior. Volatility is based on the historical volatility of the Company's Common Stock if available or of several public entities that are similar to the Company. The Company bases volatility this way because it may not have sufficient historical transactions in its own shares on which to solely base expected volatility. The risk-free interest rate is based on the U.S. Treasury rates at the date of grant with maturity dates approximately equal to the expected term at the grant date. The Company has not historically declared any dividends and does not expect to in the future.

The weighted average fair value of stock options granted during the years ended December 31, 2022 and 2021 was $223.68 and $1,398.16, respectively, per share.

The total fair value of the stock options vested, subject to service-based milestone vesting conditions, during the years ended December 31, 2022 and 2021 was approximately $769,000 and $552,000, respectively.

The total fair value of the stock options vested, subject to performance-based milestone vesting conditions, during the years ended December 31, 2022 and 2021 was approximately $0 and $623,000, respectively.

The total stock-based compensation expense for employees and non-employees is included in the accompanying condensed consolidated statements of operations and as follows:

	Year Ending December 31,	
	2022	2021
Research and development	$ 106,466	$ 640,244
General and administrative	662,658	730,826
Total stock-based compensation expense	$ 769,124	$ 1,371,070

As of December 31, 2022, the Company had unrecognized stock-based compensation expense of approximately $0.8 million. Approximately $0.3 million of this unrecognized expense will be recognized over the average remaining vesting term of the stock options of 8.49 years. Approximately $0.5 million of this unrecognized expense will vest upon achieving certain clinical and/or corporate milestones.

As of December 31, 2021, the Company had unrecognized stock-based compensation expense of approximately $1.1 million. Approximately $0.9 million of this unrecognized expense will be recognized over the average remaining vesting term of the stock options of 1.85 years. Approximately $0.2 million of this unrecognized expense will vest upon achieving certain clinical and/or corporate milestones.

Restricted Stock and Restricted Stock Units

Restricted stock refers to shares of Common Stock subject to vesting based on certain service, performance, and market conditions. Restricted stock unit awards ("*RSUs*") refer to an award under the 2014 Plan, which constitutes a promise to grant shares of Common Stock at the end of a specified restriction period.

As of December 31, 2022, and 2021, the Company had an aggregate unrecognized restricted Common Stock expense of approximately $388,000, which will be recognized when vesting of certain milestones will be become probable.

Note 12 – Agreements

License Agreement with First Wave Bio, Inc.

On December 31, 2020, we entered into the FWB License Agreement, pursuant to which FWB granted us a worldwide, exclusive right to develop, manufacture, and commercialize FWB's proprietary immediate release and enema formulations of niclosamide (the "*Niclosamide Product*") for the fields of treating ICI-AC and COVID-19 in humans.

In consideration of the license and other rights granted by FWB, we agreed to pay FWB a $9.0 million upfront cash payment due within 10 days, which was paid in January 2021 and are obligated to make an additional payment of $1.25 million due on June 30, 2021. In addition, we are obligated to pay potential milestone payments to FWB totaling up to $37.0 million for each indication, based upon the achievement of specified development and regulatory milestones. Under the FWB License Agreement we were obligated to pay FWB royalties as a mid-single digit percentage of net sales of the Niclosamide Product, subject to specified reductions. We were also obligated to issue to FWB junior convertible preferred stock, initially convertible into $3.0 million worth of Common Stock based upon the volume weighted average price of the Common Stock for the five-day period immediately preceding the date of the FWB License Agreement, or $9.118 per share, convertible into an aggregate of 4,700 shares of Common Stock. This was classified as a liability in the consolidated balance sheet because of certain NASDAQ restrictions and the requirement to obtain stockholder approval.

On January 8, 2021, we entered into a securities purchase agreement with FWB (the "*FWB Purchase Agreement*") to issue the junior convertible preferred stock to the FWB License Agreement. Pursuant to the FWB Purchase Agreement, we issued to FWB 3,290.1960 shares of Series C Preferred Stock, at an initial stated value of $750.00 per share and a conversion price of $52.50 per share, which is convertible into an aggregate of 4,700 shares of Common Stock. The shares of Series C Preferred Stock automatically converted into Common Stock upon the stockholder approval on February 24, 2021. The FWB Purchase Agreement contains demand and piggyback registration rights with respect to the Common Stock issuable upon conversion.

The conversion price of the Series C Preferred Stock was determined to be beneficial and, as a result, the Company recorded a deemed dividend of approximately $230,000 equal to the intrinsic value of the beneficial conversion feature and recognized on the issuance date and recorded as a reduction of income available to common stockholders in computing basic and diluted loss per share.

Upon the 2021 Stockholder Approval on February 24, 2021, the Company recognized a change in fair value of approximately $0.5 million based on the difference in fair value of the $3.0 million liability initially recorded pursuant to the FWB License Agreement as of December 31, 2020 and the fair value of approximately $2.5 million of Series C Preferred Stock issued pursuant to the FWB Purchase Agreement to settle the liability.

Following the 2021 Stockholder Approval, the shares of Series C Preferred Stock were automatically converted into Common Stock.

Upon consummating the Merger on September 13, 2021, the FWB License Agreement was effectively canceled.

Mayoly Agreement

On March 27, 2019, the Company and Laboratories Mayoly Spinder ("*Mayoly*") entered into an Asset Purchase Agreement (the "*Mayoly APA*"), pursuant to which the Company purchased substantially all remaining rights, title and interest in and to adrulipase. Further, upon execution of the Mayoly APA, the Joint Development and License Agreement (the "*JDLA*") previously executed by AzurRx SAS and Mayoly was assumed by the Company. In addition, the Company granted to Mayoly an exclusive, royalty-bearing right to revenue received from commercialization of adrulipase within certain territories.

Note 13 – Leases

The Company leases its offices under operating leases which are subject to various rent provisions and escalation clauses.

The Company is a party to two real property operating leases for the rental of office space. The Company has office space of 3,472 square feet in Boca Raton, Florida that is used for its corporate headquarters with a term through August 31, 2026. The Company also has office space in in Brooklyn, New York on a month-to-month basis. The Company was previously a party to office space in Hayward, California with a term through May 31, 2022, which was not renewed upon its expiration.

The Company's leases expire at various dates through 2026. The escalation clauses are indeterminable and considered not material and have been excluded from minimum future annual rental payments.

Lease expense amounted to approximately $157,000 and $261,000 for the years ended December 31, 2022 and 2021, respectively.

The weighted-average remaining lease term and weighted-average discount rate under operating leases at December 31, 2022 were:

	December 31, 2022
Lease term and discount rate	
Weighted-average remaining lease term	3.7 years
Weighted-average discount rate	7.00 %

Maturities of operating lease liabilities at December 31, 2022 were as follows:

2023	$ 83,691
2024	86,202
2025	88,788
2026	60,593
Total lease payments	319,274
Less imputed interest	(39,063)
Present value of lease liabilities	$ 280,211

Note 14 - Income Taxes

The Company is subject to taxation at the federal level in both the United States and France and at the state level in the United States. At December 31, 2022 and 2021, the Company had no tax provision for either jurisdictions.

At December 31, 2022 and 2021, the Company had gross deferred tax assets of approximately $29.5 million and $31.6 million, respectively. As the Company cannot determine that it is more likely than not that the Company will realize the benefit of the deferred tax asset, a valuation allowance of approximately $29.5 million and $31.6 million has been established at December 31, 2022 and 2021, respectively. The change in the valuation allowance was approximately $2.1 million and $5.6 million in 2022 and 2021, respectively.

The significant components of the Company's net deferred tax assets and liabilities consisted of:

	December 31,	
	2022	2021
Gross deferred tax assets:		
Net operating loss carry-forwards	$ 18,916,000	$ 30,576,000
Stock compensation	733,000	112,000
Accruals	—	30,000
Change in accounts payable	—	138,000
Intangible assets	5,708,000	791,000
Capitalized research and development	2,022,000	—
Research and development credits	1,715,000	—
Unrealized loss	318,000	—
Other	102,000	—
Deferred tax assets before valuation allowance	$ 29,514,000	$ 31,647,000
Valuation allowance	(29,450,000)	(31,647,000)
Deferred tax assets net of valuation allowance	$ 64,000	$ —
Gross deferred tax liabilities:		
Right of use asset	(64,000)	—
Total deferred tax liability	$ (64,000)	$ —
Total deferred tax asset, net	$ —	$ —

Income taxes computed using the federal statutory income tax rate differs from the Company's effective tax rate primarily due to the following:

	December 31,	
	2022	2021
Income tax benefit (expense) at statutory rate	21.0 %	21.0 %
State income tax	4.9 %	4.2 %
Non-deductible expense	8.7 %	(10.3)%
Change in valuation allowance	14.6 %	(9.5)%
Prior year adjustments	(7.7)%	(4.7)%
Dissolution of foreign subsidiary	(45.9)%	— %
Other	4.4 %	(0.7)%
Total income tax benefit (expense)	0.0 %	0.0 %

As of December 31, 2022, the Company has federal and state net operating loss carryforwards of approximately $79.7 million and $62.2 million, respectively, to offset future federal and state taxable income. Of the approximately $79.7 million of federal net operating loss carryforwards, approximately $14.8 million will begin to expire starting in 2034. The remaining federal net operating loss carryforwards do not expire, but their utilization is limited to 80% of taxable income. The state net operating loss carryforwards of approximately $62.2 million will begin to expire in 2035. As of December 31, 2022, the Company also has federal research and development tax credit carryforwards of approximately $1.7 million to offset future income taxes, which expire beginning in 2040.

The Company's ability to use its NOL carryforwards may be limited if it experiences an "ownership change" as defined in Section 382 of the Internal Revenue Code of 1986, as amended. An ownership change generally occurs if certain stockholders increase their aggregate percentage ownership of a corporation's stock by more than 50 percentage points over their lowest percentage ownership at any time during the testing period, which is generally the three-year period preceding any potential ownership change. The Company has not completed a study to determine whether transactions that have occurred over the past three years may have triggered an ownership change limitation.

The Company had taken no uncertain tax positions that would require disclosure under ASC 740, Accounting for Income Taxes, at December 31, 2022 and 2021, respectively.

Note 15 - Net Loss per Common Share

Basic net loss per share is computed by dividing net loss available to Common Stockholders by the weighted average number of common shares outstanding during the period. Diluted earnings per share reflect, in periods in which they have a dilutive effect, the impact of common shares issuable upon exercise of stock options and warrants and conversion of convertible debt that are not deemed to be anti-dilutive. The dilutive effect of the outstanding stock options and warrants is computed using the treasury stock method.

At December 31, 2022, diluted net loss per share did not include the effect of 3,054 shares of Common Stock issuable upon the conversion of Series B preferred stock, 1,750,324 shares of Common Stock issuable upon the exercise of outstanding warrants, 283 shares of restricted stock not yet issued, and 3,936 shares of Common Stock issuable upon the exercise of outstanding options as their effect would be antidilutive during the periods prior to conversion. Also excluded from the diluted net loss per are the potentially dilutive effect of shares of Common Stock potentially issuable pursuant the Series B Exchange Right.

At December 31, 2021, diluted net loss per share did not include the effect of 3,436 shares of Common Stock issuable upon the conversion of Series B preferred stock, 25,605 shares of Common Stock issuable upon the exercise of outstanding warrants, 178 shares of restricted stock not yet issued, and 2,091 shares of Common Stock issuable upon the exercise of outstanding options as their effect would be antidilutive during the periods prior to conversion. Also excluded from the diluted net loss per are the potentially dilutive effect of shares of Common Stock potentially issuable pursuant the Series B Exchange Right.

Note 16 - Employee Benefit Plans

401(k) Plan

Since 2015, the Company has sponsored a multiple employer defined contribution benefit plan, which complies with Section 401(k) of the Internal Revenue Code covering substantially all employees of the Company.

All employees are eligible to participate in the plan. Employees may contribute from 1% to 100% of their compensation and the Company matches an amount equal to 100% on the first 6% of the employee contribution and may also make discretionary profit-sharing contributions.

Employer contributions under this 401(k) plan amounted to approximately $112,000 and $107,000 for the years ended December 31, 2022 and 2021, respectively.

Note 17 - Subsequent Events

March 2023 Private Placement

On March 12, 2023, the Company entered into a securities purchase agreement (the "*March 2023 Purchase Agreement*") pursuant to which it agreed to sell, in a private placement (the "*March 2023 Private Placement*") priced at market under Nasdaq rules, an aggregate of (i) 128,000 shares of Common Stock, par value $0.0001 per share, of the Company, (ii) pre-funded warrants (the "*March 2023 Pre-Funded Warrants*") to purchase up to an aggregate of 895,018 shares of Common Stock (the "*March 2023 Pre-Funded Warrant Shares*") and (iii) common warrants (the "*March 2023 Warrants*") to purchase up to an aggregate of 2,046,036 shares of Common Stock. The public offering price for each share of Common Stock, March 2023 Pre-funded Warrant, and accompanying March 2023 Warrant to purchase one share of Common Stock was $3.91. The March 2023 Pre-Funded Warrants have an exercise price of $0.0001 per share, are exercisable immediately and will expire when exercised in full. The March 2023 Warrants have an exercise price of $3.66 per share, are exercisable immediately and will expire five years from the initial exercise date.

The March 2023 Private Placement closed on March 15, 2023. The gross proceeds from the offering were approximately $4.0 million, before deducting the placement agent's fees and other offering expenses payable by the Company. The Company has agreed to file a registration statement with the SEC covering the resale of the shares of the common stock and the shares of common stock underlying the warrants in the March 2023 Private Placement no later than the earlier of (i) thirty days following the date of the agreement or (ii) five days following the date the Company files its annual report with the SEC.

Arbitration with CRO

On March 7, 2023, the Company filed a demand for arbitration with a CRO in connection with two clinical trial agreements. The Company believes it has fulfilled all payment obligations to the CRO and is not carrying any amounts as payable on its books. The amount of potential payments due, if any, are not estimate-able nor probable at this time and therefore, a liability related to this matter has not been recorded as of December 31, 2022.

Issuance of Restricted Stock Units

On January 3, 2023, the Company issued to employees ten-year restricted stock units of 97,139 shares of Common Stock, subject to service-based milestones vesting quarterly over one year under the 2020 Plan as payment for services rendered. Such issuance was exempt from registration under 4(a)(2) of the Securities Act.

On January 3, 2023, the Company issued to consultants ten-year restricted stock units of 2,570 shares of Common Stock, subject to service-based milestones vesting quarterly over one year under the 2020 Plan as payment for services rendered. Such issuance was exempt from registration under 4(a)(2) of the Securities Act.

On January 3, 2023, the Company issued to the Board of Directors ten-year restricted stock units of 60,530 shares of Common Stock, subject to service-based milestones vesting quarterly over one year under the 2020 Plan as payment for services rendered. Such issuance was exempt from registration under 4(a)(2) of the Securities Act.

Exhibit 21.1

Subsidiaries of the Registrant

First Wave Bio, Inc., a Delaware corporation

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-1 (File Nos. 333-219385, 333-235768, 333-252087, and 333-267423), Form S-8 (File No. 333-220781) and Form S-3 (File Nos. 333-231035, 333-240129, 333-252623, 333-256476, 333-262276, 333-266375, and 333-268660) of our report dated March 20, 2023, related to the consolidated financial statements of First Wave BioPharma, Inc. as of December 31, 2022 and 2021 and for the years then ended, which appears in the Annual Report on Form 10-K of First Wave BioPharma, Inc. for the year ended December 31, 2022. Our report on the consolidated financial statements of First Wave BioPharma, Inc. includes an explanatory paragraph about the existence of substantial doubt concerning its ability to continue as a going concern.

/s/ Mazars USA LLP
New York, New York
March 20, 2023

Exhibit 31.1

CERTIFICATION PURSUANT TO RULE 13A-14 OF THE SECURITIES EXCHANGE ACT OF 1934
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, James Sapirstein, Chief Executive Officer of the Company, certify that:

1. I have reviewed this Annual Report on Form 10-K of First Wave BioPharma, Inc.;

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

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

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

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

   b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

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

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

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

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

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

Date: March 20, 2023

/s/ James Sapirstein
James Sapirstein
Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION PURSUANT TO RULE 13A-14 OF THE SECURITIES EXCHANGE ACT OF 1934
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Sarah Romano, Chief Financial Officer of the Company, certify that:

1. I have reviewed this Annual Report on Form 10-K of First Wave BioPharma, Inc.;

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

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

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

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

   b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

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

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

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

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

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

Date: March 20, 2023

/s/ Sarah Romano
Sarah Romano
Chief Financial Officer
(Principal Financial and Accounting Officer)

Exhibit 32.1

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

In connection with the Annual Report of First Wave BioPharma, Inc. (the "*Company*") on Form 10-K for the fiscal year ended December 31, 2022 as filed with the Securities and Exchange Commission on the date hereof (the "*Report*"), I, James Sapirstein, Chief Executive Officer of the Company, and Sarah Romano, Chief Financial Officer of the Company, each certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

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

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

Date: March 20, 2023

/s/ *James Sapirstein*
James Sapirstein
President and Chief Executive Officer
(Principal Executive Officer)

/s/ *Sarah Romano*
Sarah Romano
Chief Financial Officer
(Principal Financial and Accounting Officer)