UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549
Form 10-K

(Mark One)

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

For the fiscal year ended December 31, 2023
OR

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

For the transition period from to
Commission file number: 001-38940

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

Delaware	**47-3878772**
(State or other jurisdiction of Incorporation or Organization)	(I.R.S. Employer Identification No.)
35 Gatehouse Drive, A2 Waltham, MA	**02451**
(Address of Principal Executive Offices)	(Zip Code)

Registrant's telephone number, including area code: **(781) 996-0955**
Securities registered pursuant to Section 12(b) of the Exchange Act:

Title of each class	Trading symbol(s)	Name of each exchange on which registered
Common Stock, par value $0.0001 per share	MORF	The Nasdaq Stock Market LLC

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 (Section 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, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

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

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

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

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

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

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

The aggregate market value (approximate) of the registrant's common equity held by non-affiliates based on the closing price of a share of the registrant's common stock for as reported on The Nasdaq Global Market on June 30, 2023 (the last business day of the registrant's most recently completed second fiscal quarter) was $2,140,323,306.

The number of shares outstanding of the registrant's Common Stock as of February 20, 2024 was 50,037,229.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive proxy statement to be filed for its 2024 Annual Meeting of Stockholders are incorporated by reference into Part III hereof. Such proxy statement will be filed with the Securities and Exchange Commission within 120 days of the end of the fiscal year covered by this Annual Report on Form 10-K.

TABLE OF CONTENTS

PART I

FORWARD LOOKING STATEMENTS.

This Annual Report on Form 10-K, or Annual Report, contains forward-looking statements within the meaning of Section 21E of the Securities Exchange Act of 1934, as amended, or the Exchange Act, and section 27A of the Securities Act of 1933, as amended, or the Securities Act. All statements contained in this Annual Report other than statements of historical fact, including statements regarding our future results of operations and financial position, business strategy, market size, potential growth opportunities, nonclinical and clinical development activities, efficacy and safety profile of our product candidates, our ability to maintain and recognize the benefits of certain designations received by product candidates, the timing and results of nonclinical studies and clinical trials, collaboration with third parties, and the receipt and timing of potential regulatory designations, approvals and commercialization of product candidates, are forward-looking statements. The words "believe," "may," "will," "potentially," "estimate," "continue," "anticipate," "intend," "could," "would," "project," "plan," "expect" and similar expressions that convey uncertainty of future events or outcomes are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words.

We have based these forward-looking statements largely on our current expectations and projections about future events and trends that we believe may affect our financial condition, results of operations, business strategy, short-term and long-term business operations and objectives and financial needs. These forward-looking statements are subject to many risks, uncertainties, and assumptions, including those described in "Risk Factors" and elsewhere in this Annual Report. Moreover, we operate in a competitive and rapidly changing environment, and new risks emerge from time to time. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. These risks, uncertainties, and unrealized assumptions may mean the forward-looking events and circumstances discussed in or suggested by this Annual Report may not occur and actual results could differ materially and adversely from those forward-looking statements.

You should not rely upon forward-looking statements as predictions of future events. Although we believe that the forward-looking statements were reasonable when made, we cannot guarantee that the future results, levels of activity, performance or events, assumptions and circumstances reflected in the forward-looking statements will be achieved or occur. We undertake no obligation to update publicly any forward-looking statements for any reason after the date of this Annual Report to conform these statements to actual results or to changes in our expectations, except as required by law. You should read this Annual Report with the understanding that our actual future results, levels of activity, performance and events and circumstances may be materially different from our forward-looking statements.

Except where the context otherwise requires, as used in this Annual Report, the terms "we," "us," "our" and the "Company" refer to Morphic Holding, Inc., a Delaware corporation, and its subsidiaries taken as a whole, unless otherwise noted. "Morphic," "Morphic Therapeutic," the Morphic logo, and all product names are our common law trademarks. This Annual Report contains additional trade names, trademarks and service marks of other companies, which are the property of their respective owners. We do not intend our use or display of other companies' trade names, trademarks or service marks to imply a relationship with, or endorsement or sponsorship of us by, these other companies.

ITEM 1. BUSINESS.

Overview

We are a biopharmaceutical company applying our proprietary insights into integrins to discover and develop a pipeline of potentially first-in-class oral small molecule integrin therapeutics. Integrins are a target class with multiple approved injectable blockbuster drugs for the treatment of serious chronic diseases, including autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer. To date, no oral small molecule integrin therapies have been approved by the U.S. Food and Drug Administration, or FDA. Despite this, we believe our unique platform can unlock the potential to reliably generate high-quality oral molecules against specific integrin targets. The Morphic integrin technology platform, or MInT Platform, was created leveraging our unique understanding of integrin structure and function to develop novel product candidates designed to achieve the potency, high selectivity, and pharmaceutical properties required for oral administration.

We are advancing our pipeline, including our lead product candidate, MORF-057, an orally administered α4β7-specific integrin inhibitor affecting inflammation, into clinical development for the treatment of inflammatory bowel disease, or IBD, an indication for which there is significant unmet need. Only about one in five patients achieve clinical remission with approved advanced therapies, and approximately half of those patients lose response over time. As such, even newer biologic and oral agents may not adequately control tissue inflammation or symptoms for many of the sicker patients, and some will therefore develop complications that require surgical removal of the colon and rectum. In addition, many patients with moderate-severe IBD do not receive adequate treatment for their disease due to the inconvenience and fear of injectable biologics, or the safety profile of systemically immunosuppressive therapies. We believe that MORF-057 has the potential to address these unmet needs in the IBD treatment landscape as an orally administered agent with gastrointestinal, or GI, targeted immunosuppression that may be able to avoid some of the concerns associated with other approved drug classes. Furthermore, as the IBD treatment landscape evolves from monotherapy to combination therapy in order to increase therapeutic response rates in certain patient populations, we believe that MORF-057's profile is promising as a foundational backbone for next generation therapeutic regimens. We submitted an investigational new drug application, or IND, for MORF-057 in IBD in July 2020, and the FDA permitted the study submitted under the IND to proceed in August 2020. In September 2020, we initiated a Phase 1 clinical trial of MORF-057 in healthy volunteers to establish our clinical program and select doses for our Phase 2 program in IBD with an initial focus on ulcerative colitis, or UC.

The MORF-057 Phase 1 study included single ascending dose, or SAD, multiple ascending dose, or MAD, and food effect, or FE, cohorts evaluating MORF-057 safety, pharmacokinetics, or PK, and pharmacodynamics, or PD. Healthy subjects were randomized 3:1 to receive a single dose of MORF-057 at 25, 50, 100, 150 and 400 mg or matching placebo in the SAD cohorts; or twice daily, or BID, doses of 25, 50 and 100 mg MORF-057 or matching placebo for a total of 14 days in the MAD cohorts. A total of 67 eligible healthy subjects were enrolled into the studies, with 36 in the SAD, nine in the FE and 22 in the MAD cohorts. 66 subjects completed study treatment and one from the 50 mg BID MAD cohort withdrew consent for personal reasons.

MORF-057 was well tolerated in all cohorts and no safety signals were identified. MORF-057 demonstrated a favorable PK profile, where target engagement was confirmed, and a clear PK and PD relationship was established. MORF-057 was rapidly absorbed and systemic exposure was confirmed to increase approximately dose proportionally. A slight reduction in exposure without effect on trough concentrations was observed upon administration with a high fat meal in the FE study. The results suggest food intake has no significant effect on trough MORF-057 levels and that MORF-057 can be administered without regard to food in planned studies in patients.

The α4β7 receptor occupancy, or RO, increased with dose and study day, achieving saturation (>99% RO) in individual patients from all cohorts above 25 mg by day 14. In the 100 mg BID cohort, MORF-057 saturated the α4β7 receptor (mean RO >99%). Dose-and time-dependent changes in biomarkers including specific α4β7 high expressing immune cell populations were observed, adding to evidence of proof of biology for MORF-057. These changes were consistent with those reported with other integrin inhibitors including the antibody drug vedolizumab which is approved for the treatment of IBD.

In an additional MORF-057 Phase 1 study, subjects were dosed up to 200 mg BID and those receiving MORF-057 at 100 BID or 200 mg BID demonstrated α4β7 receptor saturation and statistically significant increases in circulating central memory, effector memory T lymphocyte and switched memory B lymphocyte populations compared with placebo. At the 25 mg and 50 mg BID exploratory doses, directionally increasing trends were also observed in key PD measures. All doses were well tolerated, no safety signals were identified, and a favorable PK profile was observed. In both single doses of 200 mg MORF-057 and 200 mg BID over the 14 days, MORF-057 demonstrated α4β7 receptor saturation at C_{trough}. Statistically significant changes in lymphocyte subset populations and CCR9 mRNA were observed, consistent with previous studies.

Based on the results from the Phase 1 studies, we initiated a Phase 2 clinical program of MORF-057 in March 2022. EMERALD-1, which is an open-label, single-arm multi-center Phase 2a trial designed to evaluate the efficacy, safety and tolerability of MORF-057 in adults with moderate to severe UC, completed targeted enrollment in October 2022, with 30 patients enrolled in the study. Additionally, patients that were undergoing screening at the time the study completed targeted enrollment were enrolled in the study for a total of 35 patients enrolled in the main cohort. We elected to stop enrollment of an exploratory cohort at four patients who have previously failed treatment with vedolizumab. Patients enrolled in the EMERALD-1 study are being treated with 100 mg BID at sites in the United States and Poland. The primary endpoint of the trial was the change in Robarts Histopathology Index, or RHI, a validated instrument that measures histological disease activity in UC at 12 weeks compared to baseline. Patients will then continue for an additional 40 weeks of maintenance therapy followed by a 52-week assessment. Additional outcome measures in the EMERALD-1 study include change in the modified Mayo Clinic Score, or mMCS, safety, PK parameters and key PD measures. In April 2023, we announced topline results from the main cohort of the EMERALD-1 Phase 2a clinical trial of MORF-057, which met the primary endpoint and demonstrated a statistically significant reduction of 6.4 points (p=0.002) from baseline at week 12 in the RHI score. In the study, 25.7% of patients achieved clinical remission by mMCS. MORF-057 was generally well tolerated at the dose of 100 mg BID with no serious adverse events, or SAEs, and no safety signal observed. Additionally, MORF-057 achieved saturation of α4β7 receptor and demonstrated changes in α4β7 lymphocyte subsets that are consistent with Phase 1 MORF-057 data. In August 2023, we announced the acceptance of a moderated poster presentation describing the EMERALD-1 study at UEG Week 2023 in October in Copenhagen. We presented the moderated poster presentation for the EMERALD-1 trial at UEG Week 2023, including 12 weeks of safety, PK parameters and key PD measures compared to baseline. On October 12, 2023, we presented additional data from the EMERALD-1 trial including 44 weeks of safety, PK parameters and key PD measures compared to baseline.

EMERALD-2, which is a global Phase 2b randomized controlled trial of MORF-057 began dosing patients in November 2022. Patients enrolled in the EMERALD-2 study are randomized to receive one of three active doses or a placebo: 100 mg BID, 200 mg BID, QD (once daily), or a placebo that will crosses over to MORF-057 after the 12-week induction phase. The primary endpoint of the trial is the clinical remission rate as measured by the mMCS at 12 weeks. The secondary endpoints include the change in RHI, PK and PD measures, as well as safety parameters. Following the 12-week induction phase, patients will move to a 40-week maintenance phase. We believe that we will achieve complete analysis of the data for the primary endpoint from the EMERALD-2 Phase 2b trial of MORF-057 in patients with moderate to severe UC in the first half of 2025.

Launch activities are underway for GARNET, which is a global Phase 2b randomized controlled trial of MORF-057 in Crohn's disease, and we expect the first patients to be dosed in the first half of 2024. Patients enrolled in the GARNET study will be randomized to receive one of two active doses or a placebo: 200 mg BID, 100 mg BID or a placebo that will cross over to MORF-057 after the 14-week induction phase. The primary endpoint of the trial is the proportion of participants in endoscopic response (>=50% reduction) at week 14 as determined using Simple Endoscopic Score for Crohn's Disease, or SES-CD. The secondary endpoints will include the change in Crohn's Disease Activity Index, or CDAI, measures, as well as safety parameters. Following the 14-week induction phase, patients will move to a 38-week maintenance phase. We continue to expand our α4β7 portfolio and have positioned next-generation α4β7 small molecule development candidates for clinical studies in the future.

Beyond our lead molecule, MORF-057, we are using our MInT Platform to advance a broad pipeline of preclinical programs across a variety of therapeutic areas, all of which aim to harness the potential of inhibition or activation of an integrin receptor. Additional wholly-owned programs have advanced to the lead optimization phase of discovery. We presented positive preclinical data from our αvβ8 program at the American Association for Cancer Research Annual Meeting in April 2021. Based on the data we have generated to date and the potential role of TGF-β in treating myelofibrosis, we have nominated MORF-088, a selective small molecule inhibitor of αvβ8, as a development candidate for myelofibrosis. Further pre-clinical research is ongoing with MORF-088 in the treatment of myelofibrosis to create a robust translational plan to efficiently measure if this mechanism will be effective in patients. We also have an additional research stage program ongoing against α5β1 in pulmonary hypertensive diseases, including pulmonary arterial hypertension, or PAH. We have determined that α5β1 promotes cell proliferation, survival, hypertrophic growth and fibrosis, which are key elements in the progression of PAH.

We were founded in 2014 by Dr. Timothy A. Springer of Harvard Medical School and Boston Children's Hospital, a world-renowned immunologist and biophysicist who discovered integrins. He established the importance of integrin conformations in modulating disease activity. Today, pursuant to an exclusive license from the Children's Medical Center Corporation, or the Springer Laboratory, our MInT platform is powered by these initial insights, together with our proprietary knowledge of integrin conformations, affinity regulation and dynamics. Together, this enables us to discover novel product candidates that bind and revert disease-specific integrin conformations to a non-disease physiologic state.

Since June, 2015 we have had an exclusive integrin focused collaboration agreement in place with Schrödinger, a leader in chemical simulation, machine learning models and in silico drug discovery. We have successfully used their technology platform to perform virtual screens on members of the target class of human integrins, and we and Schrödinger collaborate to facilitate prioritization of integrin targets, perform target validation and analysis, identify leads, and perform lead optimization to establish a portfolio of integrin programs. We believe that our collaboration with Schrödinger enables us to undertake accelerated drug discovery through design, iteration and optimization of leads using a variety of next-generation physics-based computational and machine learning technologies.

With our internal proven capabilities in structural biology, medicinal chemistry and screening, the Schrödinger platform accelerates our ability to design molecules with atomic precision utilizing our significant expertise in advanced structure-guided drug design technology, and machine learning protocols. In December 2022, we expanded our access as a special Schrödinger software customer enabling utilization of their full software suite beyond the scope of integrins. As a result, in 2023, we began advancing additional clinically validated targets with a focus in the inflammation and immunology therapeutic areas, which are highly complementary to our current assets within the integrin space. Specifically, we have initiated projects targeting the IL23 and TL1A pathways, among others. Injectable inhibitors of these targets have been shown to provide significant clinical benefits to IBD patients. Utilizing our expertise in small molecule drug design and optimization, we are pursuing inhibitors against these targets. If we are successful, we believe these agents could be important monotherapy agents as well as optimal to combine with MORF-057 to achieve enhanced clinical efficacy in IBD patients.

We have assembled an experienced management team, board of directors and scientific advisory board with specialized expertise in integrin therapies. They collectively bring extensive experience in discovering, developing and commercializing therapeutics, having worked at companies such as ArQule, Inc., Biogen Inc., Cubist Pharmaceuticals, Inc., Johnson & Johnson, Pfizer Inc., Pharmacia Corporation, Takeda Pharmaceutical Company Limited and Theravance Biopharma, Inc.

From inception through December 31, 2023, we have raised an aggregate of approximately $1.2 billion in gross proceeds primarily through the issuance of equity, including our convertible preferred equity securities, through our initial public offering, our underwritten public offering in March 2021, our private issuance of common stock and pre-funded warrants in February 2023, our underwritten public offering in May 2023 and sales of shares of our common stock under our at-the-market offering program, along with payments received under our collaboration agreements.

Our Strategy

Our goal is to use our MInT Platform to discover and develop potentially first-in-class oral small-molecule integrin therapeutics. We believe our platform has the potential to transform the treatment paradigm for patients suffering from a broad range of serious chronic diseases. The key tenets of our business strategy to achieve this goal include:

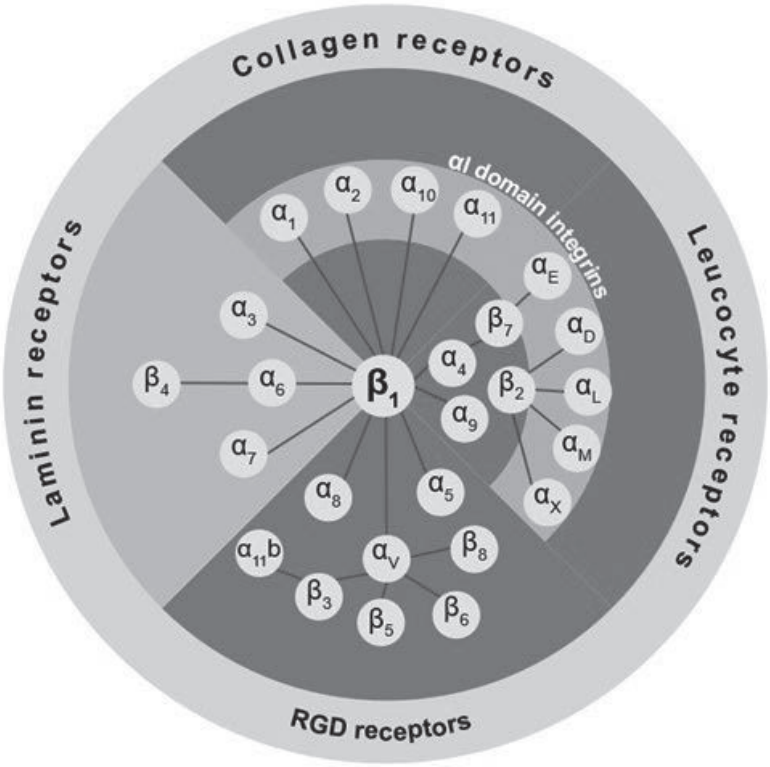
- Establishing orally available integrin modulators as a new treatment for serious chronic diseases, including autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer. We are leveraging our MInT Platform to create a new class of oral integrin targeted therapeutics to treat diseases where integrins are dysregulated and a potential benefit for oral therapies exists. We have prioritized our initial development efforts on diseases with established clinical endpoints and biomarkers, which we believe will enable us to more rapidly achieve clinical proof of concept. We are advancing our lead wholly-owned product candidate, MORF-057, an α4β7 specific integrin inhibitor, through clinical development for the treatment of IBD.
- Leveraging our proprietary MInT Platform and knowledge base to grow our pipeline of novel therapeutics. Our comprehensive MInT Platform, coupled with our development capabilities, have enabled us to build a pipeline of novel product candidates targeting chronic diseases caused by integrin dysregulation. We intend to expand our pipeline by unlocking the therapeutic potential of the four integrin subgroups to treat diseases with high unmet medical need and to potentially expand our current product candidates into new indications.
- Continuing to drive innovation across our MInT Platform. We intend to extend our leading position in the field of integrin medicine by continuing to develop and incorporate platform innovations that can further broaden the potential therapeutic reach of our oral programs.
- The Schrödinger platform enables us to accelerate our ability to design molecules with atomic precision utilizing our significant expertise in advanced structure-guided drug design technology and machine learning protocols. In December 2022, we expanded our access as a special Schrödinger software customer enabling utilization of their software suite beyond the scope of integrins. As a result, in 2023 we began advancing additional non-integrin clinically-validated inflammation and immunology targets, which are highly complementary to our current assets within the integrin space.
- Independently commercializing our products, if approved, in indications and geographies where we believe we can realize maximum value. We plan to independently advance those product candidates that we believe have well-defined clinical and regulatory approval pathways, and that we believe we can commercialize successfully, if approved. We may also seek to form strategic collaborations around certain targets, product candidates or disease areas that we believe could benefit from the resources of either larger biopharmaceutical companies or those specialized in a particular area.

Our Focus — Integrin Receptors

Integrins are the only receptors in the human body that use both intracellular and extracellular ligands to transmit signals both from the inside of the cell to the outside of the cell and from the outside of the cell to the inside of the cell. Reciprocally, these states are regulated by tensile forces transmitted through integrins when they bind to extracellular ligands and the intracellular cytoskeleton. This bi-directional signaling ability allows integrins to affect virtually every aspect of cell and organ homeostasis. Consequently, the dysregulation of integrin signaling is associated with many human diseases including autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer.

Integrin receptors are evolutionarily conserved. Integrins exist as paired combinations of 18 α and eight β subunits, and there are 24 known heterodimers. These pairings give integrins their unique abilities to recognize their ligands and modulate cellular function in specific ways. Integrins are subdivided into those on leukocytes, and those that recognize RGD-peptide, collagen, and laminin ligands. They regulate numerous aspects of cell biology and physiology including leukocyte trafficking, activation of platelets and leukocytes, activation of growth factors such as TGF-β, cell adhesion to the basement membrane and extracellular matrix, and retention or adhesion strengthening of cells within tissues. This diverse set of functions makes them actionable targets across a broad range of human diseases based on preclinical modeling or clinical establishment. The figures below summarize the 24-member integrin family and areas of clinical relevance:

Integrin Receptors by Class



Integrin Receptors and Potential Therapeutic Areas of Relevance

Autoimmune		Cancer		Fibrosis	Metabolic	Cardiovascular
$\alpha_4\beta_7$ $\alpha_4\beta_1$ $\alpha_E\beta_7$ $\alpha_L\beta_2$ $\alpha_D\beta_2$	$\alpha_1\beta_1$ $\alpha_2\beta_1$ $\alpha_{10}\beta_1$ $\alpha_5\beta_1$ $\alpha_v\beta_8$	$\alpha_v\beta_8$ $\alpha_v\beta_8/\alpha_v\beta_6$ pan-α_v $\alpha_5\beta_1$	$\alpha_M\beta_2$ $\alpha_9\beta_1$ $\alpha_3\beta_1$ $\alpha_{11}\beta_1$	$\alpha_v\beta_6$ $\alpha_v\beta_1$ /$\alpha_v\beta_6$ $\alpha_v\beta_6$ $\alpha_v\beta_3$ $\alpha_5\beta_1$ pan-α_v	$\alpha_{11}\beta_1$ $\alpha_v\beta_1$ $\alpha_2\beta_1$ $\alpha_3\beta_1$	$\alpha_{11}\beta_1$ $\alpha_5\beta_1$ $\alpha_v\beta_1$ / $\alpha_v\beta_3$ /$\alpha_v\beta_5$
Inflammatory bowel disease, multiple sclerosis, psoriasis, rheumatoid arthritis, asthma, dry eye, disease, uveitis, chronic obstructive pulmonary disease		Gastrointestinal cancers, immuno-oncology indications		Idiopathic pulmonary fibrosis, primary sclerosing cholangitis, primary biliary fibrosis, scleroderma, age-related macular degeneration	Chronic kidney disease, nonalcoholic steatohepatitis, diabetic macular edema	Acute coronary syndrome, pulmonary hypertensive diseases

Integrins as a Therapeutic Target Family

Integrins have long been recognized as drug targets. In the 1980s, the therapeutic interrogation of integrins focused on the RGD integrin, αIIbβ3. When αIIbβ3 on platelets is activated, it binds to fibrin, which bridges it to adjacent platelets and leads to clot formation. As the molecular details establishing the essential role of αIIbβ3 in platelet aggregation emerged, it became clear that inhibition of its ligand binding function would be antithrombotic. In 1994, abciximab (marketed as ReoPro®) became the first approved integrin therapy for patients undergoing percutaneous transluminal coronary angioplasty, followed by the approval of tirofiban (marketed as Aggrastat®) and eptifibatide (marketed as Integrilin®).

The next stage of development of integrins as drug targets has focused on integrin receptors on leukocytes. These therapies modulate autoimmunity by inhibiting the ability of activated immune cells, including T-cells, to enter chronically inflamed tissues. Four approved integrin medicines belong to this category:

- Efalizumab (formerly marketed as Raptiva® and subsequently withdrawn from the market), an injectable antibody inhibitor of αLβ2, approved by the FDA in 2003 for the treatment of chronic moderate to severe psoriasis;
- Natalizumab (marketed as Tysabri®), an infusible antibody inhibitor of α4β1, approved by the FDA in 2004 for the treatment of relapsing forms of multiple sclerosis and in 2008 for the treatment of moderately to severely active Crohn's disease;
- Vedolizumab (marketed as Entyvio®), an infusible antibody inhibitor of α4β7, approved by the FDA in 2014 for the treatment of moderately to severely active UC or Crohn's disease; and
- Lifitegrast (marketed as Xiidra®), a topical small-molecule inhibitor of αLβ2, approved by the FDA in 2016 for the treatment of dry eye disease.

According to Global Data, these autoimmune therapies were estimated to have achieved combined annual sales in their respective 2022 fiscal years of approximately $7.7 billion.

Development Challenges of Oral Integrin Modulators

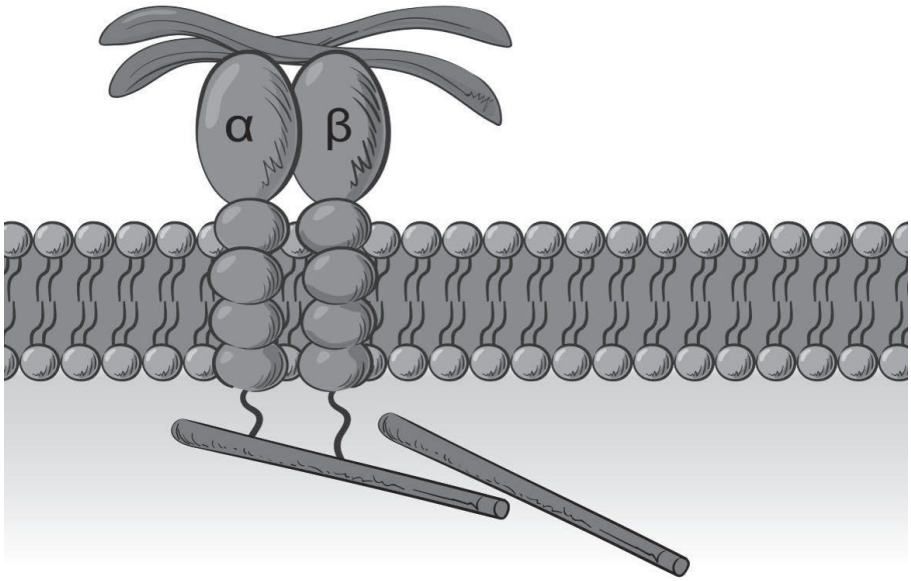
The infusible, injectable or topical nature of these therapies has limited their utility. To address these limitations, pharmaceutical companies have invested significant resources in discovering and developing oral systemic integrin therapies. For αIIbβ3 alone, six different compounds (roxifiban, sibrafiban, orbofiban, xemilofiban, lefradafiban, lotrafiban) were advanced into registrational Phase 3 clinical trials. Disappointingly, the results of these trials showed these oral systemic inhibitors of αIIbβ3 increased vascular death in patients with acute coronary syndrome. After a decade to understand these failures, we now know that all failed oral inhibitors stabilized the active integrin conformation and promoted ligand signaling if they were not potent enough to maintain full active site binding. These drawbacks resulted in greater platelet aggregation and an increased rate of adverse events.

Additionally, the unexpected disease-activating activity of oral leukocyte integrin inhibitors was observed during Phase 2 development of firategrast, an oral non-selective inhibitor of α4β1 and α4β7, where the symptoms in the patients with multiple sclerosis were exacerbated when firategrast was administered in non-saturating doses. This resulted in an increase in lesions and an increased rate of adverse events. The development of this compound was subsequently halted.

Our Platform and Approach

We believe that our MInT Platform allows us to address and overcome the challenges faced by developers of first-generation oral integrin-targeted therapeutics.

Integrin Structure



We believe that our discovery platform enables us to be the only company working across the entire 24-member integrin target family. Our MInT Platform consists of these unique capabilities:

- Proprietary ability to determine integrin structures. Using our protein constructs, cell lines and know-how, we have elucidated over 550 proprietary structures for clinically important targets across the integrin class.
- A computationally enabled product candidate design engine. We have built a library of over 18,500 optimized compounds using sophisticated medicinal and computational chemistry capabilities and biological assays for each integrin that allows us to tune highly potent and selective integrin inhibitors and activators into product candidates for preclinical and clinical development. Our ability to generate product candidates from our tunable product engine is significantly accelerated by our exclusive computational collaboration with Schrödinger, which uses advanced physics-based modeling and machine learning to create superior oral drug candidates. We have recently expanded our access as a special Schrödinger software customer enabling utilization of their software suite beyond the scope of integrins.
- An emerging ability to discover activating and inhibiting antibody candidates, by leveraging our unique ability to express and isolate specific integrin conformational constructs.
- Biology and disease translation capability. Our sophisticated and comprehensive suite of biologic tools includes a gene and protein expression atlas, a single-cell resolution profiling of human tissues from diseases of interest and development of biomarkers, which allow us to assess target engagement and pharmacodynamic activity in the disease of interest.

We initially focused on developing product candidates with a target class for areas of high unmet medical needs including:

- α4β7 and α4β1, which are established targets for autoimmune diseases; their mechanism of action and the benefits and risks of their inhibition are well understood; and
- certain αv integrins that have a preclinically well-characterized mechanism of action through the activation of TGF-β, a clinically important anti-inflammatory cytokine dysregulated in many human pathologies.

To date, we have only tested MORF-057, an α4β7-specific integrin inhibitor, in clinical studies, and we currently only have pre-clinical data regarding oral bioavailability of our other product candidates.

Our understanding of the mechanism of integrin receptor activity, modulated by complex conformations and signaling, is unique and allows us to discover both inhibitors and activators across the integrin receptor target family. Our capability has been validated by our advancement of α4β7 and other integrin programs. Our MInT Platform consists of three major components:

- Proprietary ability to determine integrin structures;
- Tunable product candidate design engine; and
- Biology and disease translation capability.

Leveraging our deep understanding of integrin conformation and molecular modes of action is a key element of our strategy to identify product candidates. These receptors undergo large conformational changes as shown in Figure 1, resulting in both inactive (bent-closed and extended-closed) and activated states of the receptor (extended-open). In the bent-closed form, the top portion of the integrin, formed by both α and β subunits, folds in half so that the top and lower half associate with each other (Figure 1 left) rendering the integrin inactive. For the integrin to be active, the extended-close state (Figure 1 middle) extends at the α and β mid-leg on the cell surface to render an extended open state (Figure 1 right). As shown with multiple integrins, the bent-closed and extended-closed conformations have low affinities for ligand, while depending on the integrin, the extended-open conformation is 700 to 5,000-fold higher in affinity for ligand. These changes in integrin conformation and affinity function to transmit bi-directional signals, enabling communication of the cell expressing the integrin on its surface and the extracellular matrix or ligands on other cells.

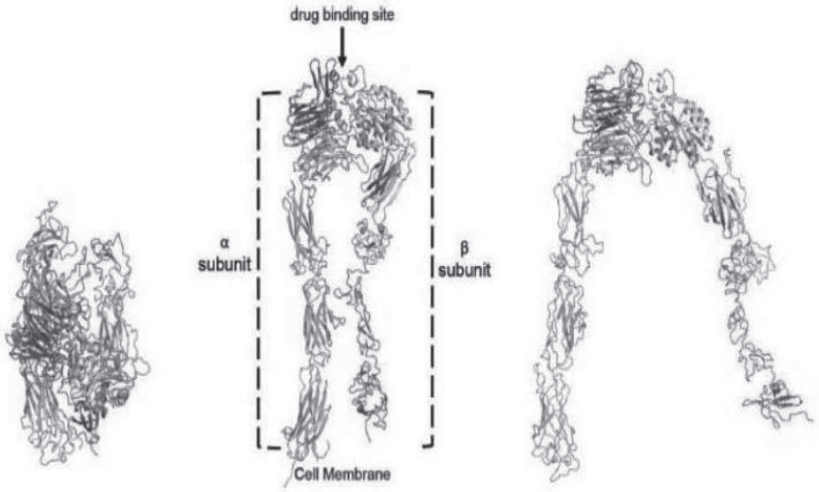


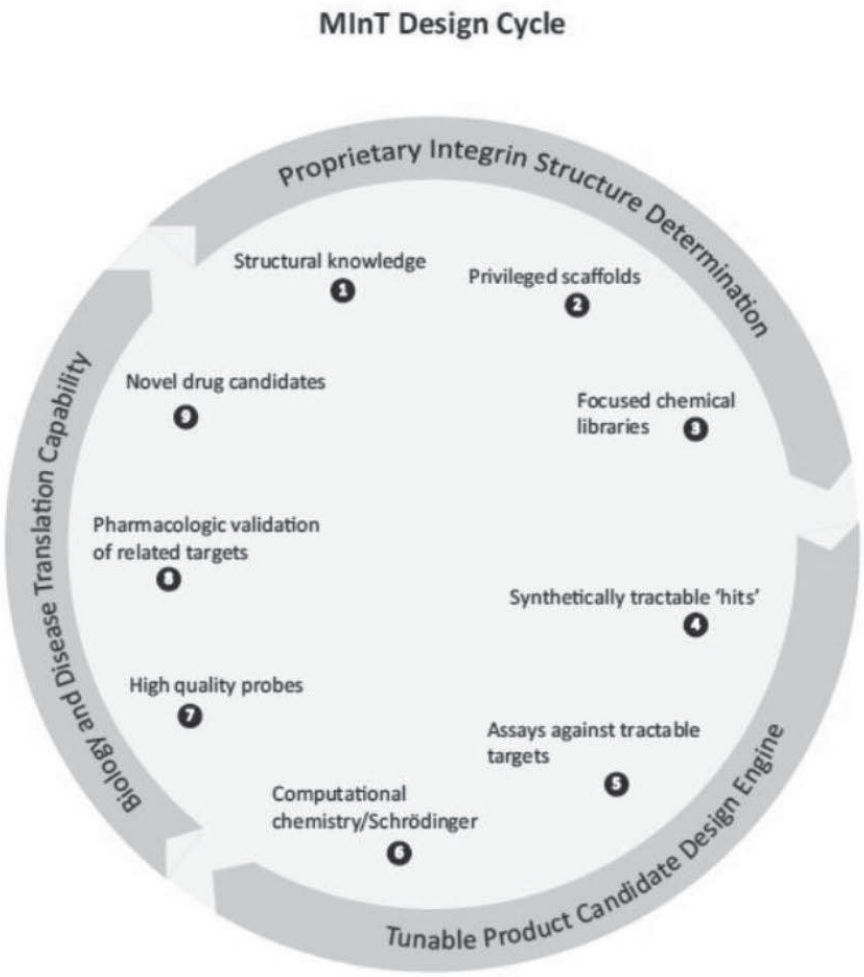
Figure 1: Integrin dynamic conformational states. Left — bent-closed inactive form of the integrin heterodimer pair, Middle — extended-closed inactive, and Right — extended-open active.

Our novel MInT Platform is rooted in our structural biology capability based on deep insights into control of complex integrin conformational states. Dr. Springer characterized an initial set of small molecules to lock specific integrin conformations and we have used and advanced this knowledge to optimize the pharmacology of our oral integrins. We design our compounds to recognize integrin conformational states that are physiologic dysregulated in disease. Binding of our compounds to integrins promotes the integrin to adopt a structure that is characteristic of healthy tissue and stops disease-specific integrin signaling. We believe past attempts to develop small molecules targeting integrins have in part failed due to a lack of sufficient understanding of these conformational changes and their impact on disease. We believe our MInT Platform has positioned us to apply our deep understanding of the biologic underpinnings of diseases linked to integrin dysfunction to develop a pipeline of novel integrin therapeutics.

The Morphic Integrin Technology (MInT) Platform

Given that the integrin target family consists of structurally and functionally related proteins, each cycle of the MInT Platform yields chemistry assets and biological data in our programs of interest while in parallel furthering our understanding of the structure and function of new integrin complexes. We believe this results in a rapid strategic compounding of knowledge and assets with each turn of the MInT design cycle. Our α4β7 program produced its first development candidate over three years after program initiation. Our αvβ6 program took only two years to achieve the same goal, which we believe was due in part to insights we had gained on chemical features that optimized oral bioavailability, clearance and metabolic stability. Our αvβ8 program has advanced even faster to development candidate profile compounds. The chemotypes and initial medicinal chemistry hits we discover become tools and compounds that can further our knowledge base around each individual integrin, which also extends to related integrins. For example, discovery efforts in αvβ6 led to highly selective αvβ8 advanced leads and starting points for additional targets, directly enabling new wholly-owned programs and supporting collaboration efforts.

As shown in the graphic below, the iterative MInT design cycle consists of nine steps based on the three pillars of our MInT Platform: our proprietary ability to determine integrin structures, our tunable product candidate design engine, and our biology and disease translation capability.



Proprietary ability to determine integrin structures

We believe that an understanding of protein crystal structures enables more effective product candidate design. Integrins are difficult to characterize structurally because they are composed of many flexible domains and interdomain linkers (see Figure 1). Our unique position of integrin structural knowledge and cell lines, and access to crystal structures for half of the integrin targets, proprietary protein reagents and knowhow has allowed us to elucidate over 550 proprietary structures for clinically important targets. Our novel approach is based on combining our deep understanding of structural biology and how integrin protein conformation regulates function in disease. An example of this is in our α4β7 program where the crystal structure of the drug binding site enables the design of novel ligands that bind at the interface of the α and β subunits (Figure 2). This critical information at the molecular level directs our research to unlock the potential of this family of receptors and develop small molecules for targeting specific conformations of the integrin receptors.

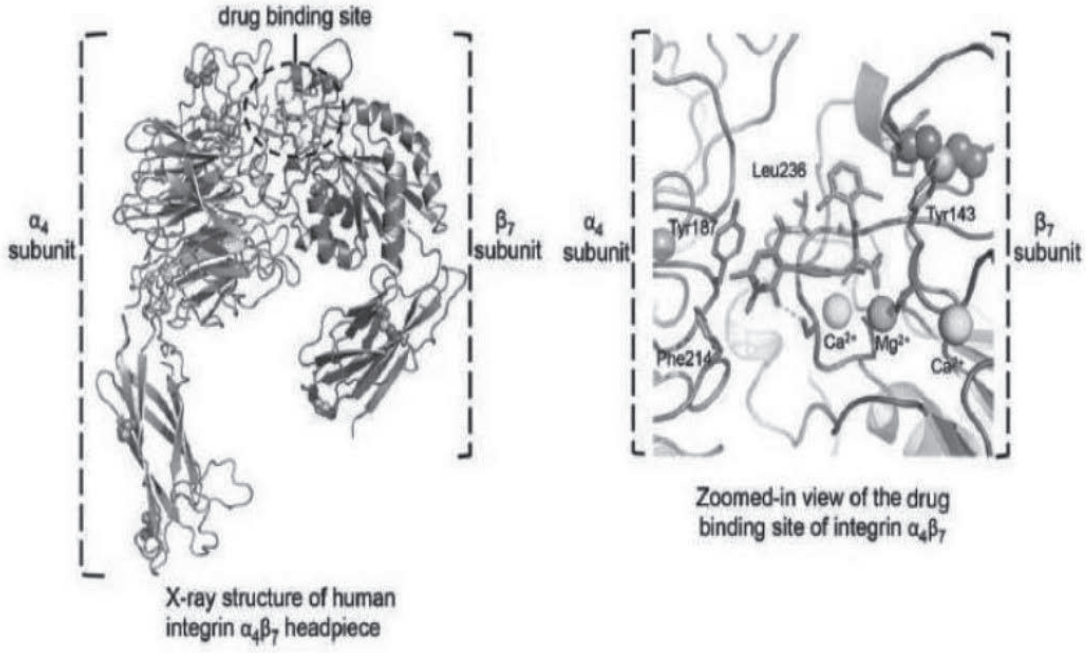


Figure 2: Left — X-ray crystal structural of the top portion of the heterodimer or headpiece of the human α 4β7 integrin receptor with the α-subunit on the left and β-subunit on the right. The drug binding site for this receptor is at the interface of the α and β subunits. Right — Zoomed in view of the drug binding site showing the key interactions responsible for regulation of protein conformation in this integrin. Data for structural rendering from: Yu, Y., Zhu, J., Mi, L.Z., Walz, T., Sun, H., Chen, J.-F., Springer, T.A. (2012). Structural specializations of α4β7 an integrin that mediates rolling adhesion. J. Cell Biol. 196, 131-146.

Tunable product candidate design engine

Proprietary Chemistry: We have significant know-how in the development of molecules that stabilize specific integrin receptor conformations, which supports our novel approach to the identification of oral integrin inhibitors. Today, our small molecule chemical library, which continues to grow, contains over 18,500 uniquely designed integrin modulators (inhibitors and activators), and our drug design technology leverages our proprietary understanding of integrin target dynamics. When coupled with our deep understanding of the molecular mode of action of specific integrins, we believe we can design appropriate chemotypes for each integrin function. Further optimization of library compounds, combined with excellence in medicinal chemistry, enables the identification of potent, selective oral small molecule product candidates.

Exclusive Schrödinger Computational Chemistry Collaboration: We have a collaboration with Schrödinger, a leader in chemical simulation and in silico drug discovery, that is exclusive as to integrins. We believe this collaboration enables us to undertake accelerated drug discovery through design, iteration and optimization of leads using a variety of next-generation physics-based computational technologies. Our collaboration with Schrödinger enables us to design molecules with atomic precision utilizing advanced structure-guided drug design technology. We have recently expanded our access as a special Schrödinger software customer enabling utilization of their software suite beyond the scope of integrins.

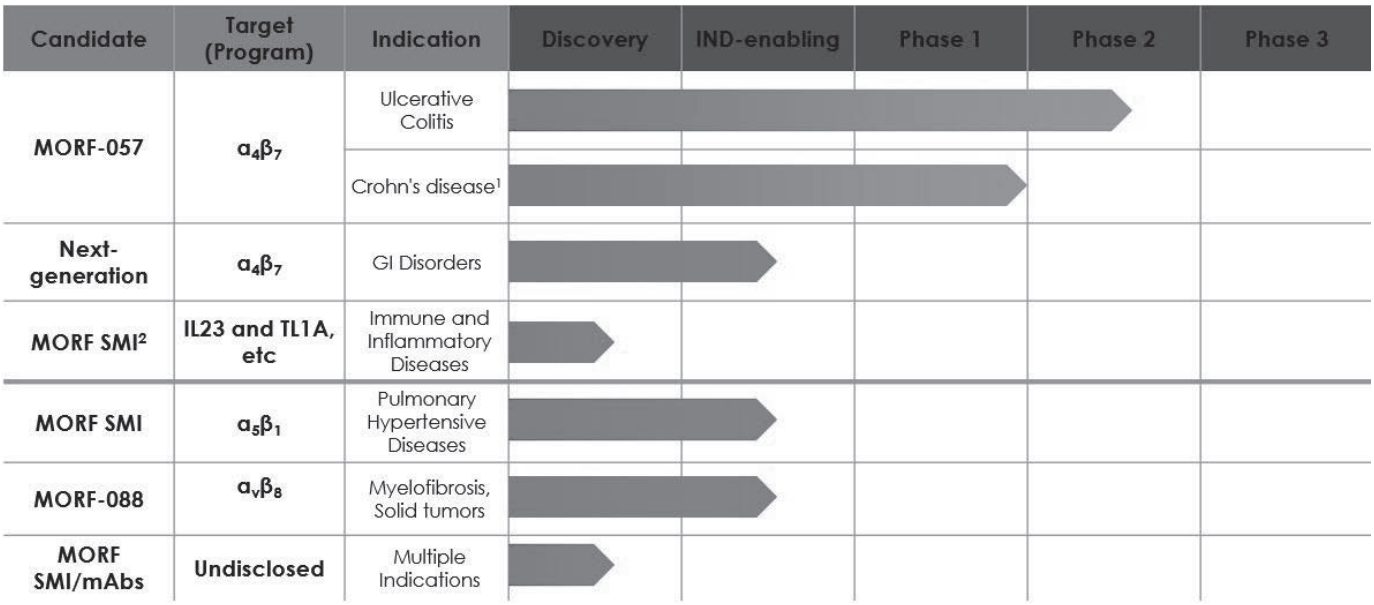
Our In Vitro Integrin Assay Panels: To identify novel inhibitors that stabilize disease-relevant receptor conformations, we have established a suite of robust in vitro assays that cover each of the integrin family members. These proprietary in-house screening assays enable biochemical and functional characterization of potency and selectivity within the integrin family, serving as powerful tools in different stages of the drug design process.

Biology and disease translation capability

The MInT Platform is built upon a deep understanding of integrin biology in human diseases, including integrin tissues and a cell expression atlas. We have built a sophisticated and comprehensive suite of in vitro, ex vivo, and disease-specific in vivo assays designed to evaluate the pharmacological effects of integrin modulation and to gain additional insights into their mechanism of action. The biological learnings from these assays have the potential to accelerate our work across multiple integrin discovery programs. We hope to strategically translate preclinical observations into our clinical development plans. These, along with our growing capabilities in pharmacokinetic and pharmacodynamic modeling, have enabled our discovery of integrin inhibitors that have the potential to impact human diseases of autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer.

Our Pipeline Programs

We have conducted an analysis of opportunities for integrin inhibition in human disease based on validating biology, safety, technology readiness and development feasibility. We have identified several actionable integrin targets across all four integrin families, and our initial focus is in high unmet medical need areas of autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer. We have also initiated projects outside of the integrin family in the IL23 and TL1A pathways, as well as more early-stage projects against other immune and inflammatory targets. We believe our MInT platform will enable the discovery of orally bioavailable inhibitors of these clinically validated targets, which have the potential to be used alone or combined with MORF-057 to achieve enhanced clinical efficacy in IBD patients. The following table summarizes key information about our current product candidates:



[1] Crohn's disease phase 2b study anticipated to begin 1H24. We have not completed a separate Phase 1 trial of MORF-057 in Crohn's disease, but expect to rely on data from our completed trials of MORF-057 in UC to initiate a Phase 2b clinical trial in Crohn's disease.
[2] SMI: oral small molecule inhibitor

Our Lead Product Candidates

MORF-057: Our α4β7-specific Integrin Inhibitor for Inflammatory Bowel Disease

We are advancing our lead α4β7 integrin inhibitor MORF-057 as a potential oral treatment for UC and Crohn's disease, two of the most common types of IBD, for which there is significant unmet need. We estimate that there are approximately 1.7 million people living with IBD in the United States. We believe MORF-057 has the potential, if approved as monotherapy as well as in combination with other IBD agents, to offer a targeted, safe, efficacious, and convenient method of treatment for patients suffering from IBD.

Background on Inflammatory Bowel Diseases

IBD comprises several autoimmune and immune-mediated conditions characterized by chronic inflammation of the GI tract. In UC, inflammation is limited to the lining of the colon, whereas in Crohn's disease, inflammation can segmentally affect any part of the GI tract and extend through the entire thickness of the bowel wall. Symptoms of these conditions include persistent diarrhea, abdominal pain, rectal bleeding, weight loss, and fatigue. Only about one in five patients achieve clinical remission with approved advanced therapies, and approximately half of those patients lose response over time. As such, even newer biologic and oral agents may not adequately control tissue inflammation or symptoms for many of the sicker patients, and some will therefore develop complications that require surgical removal of the colon and rectum. In addition, many patients with moderate-severe IBD do not receive adequate treatment for their disease due to the inconvenience and fear of injectable biologics, or the safety profile of systemically immunosuppressive therapies.

The mainstays of IBD therapy over many years have been oral and topical salicylates and glucocorticoids, immunosuppressive agents, and antibody therapies. Anti-integrin antibody therapy for IBD was first introduced with the approval of the α4 integrin inhibitor natalizumab for Crohn's disease, an indication approved following its initial approval for multiple sclerosis. Natalizumab therapy is associated with, and carries a boxed warning for, progressive multifocal leukoencephalopathy, or PML, related to its α4β1 inhibitory activity, which has limited its use in Crohn's disease. PML is a rare and often fatal viral disease characterized by progressive damage of the white matter of the brain at multiple locations. Vedolizumab, a monoclonal antibody inhibitor of the integrin α4β7, is approved for the treatment of moderately to severely active UC and Crohn's disease, and does not carry a boxed warning.

Overview of Pathway and Target Biology

Integrin α4β7 binds to mucosal addressin cell adhesion molecule, or MAdCAM, which is expressed at a high level almost exclusively on the endothelial cells of the gut. Blockade of this interaction prevents immune cell entry into inflamed tissue in the gut and has been shown to be effective in treating IBD, as evidenced by the approval of vedolizumab.

Our Solution

Utilizing our MInT Platform, we discovered MORF-057, an orally administered α4β7-specific integrin inhibitor. Our strategy was driven by our ability to discover oral therapies and our knowledge of how to achieve target potency, permeability, and selectivity, thereby minimizing off target risk of inhibiting α4β1, which is implicated in PML. We believe that MORF-057 has the potential to address the unmet needs in the IBD treatment landscape as an orally administered agent with GI-targeted immunosuppression that may be able to avoid some of the safety concerns associated with other drug classes. Furthermore, as the IBD treatment landscape evolves from monotherapy to combination therapy in order to increase therapeutic response rates in certain patient populations, we believe that MORF-057's profile is promising as a foundational backbone for next generation of oral therapeutic regimens.

Preclinical Data, Pharmacology and Biomarker Data

Using our proprietary MInT Platform, we have designed α4β7 small molecule-inhibitors, including MORF-057, that are potent and have high selectivity for α4β7 relative to other integrins, including α4β1 and αEβ7, as assessed by a suite of in vitro assays. Table 1 below shows measurements of the potency of MORF-057 as assessed in our cell adhesion assays, as compared to reference products vedolizumab, natalizumab and etrolizumab, as well as AJM300, a product candidate being developed by a third party. We determined all of these potencies in our laboratories. The cell adhesion assay evaluated the ability of α4β7 to bind to its ligand MAdCAM, α4β1 to its ligand VCAM, and αEβ7 to its ligand E-cadherin in vitro. These assays have been shown to be useful in discovering drug candidates for IBD. IC50 values are commonly accepted measurements of drug potency.

MORF-057 has been observed to be a highly potent α4β7 inhibitor with >3,000-fold selectivity in our cell adhesion assay as compared to α4β1 and αEβ7.

Inhibitor	$\alpha_4\beta_7$ IC_{50}[a] RPMI8866 MAdCAM in 50% serum	$\alpha_4\beta_1$ IC_{50}[a] Jurkat VCAM in 50% serum	$\alpha_4\beta_1$ IC_{50}[a] RPMI8866 VCAM in 50% serum	$\alpha_4\beta_7/\alpha_4\beta_1$ Fold selectivity	$\alpha_E\beta_7$ IC_{50}[a] K562- $\alpha_E\beta_7$ E-Cadherin	$\alpha_4\beta_7/\alpha_E\beta_7$ Fold selectivity
MORF-057	1.2 ± 0.8 nM	>50 μM	4,290 ± 670 nM	>3,000	52 μM	>143,000
Vedolizumab	0.035 ± 0.020 nM	>180 nM	>1,000 nM	>3,000	ND	--
Natalizumab	0.166 nM	1.8 nM	0.14 nM	1 - 12	ND	--
AJM300[b]	93 ± 66 nM	4200 nM	779 ± 261 nM	8 - 45	ND	--
Etrolizumab	0.0185 nM	ND	>1,000 nM	$>10^6$	1.2 nM	14

Table 1
**RPMI8866, Jurkat and K562- αEβ7 transfected cell lines used for α4β7, α4β1 and αEβ7, respectively.*
ND = Not Determined
DDW 2020, Morphic Therapeutic, Jamie Wong, ePoster Tul1283

The in vivo activity of our α4β7 inhibitor was also evaluated in a single dose acute PD model, where the impact of blocking the α4β7 integrin on the trafficking of T lymphocytes to the gut was assessed in mice. The procedure of the T lymphocyte homing uses fluorescently labelled TK1 cells, which expresses high level of α4β7 integrin on the surface and an n=5 animals per group. Several of our compounds, including our development candidate MORF-057, have been evaluated in this assay to assess dose response (Figure 3). We observed a statistically significant response at all doses tested, and at the three highest doses tested, we observed our compound to be as potent as DATK32, a mouse surrogate of the α4β7 antibody vedolizumab. In Figure 3 below, the right panel shows dose-dependent inhibition of the carboxyfluorescein succinimidyl ester, or CFSE, labeled T cells homing to mesenteric lymph nodes observed with our small molecule α4β7 inhibitor and DATK32, a mouse surrogate of vedolizumab in the assay. All treatment groups showed a statistically significant difference (***p<0.0001) compared to vehicle, using a one-way analysis of variance (ANOVA), followed by Bonferroni's multiple comparison test. MORF-057 exhibited good in vitro permeability, resulting in high oral exposure in multiple preclinical models. In addition, MORF-057 has a low to moderate clearance and moderate half-life in animal species, supporting twice daily use in humans.

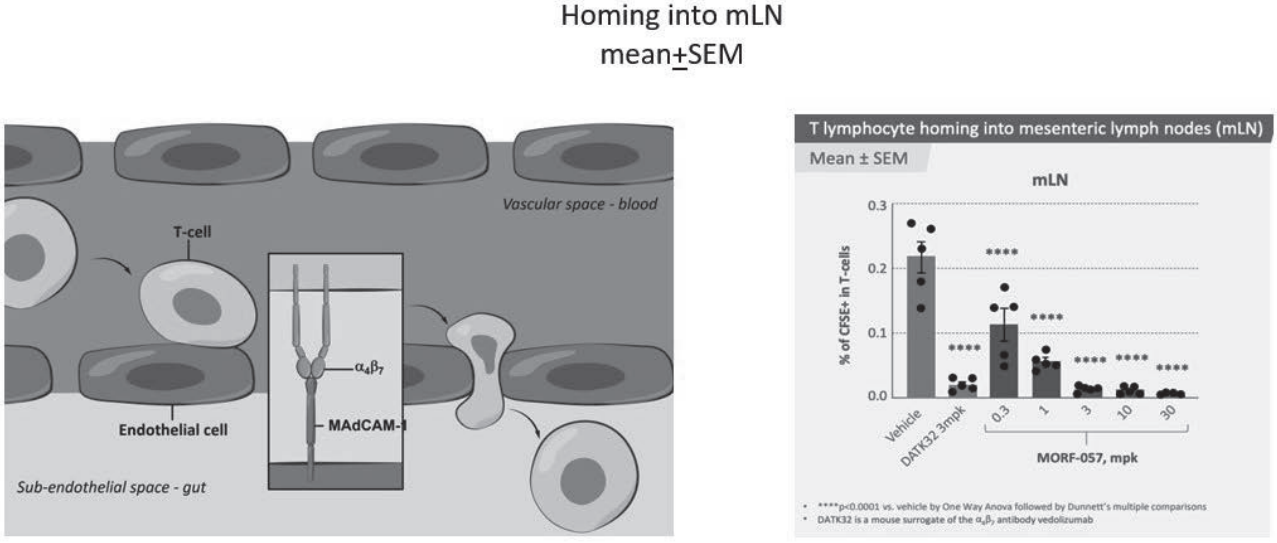


Figure 3. The left panel on the left shows the mechanism of the α4β7expressing lymphocytes in IBD. The α4β7expressing lymphocytes traffic to the gut and adhere to MAdCAM, followed by extravasation and migration to the inflammation site. The panel on the right shows the results of the in vivo assay to detect activity of our product candidates as compared to a mouse surrogate of vedolizumab.

MORF-057 has also been shown to inhibit α4β7 CD4+ T cell trafficking to mucosal sites in a non-human primate model. In this model inhibition of the trafficking of cells to the intestine was monitored indirectly by observing their resulting increase in systemic circulation. Figure 4 below shows that MORF-057 dosed orally twice daily increases the level of T memory cells in circulation in a statistically significant manner.

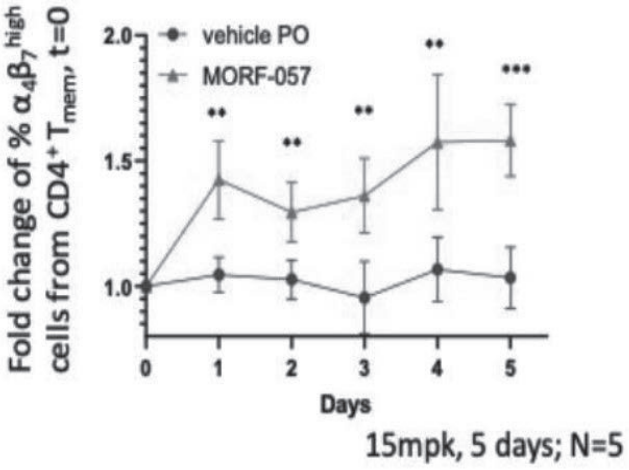
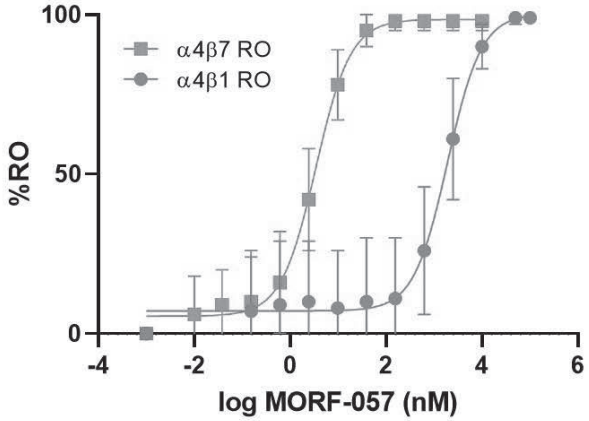


*Figure 4: Fold change in % α4β7 high T memory cells following oral dosing of MORF-057 in non-human primate. Means and SD of data normalized per individual at timepoint 0h (first dose administration). T test analysis was performed at each timepoint. Statistical significance determined using the Holm-Sidak method, with alpha = 0.05. ** p < 0.01, *** p < 0.001.*

Translational biomarkers such as RO have been validated as a PD marker in preclinical studies and early clinical trials of vedolizumab. When a product candidate binds to α4β7, it occupies the integrin ligand binding site and interferes with the ability of MAdCAM to bind and contribute to immune cell accumulation into the inflamed gut tissue. An assay that measures binding of the product candidate to α4β7 in lymphocytes in circulating blood is termed a blood based α4β7 RO assay. Free α4β7 and α4β1 signal intensities were inhibited by increasing concentrations of MORF-057. The results in Figure 5 also show that MORF-057 is highly potent and selective for α4β7. The RO assay exhibits almost identical performance between healthy subjects and UC patients.



	$\alpha_4\beta_7$ IC_{50} (nM)	$\alpha_4\beta_1$ IC_{50} (nM)	Selectivity Index (Average)
Healthy (n = 19)	3.44 ± 1.74	1,560 ± 540	717
UC (n = 7)	2.00 ± 0.93	2,810 ± 840	1939

Figure 5 left: Calculated percentage α4β7 and α4β1 occupancy at varying MORF-057 concentrations in blood isolated from healthy subjects and UC patients. Data are mean ± SD of 26 donors. Table 5 right: MORF-057 is a potent and selective inhibitor of α4β7 over α4β1 in human whole blood ex vivo in both normal healthy volunteers and UC patients. Values are the mean ± standard deviation.

MORF-057 Clinical Development Overview

Phase 1

In September 2020, we announced the initiation of a healthy volunteer Phase 1 clinical trial, with SAD, FE and MAD cohorts to evaluate the safety and PK profile of multiple doses of MORF-057.

In March 2021, we announced preliminary results from the Phase 1 SAD clinical trial of MORF-057 demonstrating that MORF-057 was well tolerated in all dose cohorts ranging from 25 mg to 400 mg, achieved greater than 95% mean RO of α4β7 integrin at the three highest dose levels, and demonstrated the potential to saturate the α4β7 receptor with oral administration.

In July 2021, after completion of the MAD and FE portions of the MORF-057 clinical program, we reported the full data set from the Phase 1 clinical trial at the European Crohn's and Colitis Organisation (ECCO) 2021 Virtual Congress. The full MORF-057 Phase 1 study included SAD, MAD and FE cohorts evaluating MORF-057 safety, PK, and PD. Healthy subjects were randomized 3:1 to receive a single dose of MORF-057 at 25, 50, 100, 150 and 400 mg or matching placebo in the SAD cohorts; or BID doses of 25, 50 and 100 mg MORF-057 or matching placebo for a total of 14 days in the MAD cohorts. A total of 67 eligible healthy subjects were enrolled into the studies, with 36 in the SAD, nine in the FE and 22 in the MAD cohorts. 66 subjects completed study treatment and one from the 50 mg BID MAD cohort withdrew consent for personal reasons.

MORF-057 was well tolerated in all cohorts and no safety signals were identified. MORF-057 demonstrated a favorable PK profile, where target engagement was confirmed, and a clear PK and PD relationship was established. MORF-057 was rapidly absorbed and systemic exposure was confirmed to increase approximately dose proportionally. The FE results suggest food intake has no impact on trough MORF-057 levels and that MORF-057 can be administered without regard to food in planned studies in patients.

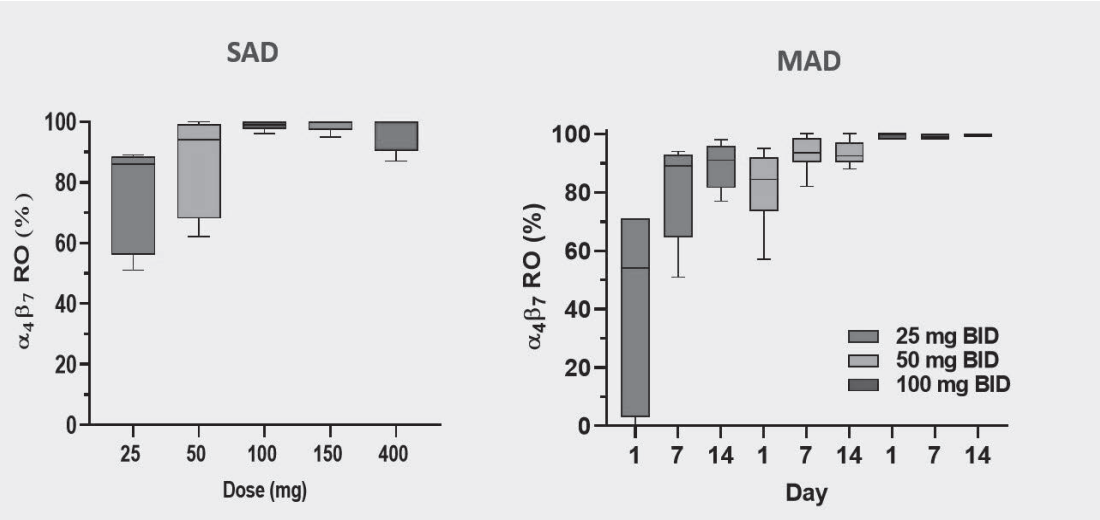


Figure 6: Receptor Occupancy with dose and study day, achieving saturation (>99%) in individuals in each cohort above 25 mg.

α4β7 RO increased with dose and study day, achieving saturation (>99% RO) (Figure 6) in individual patients from all cohorts above 25 mg by day 14. In the 100 mg BID cohort, MORF-057 saturated the α4β7 receptor (mean RO >99%) at all measured timepoints. Dose-and time-dependent changes in biomarkers including specific α4β7 high expressing immune cell populations were observed, adding to evidence of proof of biology for MORF-057. These changes were consistent with those reported with other integrin inhibitors including the antibody drug vedolizumab which is approved for the treatment of IBD.

In the MORF-057 Phase 1 study, subjects receiving MORF-057 at 200 mg BID demonstrated α4β7 receptor saturation and statistically significant increases in circulating central memory, effector memory T lymphocyte and switched memory B lymphocyte populations compared with placebo (Figure 7). At the 25 mg and 50 mg BID exploratory doses, directionally increasing trends were also observed in key pharmacodynamic measures. All doses were well tolerated, no safety signals were identified, and a favorable PK profile was observed. In both single doses of 200 mg MORF-057 and 200 mg BID over the 14 days, MORF-057 demonstrated α4β7 receptor saturation at C_{trough}. Statistically significant changes in lymphocyte subset populations and CCR9 mRNA were observed, consistent with previous studies. The full Phase 1 data set strongly supported the progression of MORF-057 into Phase 2 studies.

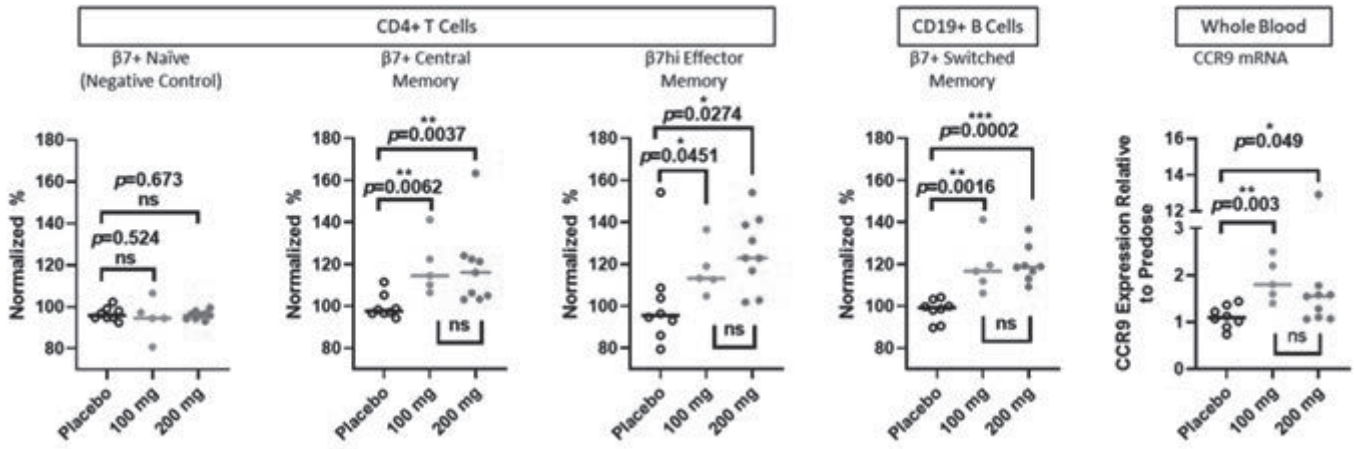


Figure 7: Lymphocyte subset populations were measured using multi-color flow cytometry. Subjects receiving MORF-057 at 100 mg BID and 200 mg BID demonstrated statistically significant increases in circulating lymphocyte subsets, consistent with mechanistic expectations.

Phase 2 EMERALD Program in Ulcerative Colitis

Based on the results from the Phase 1 studies, we initiated a Phase 2 clinical trial of MORF-057 in March 2022. EMERALD-1 (MORF-057-201), which is an open-label multi-center Phase 2a trial designed to evaluate the efficacy, safety and tolerability of MORF-057 in adults with moderate to severe UC, completed targeted enrollment in October 2022, with 30 patients enrolled in the study. Additionally, patients that were undergoing screening at the time the study completed targeted enrollment were enrolled in the study for a total of 35 patients enrolled in the main cohort. We elected to stop enrollment of an exploratory cohort at four patients who have previously failed treatment with vedolizumab. Patients enrolled in the EMERALD-1 study are being treated with 100 mg BID at sites in the United States and Poland. The primary endpoint of the trial is the change in RHI, a validated instrument that measures histological disease activity in UC at 12 weeks compared to baseline. Patients will then continue for an additional 40 weeks of maintenance therapy followed by a 52-week assessment. Secondary and additional outcome measures in the EMERALD-1 study include change in the mMCS, safety, PK parameters and key PD measures including α4β7 RO and lymphocyte subset trafficking. In April 2023, we announced topline results from the main cohort of the EMERALD-1 Phase 2a clinical trial of MORF-057, which met the primary endpoint and demonstrated a statistically significant reduction of 6.4 points (p=0.002) from baseline at week 12 in the RHI score. In the study, 25.7% of patients achieved clinical remission by mMCS. MORF-057 was generally well tolerated at the dose of 100 mg BID with no SAEs and no safety signal observed. Additionally, MORF-057 achieved saturation of α4β7 receptor and demonstrated changes in α4β7 lymphocyte subsets that are consistent with Phase 1 MORF-057 data. In August 2023, we announced the acceptance of a moderated poster presentation describing the EMERALD-1 study at UEG Week 2023 in October in Copenhagen. We presented the moderated poster presentation for the EMERALD-1 trial at UEG Week 2023, including 12 weeks of safety, PK parameters and key PD measures compared to baseline. On October 12, 2023, we presented additional data from the EMERALD-1 trial including 44 weeks of safety, PK parameters and key PD measures compared to baseline.

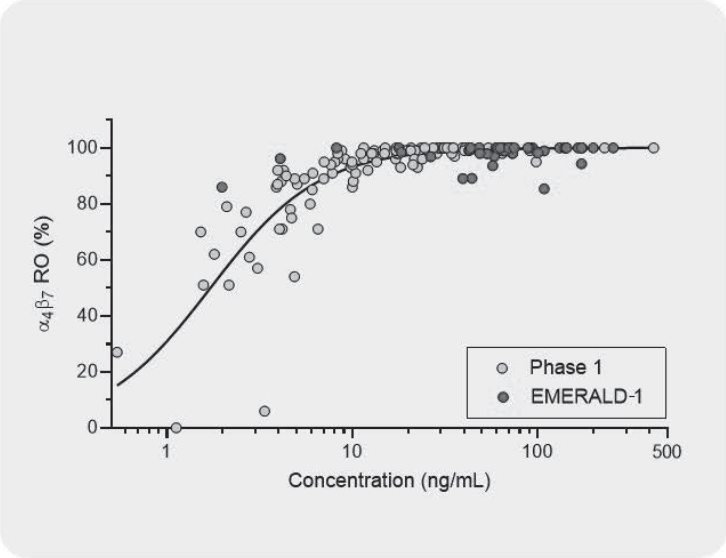
As shown in Figure 8, we observed no new SAEs or grade 3 treatment related adverse events, consistent with our previously reported data. Safety is one of the most important attributes of any IBD treatment, and the emerging profile of MORF-057 to date continues to be favorable.

MORF-057: Generally Well-Tolerated in EMERALD-1 No Safety Signal Observed (as of 10/10/23)*

Endpoint	Patients, N = 35
Patients with ≥1 TEAE, n (%)	12 (34.3)
Serious TEAEs, n (%)	0
Patients with AE leading to death, n (%)	0
Patients with any grade 3 TEAEs, n (%) UC exacerbation[a]	 2 (5.7)
Common TEAEs (>5%), n (%) UC exacerbation Anemia[b,c]	 4 (11.4) 3 (8.6)
Treatment-related TEAE, n (%)	2 (5.7)

Figure 8. MORF-057: Generally Well-Tolerated in EMERALD-1 No Safety Signal Observed
[a] Both UC exacerbations, one led to early discontinuation
[b] All anemia events occurred in patients who had anemia at baseline and continued on study with iron supplements
[c] A third of patients with inflammatory bowel disease have iron-deficiency anemia
**As of 10/10/23, patients had been on EMERALD-1 study beyond the 12-week induction period and no other safety signals or SAEs had been reported*

The data observed in EMERALD-1 shown in Figure 9 were consistent with the experience in healthy volunteer studies where we reported sustained saturation of the α4β7 receptor rapidly in the vast majority of patients at the 100 mg BID dose. The mean trough α4β7 RO was >98% at week 12 and the α4β1 projected RO was below the limit of quantification with mean trough RO estimated to be <15% with no lymphocytosis or changes to circulating naïve T-cells were observed, consistent with low levels of RO for α4β1.



α4β7 selectivity over α4β1 consistent with Phase 1 results

RO at 12 weeks		
	α4β7	α4β1
Mean	**>98%**	BLQ
Median	**>99%**	BLQ

- α4β7 RO achieved early and sustained saturating levels
- α4β1 RO remained at low levels
- No lymphocytosis or changes to circulating naïve T-cells were observed
- α4β1 projected RO was below the limit of quantitation with mean trough value estimated to be <15%

Figure 9. Patient a4β7 RO Consistent with Healthy Volunteer RO

The PD data in Figure 10 show substantial lymphocyte subset changes, consistent with engagement of the α4β7 receptor further confirming the mechanistic hypothesis. A significant increase was observed in circulating levels of effector memory T-cells, central memory T-cells, and switched memory B-cells; these changes are consistent with the Phase 1 trial observations, as well as with published vedolizumab data.

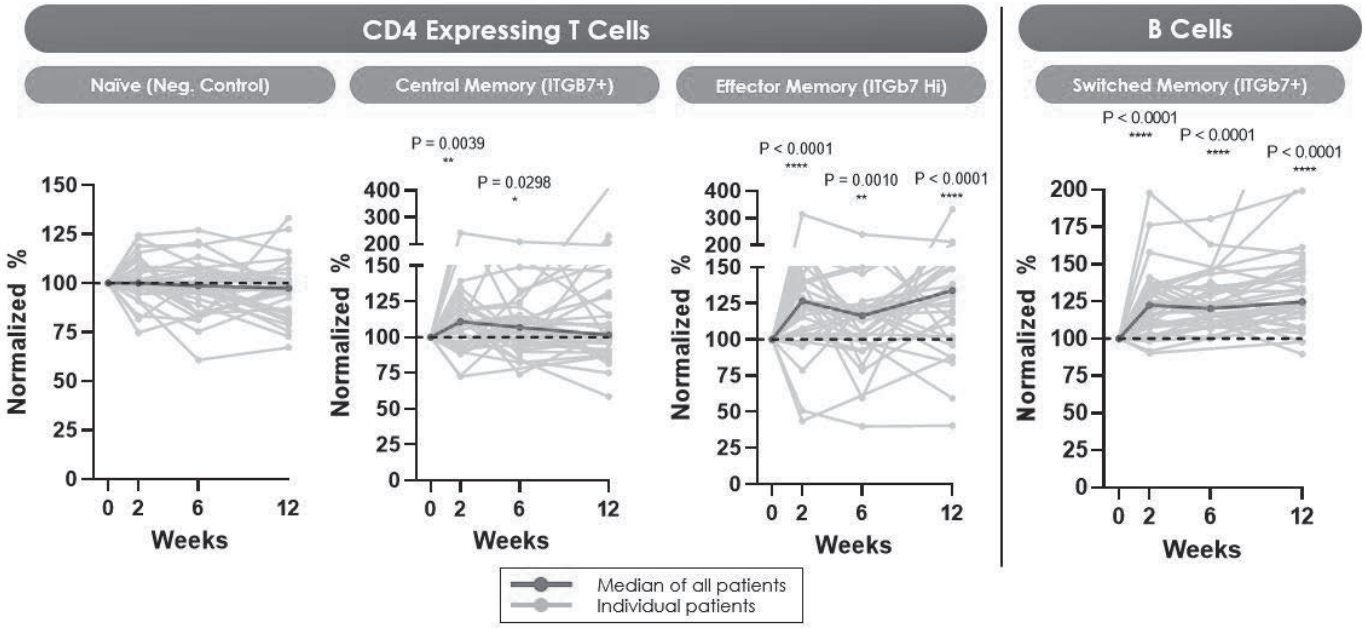


Figure 10. Substantial Lymphocyte Subset Changes Observed, Consistent with Engagement of α4β7

Key topline efficacy data are outlined in Figure 11. EMERALD-1 met its primary endpoint with a statistically significant reduction in RHI from baseline of 6.4 points (p=0.0019). The RHI remission rate of 22.9% is consistent with the mMCS remission rate of 25.7%. The endoscopic improvement rate of 25.7% was identical to the mMCS remission rate. Finally, we observed a 2.3 point mean reduction in mMCS at week 12.

Endpoint @ Week 12	Overall (N=35)
Change in RHI, Mean (SD)	**-6.4 (11.18)** ***p=0.0019***
RHI remission, n (%)	8 (22.9%)
Clinical response (mMCS)[1], n (%)	16 (45.7%)
Clinical remission (mMCS)[2], n (%)	9 (25.7%)
Endoscopic Response/Improvement[3], n (%)	9 (25.7%)
Change from baseline to Week 12 in the Modified MCS, Mean (SD)	-2.3 (2.14)

Figure 11. Primary Endpoint Met with Statistical Significance
[1]Clinical response (mMCS): decrease from baseline in the mMCS ≥2 points and ≥30% from baseline, plus a decrease in rectal bleeding subscore ≥1 or an absolute rectal bleeding subscore ≤1
[2]Clinical remission (mMCS): rectal bleeding subscore of 0; a stool frequency subscore of ≤1; and an MES of ≤1 without friability
[3]Endoscopic response / improvement: MES ≤1

Efficacy of MORF-057 in EMERALD-1 is shown in Figure 12 through individual patient mMCS changes at the end of the 12-week induction period. The waterfall plot shows the change from baseline in mMCS for each of the 35 patients in the EMERALD-1 study, the underlying patient-by-patient data from the study and shows that >75% of patients on MORF-057 in the EMERALD-1 study experienced improvements as measured by the mMCS at week 12.

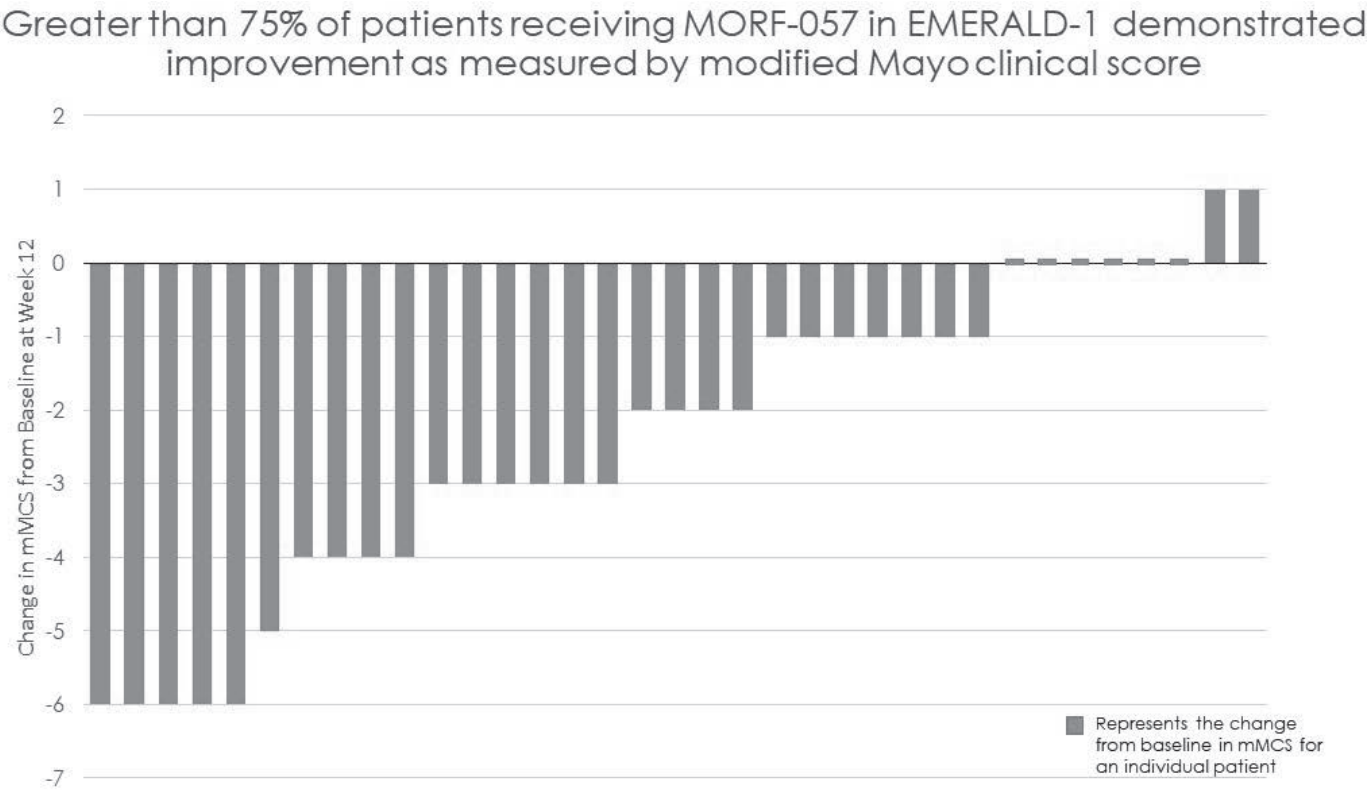


Figure 12. Change in Central mMCS By Patient from Baseline at Week 12

Figure 13 shows symptomatic remission data as of the 44-week period, at which time all patients had either completed their 44-week visit or had discontinued from the study. Symptomatic remission is a clinical, two component score. On the left, the intent to treat analysis includes all 35 patients enrolled in the study, while the right panel includes only those patients that completed a 44-week assessment. In a subset analysis, naïve patients responded more quickly, by week 6, and then sustained that response through the measured timepoints. Patients who were refractory to previous therapies took longer to achieve symptomatic remission, but by week 20 the proportion of advanced therapy experienced patients in symptomatic remission increased and was generally sustained through week 44.

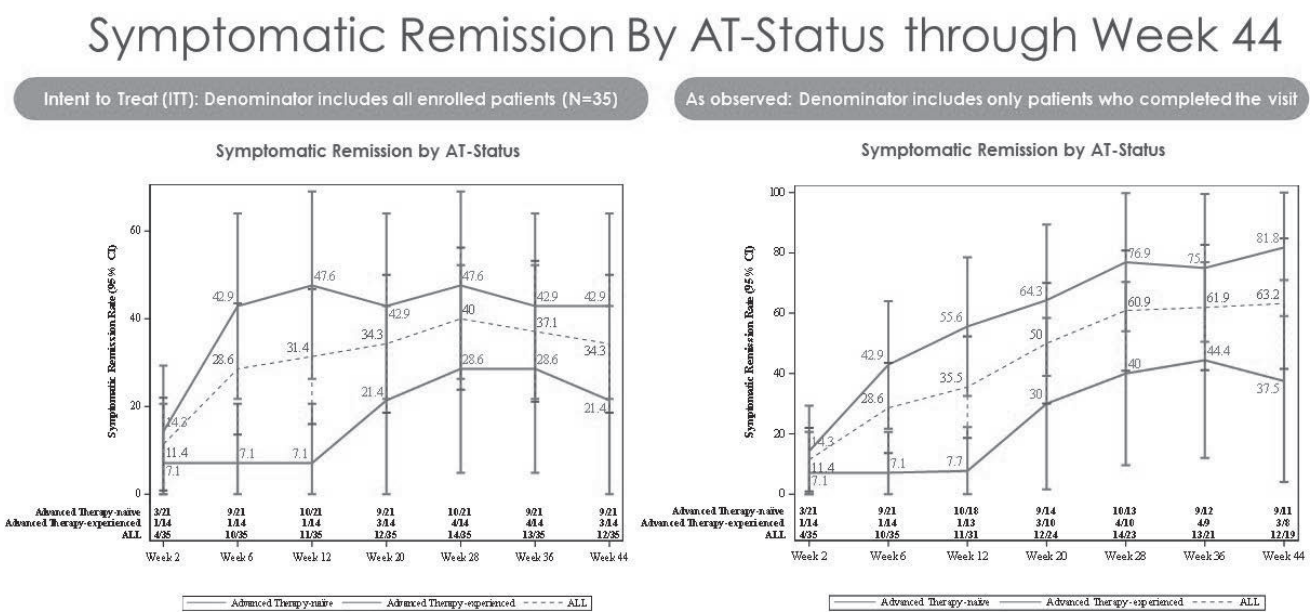


Figure 13. Symptomatic Remission is defined as a stool frequency subscore=0 (or =1 with a >=1-point decrease from baseline) and rectal bleeding subscore=0
Note: These are ad hoc analyses and are subject to change during the quality control and trial completion processes.

EMERALD-2 (MORF-057-202), which is a global Phase 2b randomized controlled trial of MORF-057, began in November 2022. Patients enrolled in the EMERALD-2 study will be randomized to receive one of three active doses or a placebo: 100 mg BID, 200 mg BID, QD (once daily), or a placebo which will cross over to MORF-057 after the 12-week induction phase. The primary endpoint of the trial is the clinical remission rate as measured by the mMCS at 12 weeks. The secondary endpoints will include the change in RHI, PK and PD measures, as well as safety parameters. Following the 12-week induction phase, patients will move to a 40-week maintenance phase. We believe that we will achieve completion of the primary endpoint from the EMERALD-2 Phase 2b trial of MORF-057 in patients with moderate to severe UC in the first half of 2025.

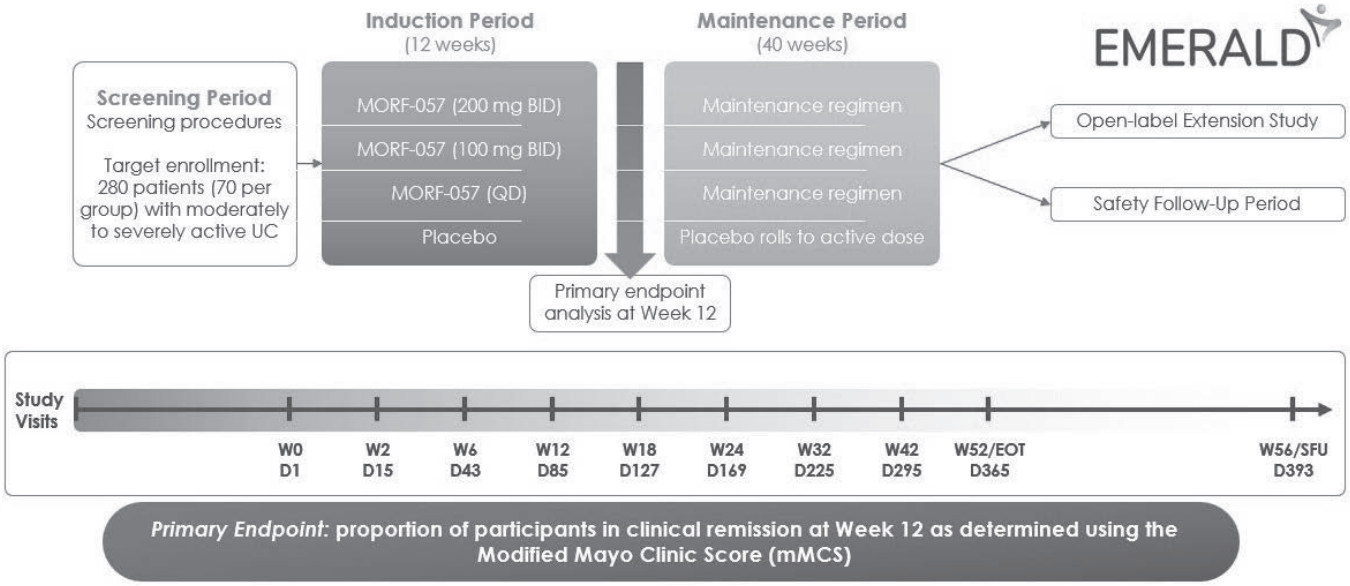


Figure 14. EMERALD-2 Phase 2b Study in Moderate to Severe UC

Anticipated Phase 2b GARNET Study Program in Crohn's Disease

Launch activities are underway for the GARNET Phase 2b (MORF-057-203) study of MORF-057 in Crohn's disease and we expect to begin dosing patients in the first half of 2024. GARNET is a global Phase 2b randomized controlled trial of MORF-057, where enrolled patients will be randomized to receive one of two active doses or a placebo: 200 mg BID, 100 mg BID or a placebo that will cross over to MORF-057 after the 14-week induction phase. The primary endpoint of the trial is the proportion of participants in endoscopic response (≥50% reduction) at week 14 as determined using SES-CD. The secondary endpoints will include the change in CDAI measures, as well as safety parameters. Following the 14-week induction phase, patients will move to a 38-week maintenance phase.

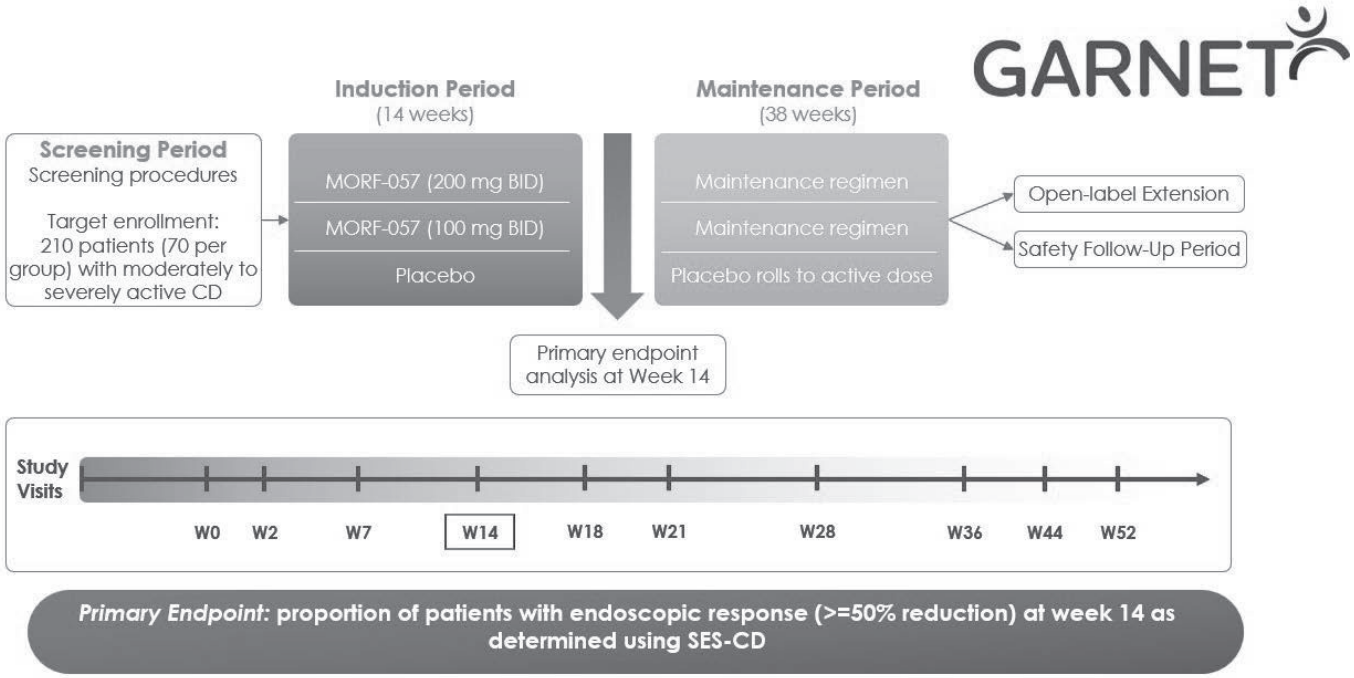


Figure 15. GARNET Phase 2b trial design

Additional Preclinical and Discovery Efforts

Next-generation α4β7 Integrin inhibitors for GI Diseases

Based on the well-understood biology of α4β7 inhibition and our progress with the MORF-057 program, Morphic has discovered and is advancing a family of next-generation α4β7 inhibitors through pre-clinical development with an initial therapeutic focus on potential development in GI indications beyond IBD, including eosinophilic GI disorders, pouchitis and other indications.

αvβ8 Integrin inhibitor program for myelofibrosis and immuno-oncology

We have advanced our αvβ8 integrin inhibitor through preclinical development for the treatment of myelofibrosis and solid tumors. We have previously presented promising pre-clinical oncology efficacy data. For example, in an immune-excluded model of breast cancer, a Morphic small molecule inhibitor reversed insensitivity to immune checkpoint blockade. However, based on the beneficial development path and commercial tractability of myelofibrosis, we have prioritized our αvβ8 inhibitor program in myelofibrosis over our immune-oncology program in solid tumors as we await clinical and competitive landscape developments from external αvβ8-targeted programs in immune-oncology.

Myelofibrosis is a subtype of myeloproliferative neoplasm, or MPN, a group of hematologic malignancies manifested with the overproduction of blood cells (erythrocytes, leukocytes, or platelets). Three MPN subtypes have been identified: polycythemia vera, or PV, essential thrombocythemia, or ET, and primary myelofibrosis, or PMF. PV or ET can progress into myelofibrosis. Constitutive activation of JAK-STAT signaling plays a central role in the pathogenesis of myelofibrosis. Progression from the early stage MPN to myelofibrosis is associated with the accumulative expansion of aberrant hematopoietic stem cells, carrying somatic mutations acquired decades before disease manifestation. Phenotypic mutations in the JAK2, CALR, and MPL genes are associated with most cases of myelofibrosis. Myelofibrosis is characterized by cytopenias, burdensome symptoms, splenomegaly, progressive bone marrow, or BM fibrosis, and extramedullary hematopoiesis as a response to profibrotic changes and cytokine abnormalities in the BM niche. The overall survival is poor, typically between 5-7 years on average.

The rationale for αvβ8 inhibition in myelofibrosis is based on its role in TGFβ activation. Inhibition blocks αvβ8-mediated TGF-β1 and TGF-β3 activation to enable tissue-specific and localized inhibition of TGF-β signaling, to avoid global inhibition of TGF-β signaling and to prevent adverse toxicities, including cardiovascular, and pro-neoplastic. αvβ8 is expressed on cell types related to myelofibrosis pathogenesis, being a key mediator of TGF-β activation in the bone marrow. While αvβ6 also activates TGFβ, the expression of β8 in both healthy and myelofibrosis patient-derived human bone marrow is much higher than the expression of β6 (Figure 16). This indicates that αvβ8 is the dominant integrin driving TGF-β activation in this biologically relevant tissue.

TGF-β likely plays a critical role in the pathogenesis of myeloproliferative neoplasms and myelofibrosis progression. It is upregulated in myelofibrosis patients, promoting collagen deposition and bone marrow fibrosis, hallmarks of myelofibrosis. It is reported to have a direct effect on megakaryopoiesis, inhibiting megakaryocyte maturation and platelet production. Additionally, it promotes dormancy of normal but not myelofibrosis hematopoietic stem cells. Inhibiting the TGF-β signaling pathway in myelofibrosis is expected to decrease the fibrogenic stimuli leading to myelofibrosis and concomitantly restore megakaryocyte maturation and normal hematopoiesis by increasing the number of wild-type but not mutated progenitor cells. We have determined that inhibition of αvβ8 in vivo leads to enrichment of megakaryocytes and reduction in osteoblasts, suggesting a potentially healthier bone marrow niche (Figure 16). Thus, an effective αvβ8 inhibitor allows for local and cell-type-specific suppression of TGF-β signaling, within the pathogenic niche. The only approved therapies are JAK inhibitors that do not report any improvement in fibrosis, erythrocytes, and platelets.

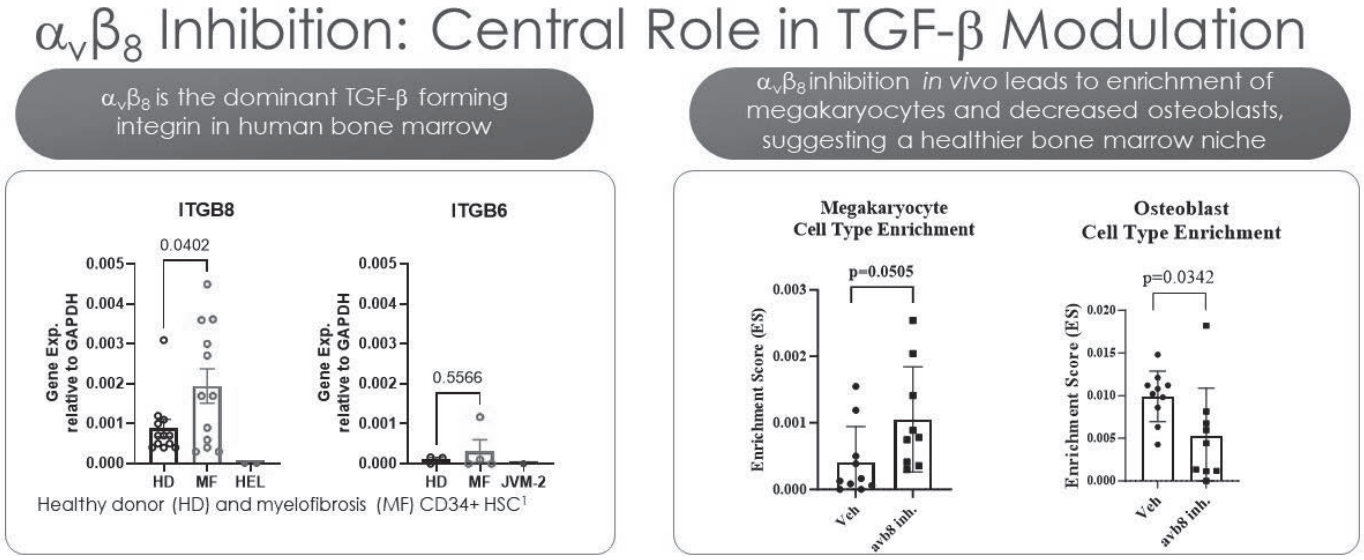


Figure 16. Left: Human gene expression profile in the bone marrow of healthy donors and myelofibrosis patients. Right: Enrichment of megakaryocytes and decreased osteoblasts after inhibition of $\alpha_V\beta_8$ in vivo.

[1]The HEL 92.1.7 (HEL) and JVM-2 cell lines were used as negative controls for ITGB8 and ITGB6 expression, respectively.

Based on the data we have generated to date and the potential role of TGF-β in treating myelofibrosis, we are advancing MORF-088, a selective small molecule inhibitor of αvβ8 for myelofibrosis. Further pre-clinical research is ongoing, and the creation of a robust translational plan is in progress to efficiently measure if this mechanism will be effective in myelofibrosis patients.

α5β1 inhibitor program for pulmonary hypertensive diseases

Inhibition of fibronectin integrins has been shown in preclinical studies to drive multiple key independent processes in hypertensive diseases including reversal of pulmonary vasculature remodeling, prevention of right ventricular fibrosis and improvement of cardiomyocyte metabolic efficiency.

PAH is a rare, progressive disorder characterized by pulmonary vascular remodeling, resulting in high pulmonary artery pressure and progressive right ventricular, or RV, dysfunction. Current treatments, which target the prostacyclin, endothelin-1, or nitric oxide pathways, slow disease progression. However, the 5-year survival rate of approximately 60% highlights the need for therapies targeting alternative pulmonary vascular remodeling pathways. It is now recognized that, like cancer cells, pulmonary artery, or PA, smooth muscle cells exhibit exaggerated proliferation and resistance to apoptosis in response to increased PA stiffness caused by extracellular matrix remodeling. Integrins are known to promote cell proliferation, survival, hypertrophic growth and fibrosis, which are key elements in the progression of PAH, thus integrin expression and their effects on PA remodeling and RV failure was examined (Bonnet et. al. presented at AHA 2021, Circulation. 2021; 144:A10717).

Expression of α5β1 is significantly increased in distal pulmonary arteries, pulmonary artery smooth muscle cells and the right ventricle from PAH patients. In addition, increased expression was found in monocrotaline (MCT) and pulmonary artery banding rats. Pharmacological inhibition of α5β1 in vitro decreased PAH pulmonary artery smooth muscle cell proliferation and resistance to apoptosis which were associated with a decreased activation of α5β1 downstream signaling pathways. In cardiomyocytes and human right ventricular fibroblasts, inhibition of these integrins decreased hypertrophy and right ventricular fibroblast activation and proliferation. Inhibition of α5β1 improved vascular remodeling and right ventricular function in vivo as assessed by echocardiography and right heart catheterization in MCT rats with established PAH. α5β1 inhibition resulted in improvements in vascular remodeling and RV failure, suggesting that $\alpha_5\beta_1$ plays an important role in the pathophysiology of PAH (Figure 17). In addition, incubation of an α5β1 inhibitor with precision cut lung slices from human PAH patients demonstrates reduced pulmonary artery smooth muscle proliferation, resulting in beneficial remodeling and reduced arterial wall thickness (Figure 18). The positive effects observed with α5β1 inhibition in pre-clinical PAH models is guiding Morphic in the pursuit of a lead molecule for future approaches in clinical development.

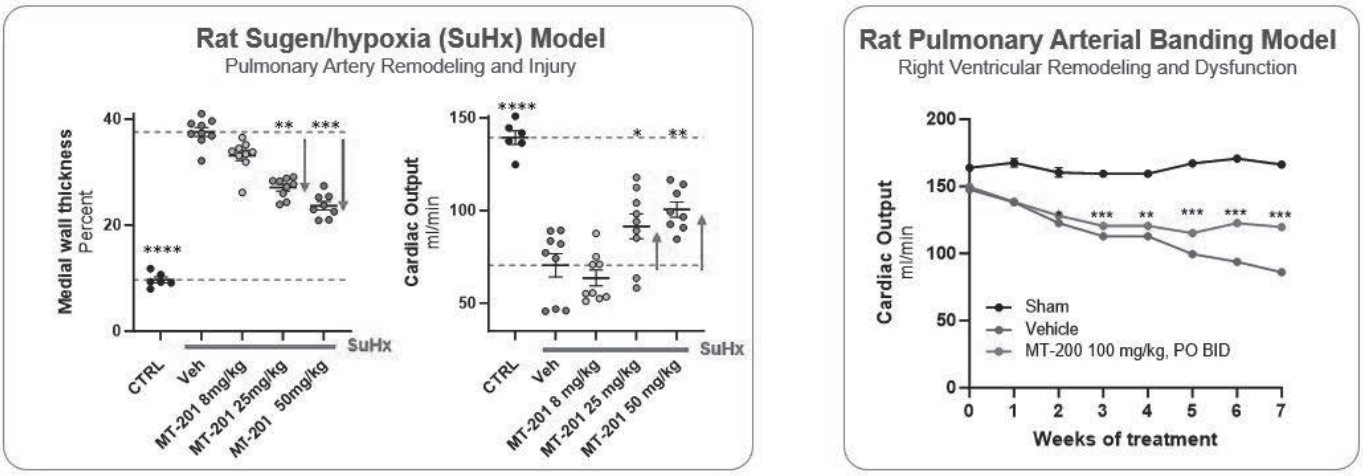


Figure 17: Pharmacological inhibition of fibronectin binding integrins with a broad-spectrum integrin small molecule inhibitor (SMi) with and without standard of care (SOC) reverses PAH in MCT-rat model with established PAH. The use of combination SOC and SMi preserves RV function.

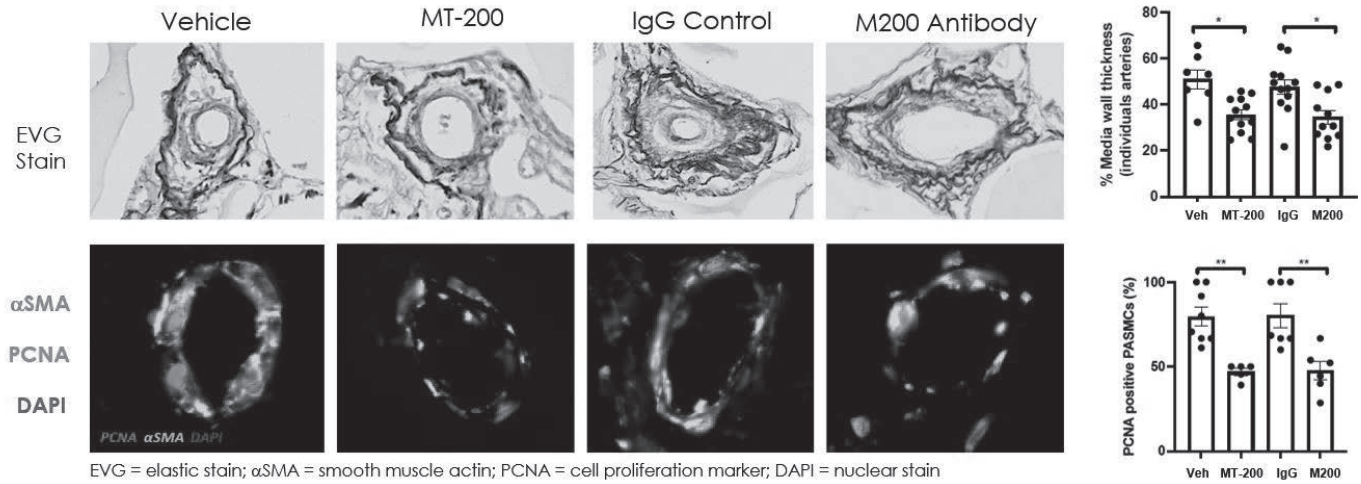


Figure 18: Inhibition of $\alpha_5\beta_1$ in precision cut lung slices from human PAH patients demonstrates reduced arterial wall thickness and reduced pulmonary artery smooth muscle proliferation.

Additional new integrin programs

Our strategy has enabled the identification of small molecule and antibody modulators of multiple integrin targets that allow in-depth interrogations of these mechanisms. We are considering additional integrin modulator programs for fibrosis-related indications, pulmonary/cardiovascular-related indications, and muscle-related indications. Due to the role of integrins in TGF-β activation, mechano-transduction, adhesion, cell migration and cell proliferation, integrins may trigger different pathways to initiate or exacerbate diseases under various pathophysiologic states, and their modulators may be distinctly well suited for treatment in the context of different organ systems. These programs are at different discovery stages, with at least one of them expected to reach the development candidate state in the next eighteen months.

Collaboration and License Agreements

Schrödinger Agreement

In June 2015, we entered into a collaboration agreement with Schrödinger, or as amended as of the date hereof, the Schrödinger Agreement, to explore drug targets selected by us. Under the collaboration, Schrödinger uses its technology platform to perform virtual screens, and we and Schrödinger collaborate to facilitate prioritization of targets, perform target validation and analysis, identify leads and perform lead optimization. Under the terms of the Schrödinger Agreement, Schrödinger exclusively works with us on integrin targets during the term thereof. In consideration for its performance of activities under the collaboration, Schrödinger has received approximately 3.4 million units of Series Seed preferred units. In addition, with respect to compounds identified as part of the collaboration, Schrödinger may be eligible to receive certain payments from us related to development milestones, not to exceed in the aggregate $3.1 million, on a target-by-target basis, a low six-figure payment upon initiation of lead optimization and on a compound-by-compound basis, as well as royalties in the low single digits on sales of products containing such compounds. In addition, we have agreed to pay Schrödinger a percentage, in the mid-single digits, of certain payments we receive from third parties in connection with the licensing or transfer of the rights to exploit such compounds to such third parties, and a one-time fee of $1.0 million paid in 2019. Schrödinger may terminate the Schrödinger Agreement under certain circumstances, including if a certain number of developmental milestones have not been achieved by us within a certain timeframe.

We have successfully used Schrödinger's technology platform to perform virtual screens of members of the target class of human integrins, and we and Schrödinger collaborate to facilitate prioritization of integrin targets, perform target validation and analysis, identify leads, and perform lead optimization to establish a portfolio of integrin programs. We believe the Schrödinger Agreement enables us to undertake accelerated drug discovery through design, iteration and optimization of leads using a variety of next-generation physics-based computational and machine learning technologies.

With our internal proven capabilities in structural biology, medicinal chemistry and screening, the Schrödinger platform accelerates our ability to design molecules with atomic precision utilizing our significant expertise in advanced structure-guided drug design technology, and machine learning protocols. In December 2022, we expanded our access as a special Schrödinger software customer enabling utilization of their software suite beyond the scope of integrins. As a result, in 2023, we began advancing additional clinically validated targets with a focus in the inflammation and immunology therapeutic areas, which are highly complementary to our current assets within the integrin space. These additional targets include the IL23 and TL1A pathways, among others. Injectable inhibitors of these targets have been shown to provide significant clinical benefits to IBD patients. Utilizing our expertise in small molecule drug design and optimization, we are pursuing inhibitors against these targets. If we are successful, we believe these agents would be optimal to combine with MORF-057 to achieve enhanced clinical efficacy in IBD patients.

Children's Medical Center Corporation Agreement

In October 2015, we entered into an exclusive license agreement, as amended as of the date hereof, the CMCC Agreement, with the Children's Medical Center Corporation, or CMCC, relating to technology on inhibiting integrins developed by Dr. Springer during his employment at Boston Children's Hospital, an affiliate of CMCC. Under this agreement, we have an exclusive license under certain patent rights, and a non-exclusive license under certain know-how, owned by CMCC to develop and commercialize products worldwide for any therapeutic or diagnostic use in humans and veterinary applications. We also have the option to add new patent rights and know-how generated by the laboratory of Dr. Springer within a specified time after the effective date of the CMCC Agreement for additional payments consistent with fair market value. In consideration of the license grants, upon execution of the CMCC Agreement we issued CMCC a number of shares of common stock representing 6% of the then issued and outstanding units on a fully diluted basis. We also paid CMCC an upfront license issue fee of $50,000, and reimbursed CMCC for certain patent prosecution costs. We also agreed to pay CMCC a license maintenance fee for the first three years after the effective date of the CMCC Agreement, certain development milestones, a percentage of sublicensing income we may receive, and running royalties in the low single digits on net sales of licensed products.

Under the CMCC Agreement, we have agreed to use commercially reasonably efforts to bring one or more licensed products to market, and to implement activities in a development plan within the timeframes set forth therein. In addition, if we fail to meet one or more specific developmental milestones, and do not take appropriate corrective action, then CMCC shall have the right to terminate the agreement.

Intellectual Property

Our success depends, in part, on our ability to protect our intellectual property related to (i) our product candidates and related methods, and (ii) our MInT Platform for generating integrin structures and modulators of those structures. Our success also depends on having the freedom to operate to enable commercialization of our product candidates, if approved, and preventing others from infringing our patent rights. We protect our MInT Platform using trade secrets, proprietary know-how, and, on rare occasion, patents. We protect our small molecule products using patents, and our policy is to seek product patent protection in key jurisdictions, including the United States, major European countries, and other jurisdictions we deem appropriate or as required by our collaboration agreements.

We file patent applications with respect to claims to compositions comprising our small-molecule inhibitors that modulate integrin activity, the compounds themselves, the use of such compounds to treat disease, as well as related manufacturing methods.

Patent Rights

We have exclusively licensed issued U.S. patents and pending U.S. patent applications from CMCC with claims relating to modified integrin polypeptides and modified integrin polypeptide dimers. The licensed U.S. patents and any other U.S. patents that may issue from the pending U.S. patent applications are expected to expire in 2035, absent any adjustments or extensions. In addition, we rely extensively on trade secret protection for our MInT Platform, which extends beyond the initial integrin technology licensed from CMCC.

As of December 31, 2023, we solely owned various issued patents and pending patent applications with respect to compositions of matter and methods of use for treating therapeutic indications related to the α4β7 integrins in the United States and many other major jurisdictions worldwide, including Europe, Japan and China. The expected expiration dates for the patents (or patent applications if granted) directed to our α4β7 program compounds are between 2039 and 2041 plus any extensions or adjustments of term available under national law.

Intellectual Property Protection

We cannot predict whether the patent applications we pursue will issue as patents in any particular jurisdiction or whether the claims of any issued patents will provide any proprietary protection from competitors. Further, any issued patents may expire before the expected expiration dates disclosed above due to actions taken during patent prosecution, such as submission of a disclaimer surrendering the term of a patent beyond a certain date. Even if our pending patent applications are granted as issued patents, those patents, as well as any patents we license from third parties, may be challenged, circumvented or invalidated by third parties. While there are currently no contested proceedings or third-party claims relating to any of the patent applications described above, we cannot provide any assurances that we will not have such proceedings or third-party claims at a later date or once any patent is granted.

The term of a patent depends upon the legal term of patents in the particular country in which it is obtained. In most countries in which we file, the patent term is 20 years from the earliest date of filing a non-provisional patent application. In the United States, the term of a patent that covers an FDA-approved drug may be eligible for patent term extension, which permits in some cases restoration of patent term as compensation for patent term lost during the FDA regulatory review process. In certain circumstances, the Hatch-Waxman Act permits a patent term extension of up to five years beyond the unextended expiration date of the U.S. patent. The length of the patent term extension is related to the length of time the approved drug is under regulatory review. Patent term extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval, and only one patent applicable to an approved drug may be extended. Provisions are available in Europe and other foreign jurisdictions to extend the term of a patent that covers an approved drug, or provide an additional period of protection for the approved pharmaceutical product following expiry of the patent. In the future, if our products receive FDA approval, we expect to apply for patent term extensions on patents covering those products. We plan to seek patent term extensions to any of our issued patents in any jurisdiction where these are available; however, there is no guarantee that the applicable authorities, including the U.S. Patent and Trademark Office in the United States and the national patent offices in Europe, will agree with our assessment of whether such extensions should be granted, and, if granted, the length of such extensions.

In addition to our reliance on patent protection for our inventions, product candidates, and research programs, we also rely on trade secret protection for our confidential and proprietary information. For example, certain elements of our MInT Platform may be based on unpatented trade secrets that are not publicly disclosed. Although we take steps to protect our proprietary information and trade secrets, including through contractual means with our employees and consultants, third parties may independently develop substantially equivalent proprietary information and techniques, or otherwise gain access to our trade secrets or disclose our technology. Thus, we may not be able to meaningfully protect our trade secrets. It is our policy to require our employees, consultants, outside scientific collaborators, sponsored researchers, and other advisors to execute confidentiality agreements upon the commencement of employment or consulting relationships with us. These agreements provide that all confidential information concerning our business or financial affairs developed or made known to the individual or entity during the course of the party's relationship with us is to be kept confidential, and not disclosed to third parties except in specific circumstances. In the case of employees, the agreements provide that all inventions conceived by the individual, and which are related to our current or planned business or research and development or made during normal working hours, on our premises or using our equipment or proprietary information, are our exclusive property. In addition, we take other appropriate precautions, such as physical and technological security measures, to guard against misappropriation of our proprietary technology by third parties. We have also adopted policies and conduct training that provides guidance on our expectations and practices to protect our trade secrets.

Manufacturing

Currently, all of our clinical manufacturing facilities for clinical drug manufacturing, storage, distribution or quality testing is outsourced to third-party manufacturers. As our development programs progress and we build new process efficiencies, we expect to continually evaluate this strategy with the objective of satisfying demand for registration trials and, if approved, the manufacture, sale and distribution of commercial products.

Competition

The biotechnology and pharmaceutical industries are characterized by rapid evolution of technologies, fierce competition and strong defense of intellectual property. While we believe that our MInT Platform and our knowledge, experience and scientific resources provide us with competitive advantages, we face competition from major pharmaceutical and biotechnology companies, academic institutions, governmental agencies and public and private research institutions, among others.

Any product candidates that we successfully develop and commercialize will compete with currently approved therapies and new therapies that may become available in the future. Key product features that would affect our ability to effectively compete with other therapeutics include the efficacy, safety and convenience of our products.

Despite significant biopharmaceutical industry investment, no oral integrin therapies have been approved in the United States or Europe. We are developing MORF-057, an oral small molecule α4β7-specific integrin inhibitor, for the treatment of IBD. Currently approved IBD therapies include Entyvio (vedolizumab), an injectable α4β7 monoclonal antibody marketed by Takeda Pharmaceutical Company Limited, as well as therapies with different mechanisms of action marketed by AbbVie Inc., Johnson & Johnson, UCB, Biogen Inc., Pfizer Inc., Eli Lilly and Company, and Bristol-Myers Squibb, in addition to other pharmaceutical companies, against which our product candidate may compete, if approved. Further, we are aware of oral α4β7 therapies in clinical development for IBD by Gilead Sciences, Inc, and EA Pharma Co. LTD, as well as therapies with different mechanisms of action in clinical development by AbbVie Inc., Johnson & Johnson, Pfizer, Inc., Eli Lilly and Company, Merck, Roche, Sanofi, Teva, Takeda, and Bristol-Myers Squibb, in addition to other pharmaceutical companies.

Our αvβ8-specific small molecule integrin inhibitor program is under development for the treatment of myelofibrosis and solid tumors. Currently approved myelofibrosis therapies include the oral JAK inhibitors Jakafi (ruxolitinib), marketed by Incyte Corp and Novartis International AG, Inrebic (fedratinib), marketed by Bristol-Myers Squibb, Vonjo (pacritinib), marketed by Swedish Orphan Biovitrum AB, and Ojjaara (momelotinib), marketed by GlaxoSmithKline plc. We are aware of myelofibrosis therapies in clinical development by MorphoSys AG, Incyte Corp, Geron Corporation, AbbVie Inc., and Bristol-Myers Squibb in addition to other pharmaceutical companies. There are currently no approved αvβ8 inhibitors for any indication. We are aware of αvβ8 targeted therapies in clinical development for the treatment of solid tumors, including a monoclonal antibody by Pfizer, Inc. and small molecule by Pliant Therapeutics. In addition, we are aware of a preclinical stage anti-αvβ8 monoclonal antibody for solid tumors from Corbus Pharmaceuticals Holdings, Inc. Furthermore, there are multiple antibody and small molecule therapeutics targeting the TGF-β pathway for the treatment of solid tumors in development by Novartis International AG, AbbVie Inc., Roche Holding AG, Merck & Co., Inc., Bristol-Myers Squibb, and Scholar Rock, in addition to other pharmaceutical companies.

Our α5β1-specific small molecule integrin inhibitor program is under development for the treatment of pulmonary hypertensive diseases, including PAH. Currently approved PAH therapies include the endothelin pathway agents Letaris (ambrisentan), marketed by Gilead Sciencs, Inc., Tracleer (bosentan), marketed by Johnson & Johnson, and Opsumit (macitentan), marketed by Johnson & Johnson; nitric oxide pathway agents Revatio (sildenafil), marketed by Viatris Inc., Adcirca (tadalafil), marketed by United Therapeutics Corporation, and Adempas (riociguat), marketed by Bayer AG; and prostacyclin pathway agents Uptravi (selexipag), marketed by Johnson & Johnson, Orenitram (oral treprostinil), marketed by United Therapeutics Corporation, Ventavis (iloprost), marketed by Johnson and Johnson, Tyvaso (inhaled treprostinil), marketed by United Therapeutics Corporation, Flolan (epoprostenol), marketed by GlaxoSmithKline plc, and Remodulin (parenteral treprostinil), marketed by United Therapeutics Corporation; in addition to other pharmaceutical companies. We are aware of PAH therapies in clinical development including agents by Merck & Co., Inc., Liquidia Corporation, Gossamer Bio, Inc., Aerovate Therapeutics, Inc., United Therapeutics Corporation, and Keros Therapeutics, Inc., in addition to other pharmaceutical companies.

Many of our competitors have significantly greater financial resources and expertise than we do in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved products. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs. Additionally, our competitors may also include companies that are or will be developing therapies for the same therapeutic areas that we are targeting, including autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer.

Government Regulation

Pharmaceutical products are subject to extensive regulation by government authorities in the United States, at the federal, state and local level, and in other countries and jurisdictions. The processes for obtaining regulatory approvals in the United States and in foreign countries and jurisdictions, along with subsequent compliance with applicable statutes and regulations and other regulatory authorities, require the expenditure of substantial time and financial resources.

FDA Approval Process

In the United States, pharmaceutical products are subject to extensive regulation by the FDA. The Federal Food, Drug, and Cosmetic Act, or FD&C Act, and other federal and state statutes and regulations govern, among other things, the research, development, testing, manufacture, storage, recordkeeping, approval, labeling, promotion and marketing, distribution, post-approval monitoring and reporting, sampling and import and export of pharmaceutical products. Failure to comply with applicable U.S. requirements may subject a company to a variety of administrative or judicial sanctions, such as clinical hold, FDA refusal to approve pending new drug applications, or NDAs, warning or untitled letters, product recalls, product seizures, total or partial suspension of production, sale, distribution, injunctions, fines, civil penalties and criminal prosecution.

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

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

The FDA may order the temporary, or permanent, discontinuation of a clinical trial at any time, or impose other sanctions, if it believes that the clinical trial either is not being conducted in accordance with FDA requirements or presents an unacceptable risk to the clinical trial patients. The study protocol and informed consent information for patients in clinical trials must also be submitted to an institutional review board, or IRB, and ethics committee for approval. An IRB may also require the clinical trial at the site to be halted, either temporarily or permanently, for failure to comply with the IRB's requirements, or may impose other conditions.

Clinical trials to support NDAs for marketing approval are typically conducted in three sequential phases, but the phases may overlap. In Phase 1, the initial introduction of the drug into healthy human subjects or patients, the drug is tested to assess metabolism, PK, pharmacological actions, side effects associated with increasing doses, and, if possible, early evidence of effectiveness. Phase 2 usually involves trials in a limited patient population to determine the effectiveness of the drug for a particular indication, dosage tolerance and optimum dosage, and to identify common adverse effects and safety risks. If a drug demonstrates evidence of effectiveness and an acceptable safety profile in Phase 2 evaluations, Phase 3 trials are undertaken to obtain the additional information about clinical efficacy and safety in a larger number of patients, typically at geographically dispersed clinical trial sites, to permit the FDA to evaluate the overall benefit-risk relationship of the drug and to provide adequate information for the labeling of the drug. In most cases, the FDA requires two adequate and well-controlled Phase 3 clinical trials to demonstrate the efficacy of the drug. A single Phase 3 trial may be sufficient in rare instances, including (1) where the study is a large multicenter trial demonstrating internal consistency and a statistically very persuasive finding of a clinically meaningful effect on mortality, irreversible morbidity or prevention of a disease with a potentially serious outcome and confirmation of the result in a second trial would be practically or ethically impossible or (2) when in conjunction with other confirmatory evidence.

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

After completion of the required clinical testing, an NDA is prepared and submitted to the FDA. FDA approval of the NDA is required before marketing of the product may begin in the U.S. The NDA must include the results of all preclinical, clinical and other testing and a compilation of data relating to the product's pharmacology, chemistry, manufacture and controls. The cost of preparing and submitting an NDA is substantial. The submission of most NDAs is additionally subject to a substantial application user fee, currently exceeding $4,000,000 for Fiscal Year 2024, and the manufacturer and/or sponsor under an approved NDA are also subject to annual program fees, currently exceeding $410,000 for each prescription product for Fiscal Year 2024. These fees are typically increased annually. Sponsors of applications for drugs granted Orphan Drug Designation are exempt from these user fees.

The FDA has 60 days from its receipt of an NDA to determine whether the application will be filed based on the agency's threshold determination that it is sufficiently complete to permit substantive review. Once the submission is filed, the FDA begins an in-depth review. The FDA has agreed to certain performance goals in the review of NDAs to encourage timeliness. Most applications for standard review drug products are reviewed within ten to twelve months of the date of submission of the NDA to the FDA; most applications for priority review drugs are reviewed in six to eight months of the date of submission of the NDA to the FDA. Priority review can be applied to drugs that the FDA determines offer major advances in treatment or provide a treatment where no adequate therapy exists. The review process for both standard and priority review may be extended by the FDA for three additional months to consider certain late-submitted information, or information intended to clarify information already provided in the submission.

The FDA may also refer applications for novel drug products, or drug products that present difficult questions of safety or efficacy, to an outside advisory committee — typically a panel that includes clinicians and other experts — for review, evaluation and a recommendation as to whether the application should be approved. The FDA is not bound by the recommendation of an advisory committee, but it generally follows such recommendations.

Before approving an NDA, the FDA will typically inspect one or more clinical sites to assure compliance with GCP. Additionally, the FDA will inspect the facility or the facilities at which the drug is manufactured. The FDA will not approve the product unless compliance with current good manufacturing practices, or cGMPs, is satisfactory and the NDA contains data that provide substantial evidence that the drug is safe and effective in the indication studied.

After the FDA evaluates the NDA and the manufacturing facilities, it issues either an approval letter or a complete response letter. A complete response letter generally outlines the deficiencies in the submission and may require substantial additional testing, or information, in order for the FDA to reconsider the application. If, or when, those deficiencies have been addressed to the FDA's satisfaction in a resubmission of the NDA, The FDA will issue an approval letter. The FDA has committed to reviewing such resubmissions in two or six months depending on the type of information included. An approval letter authorizes commercial marketing of the drug with specific prescribing information for specific indications. As a condition of NDA approval, the FDA may require a risk evaluation and mitigation strategy, or REMS, to help ensure that the benefits of the drug outweigh the potential risks. REMS can include medication guides, communication plans for healthcare professionals, and

elements to assure safe use, or ETASU. ETASU can include, but are not limited to, special training or certification for prescribing or dispensing, dispensing only under certain circumstances, special monitoring and the use of patient registries. The requirement for a REMS can materially affect the potential market and profitability of the drug. Moreover, product approval may require substantial post-approval testing and surveillance to monitor the drug's safety or efficacy. Once granted, product approvals may be withdrawn if compliance with regulatory standards is not maintained or problems are identified following initial marketing.

Changes to some of the conditions established in an approved application, including changes in indications, labeling, or manufacturing processes or facilities, require submission and FDA approval of a new NDA or NDA supplement before the change can be implemented. An NDA supplement for a new indication typically requires clinical data similar to that in the original application, and the FDA uses the same procedures and actions in reviewing NDA supplements as it does in reviewing NDAs.

Fast Track Designation and Accelerated Approval

The FDA is required to facilitate the development, and expedite the review, of drugs that are intended for the treatment of a serious or life-threatening disease or condition for which there is no effective treatment and which demonstrate the potential to address unmet medical needs for the condition. Under the Fast Track program, the sponsor of a new drug candidate may request that the FDA designate the drug candidate for a specific indication as a Fast Track drug concurrent with, or after, the filing of the IND for the drug candidate. The FDA must determine if the drug candidate qualifies for Fast Track Designation within 60 days of receipt of the sponsor's request. If a submission is granted Fast Track Designation, the sponsor may engage in more frequent interactions with the FDA, and the FDA may review sections of the NDA before the application is complete. This rolling review is available if the applicant provides, and the FDA approves, a schedule for the submission of the remaining information and the applicant pays applicable user fees. However, the FDA's time period goal for reviewing an application does not begin until the last section of the NDA is submitted. Additionally, Fast Track Designation may be withdrawn by the FDA if the FDA believes that the designation is no longer supported by data emerging in the clinical trial process.

Under the FDA's accelerated approval regulations, the FDA may approve a drug for a serious or life-threatening illness that provides meaningful therapeutic benefit to patients over existing treatments based upon a surrogate endpoint that is reasonably likely to predict clinical benefit, or on a clinical endpoint that can be measured earlier than irreversible morbidity or mortality, that is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity or prevalence of the condition and the availability or lack of alternative treatments. The accelerated approval pathway is contingent on a sponsor's agreement to conduct additional post-approval confirmatory studies to verify and describe the product's clinical benefit. These confirmatory trials must be completed with due diligence and, in most cases, the FDA may require that the trial be designed, initiated, and/or fully enrolled prior to approval. Failure to conduct required post-approval studies, or to confirm a clinical benefit during post-marketing studies, would allow the FDA to withdraw the product from the market on an expedited basis.

The Food and Drug Omnibus Reform Act, or FDORA, includes provisions related to the accelerated approval pathway. Pursuant to FDORA, the FDA is authorized to require a post-approval study to be underway prior to approval or within a specified time period following approval. FDORA also requires the FDA to specify conditions of any required post-approval study, which may include milestones such as a target date of study completion and requires sponsors to submit progress reports for required post-approval studies and any conditions required by the FDA not later than 180 days following approval and not less frequently than every 180 days thereafter until completion or termination of the study. FDORA enables the FDA to initiate enforcement action for the failure to conduct with due diligence a required post-approval study, including a failure to meet any required conditions specified by the FDA or to submit timely reports.

In clinical trials, a surrogate endpoint is a measurement of laboratory or clinical signs of a disease or condition that substitutes for a direct measurement of how a patient feels, functions or survives. Surrogate endpoints can often be measured more easily or more rapidly than clinical endpoints. A drug candidate approved on this basis is subject to rigorous post-marketing compliance requirements, including the completion of Phase 4 or post-approval clinical trials to confirm the effect on the clinical endpoint. Failure to conduct required post-approval studies, or confirm a clinical benefit during post-marketing studies, will allow the FDA to withdraw the drug from the market on an expedited basis. All promotional materials for drug candidates approved under accelerated regulations are subject to priority review by the FDA.

Breakthrough Therapy Designation

The FDA is also required to expedite the development and review of the application for approval of drugs that are intended to treat a serious or life-threatening disease or condition where preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints. Under the Breakthrough Therapy program, the sponsor of a new drug candidate may request that the FDA designate the drug candidate for a specific indication as a breakthrough therapy concurrent with, or after, the filing of the IND for the drug candidate. The FDA must determine if the drug candidate qualifies for Breakthrough Therapy designation within 60 days of receipt of the sponsor's request.

Orphan Drugs

Under the Orphan Drug Act, the FDA may grant Orphan Drug Designation to drugs intended to treat a rare disease or condition — generally a disease or condition that affects fewer than 200,000 individuals in the U.S. Orphan Drug designation must be requested before submitting an NDA. After the FDA grants Orphan Drug Designation, the generic identity of the drug and its potential orphan use are disclosed publicly by the FDA. Orphan Drug Designation does not convey any advantage in, or shorten the duration of, the regulatory review and approval process. The first NDA applicant to receive FDA approval for a particular active ingredient to treat a particular disease with FDA Orphan Drug Designation is entitled to a seven-year exclusive marketing period in the U.S. for that product, for that indication. During the seven-year exclusivity period, the FDA may not approve any other applications to market the same drug for the same disease, except in limited circumstances, such as a showing of clinical superiority to the product with orphan drug exclusivity. Orphan drug exclusivity does not prevent the FDA from approving a different drug for the same disease or condition, or the same drug for a different disease or condition. Among the other benefits of Orphan Drug Designation are tax credits for certain research and an exemption from the NDA application user fee.

Disclosure of Clinical Trial Information

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

Pediatric Information

Under the Pediatric Research Equity Act, or PREA, NDAs or supplements to NDAs must contain data to assess the safety and effectiveness of the drug for the claimed indications in all relevant pediatric subpopulations and to support dosing and administration for each pediatric subpopulation for which the drug is safe and effective. The FDA may grant full or partial waivers, or deferrals, for submission of data. With certain exceptions, PREA does not apply to any drug for an indication for which orphan designation has been granted.

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

Post-Approval Requirements

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

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

The Hatch-Waxman Act

Orange Book Listing

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

The ANDA applicant is required to certify to the FDA concerning any patents listed for the approved product in the FDA's Orange Book. Specifically, the applicant must certify that (i) the required patent information has not been filed; (ii) the listed patent has expired; (iii) the listed patent has not expired but will expire on a particular date and approval is sought after patent expiration; or (iv) the listed patent is invalid or will not be infringed by the new product. The ANDA applicant may also elect to submit a section viii statement certifying that its proposed ANDA label does not contain (or carve out) any language regarding the patented method-of-use rather than certify to a listed method-of-use patent. If the applicant does not challenge the listed patents, the ANDA application will not be approved until all the listed patents claiming the referenced product have expired. A certification that the new product will not infringe the already approved product's listed patents, or that such patents are invalid, is called a Paragraph IV certification. If the ANDA applicant has provided a Paragraph IV certification to the FDA, the applicant must also send notice of the Paragraph IV certification to the NDA and patent holders once the ANDA has been 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. The filing of a patent infringement lawsuit within 45 days of the receipt of a Paragraph IV certification automatically prevents the FDA from approving the ANDA until the earlier of 30 months, expiration of the patent, settlement of the lawsuit, or a decision in the infringement case that is favorable to the ANDA applicant.

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

Exclusivity

Upon NDA approval of a new chemical entity, or NCE, which is a drug that contains no active moiety that has been approved by the FDA in any other NDA, that drug receives five years of marketing exclusivity during which the FDA cannot receive any ANDA seeking approval of a generic version of that drug. An ANDA may be submitted one year before NCE exclusivity expires if a Paragraph IV certification is filed. If there is no listed patent in the Orange Book, there may not be a Paragraph IV certification, and, thus, no ANDA may be filed before the expiration of the exclusivity period. Certain changes to a drug, such as the addition of a new indication to the package insert, can be the subject of a three-year period of exclusivity if the application contains reports of new clinical investigations (other than bioavailability studies) conducted or sponsored by the sponsor that were essential to the approval of the application. The FDA cannot approve an ANDA for a generic drug that includes the change during the exclusivity period.

Patent Term Extension

After NDA approval, owners of relevant drug patents may apply for up to a five-year patent extension. The allowable patent term extension is generally calculated as half of the drug's testing phase (the time between IND application and NDA submission) and all of the review phase (the time between NDA submission and approval) up to a maximum of five years. If the extended patent was issued during the development or review period, the calculation begins from the date of patent issuance. The review period can be shortened if the FDA determines that the applicant did not pursue approval with due diligence. The total patent term after the extension may not exceed 14 years, and only one patent can be extended. For patents that might expire during the application phase, the patent owner may request an interim patent extension. An interim patent extension increases the patent term by one year and may be renewed up to four times. For each interim patent extension granted, the post-approval patent extension is reduced by one year. The director of the United States Patent and Trademark Office must determine that approval of the drug covered by the patent for which a patent extension is being sought is likely. Interim patent extensions are not available for a drug for which an NDA has not been submitted.

Other Healthcare Laws

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

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

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

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

In addition, HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, including the Final Omnibus Rule published on January 25, 2013, impose obligations on certain healthcare providers, health plans, and healthcare clearinghouses, known as covered entities, as well as their business associates that perform certain services involving the storage, use or disclosure of individually identifiable health information, including mandatory contractual terms, with respect to safeguarding the privacy, security, and transmission of individually identifiable health information, and require notification to affected individuals and regulatory authorities of certain breaches of security of individually identifiable health information. HITECH increased the civil and criminal penalties that may be imposed against covered entities, business associates and possibly other persons, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorney's fees and costs associated with pursuing federal civil actions. In addition, many state laws govern the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and may not have the same effect, and often are not pre-empted by HIPAA. For example, the California Consumer Privacy Act of 2018, or CCPA, imposes obligations on businesses to which it applies, including, but not limited to, providing specific disclosures in privacy notices and affording California residents certain rights related to their personal data, although it exempts some data processed in the context of clinical trials. In addition, the California Privacy Rights Act of 2020, or CPRA, which went into effect on January 1, 2023, imposes additional obligations on companies covered by the legislation and significantly modifies the CCPA, including by expanding consumers' rights with respect to certain sensitive personal information. The CPRA also creates a new state agency that is vested with authority to implement and enforce the CCPA and CPRA. Virginia's Consumer Data Protection Act, which took effect on January 1, 2023, requires businesses subject to the legislation to conduct data protection assessments in certain circumstances and requires opt-in consent from consumers to acquire and process their sensitive personal information, which includes information revealing a consumer's physical and mental health diagnosis and genetic and biometric information that can identify a consumer. In addition, Colorado enacted the Colorado Privacy Act, and Connecticut enacted the Connecticut Data Privacy Act, each of which took effect on July 1, 2023, and Utah enacted the Consumer Privacy Act, which became effective on December 31, 2023, and each of these laws may increase the complexity, variation in requirements, restrictions and potential legal risks, and could require increased compliance costs and changes in business practices and policies. Other states have also enacted, proposed, or are considering proposing, data privacy laws, which could further complicate compliance efforts, increase our potential liability and adversely affect our business. Further, pursuant to the federal Physician Payments Sunshine Act, enacted as part of the ACA, the Centers for Medicare & Medicaid Services, or CMS, has issued a final rule that requires manufacturers of approved prescription drugs that are reimbursable under Medicare, Medicaid, or the Children's Health Insurance Program, with certain exceptions, to collect and report information on certain payments or transfers of value to physicians, physician assistants, nurse practitioners or clinical nurse specialists, certified registered nurse anesthetists, certified nurse-midwives and teaching hospitals, as well as investment interests held by physicians and their immediate family members. The reports must be submitted on an annual basis. The reported data is made available in searchable form on a public website on an annual basis. Failure to submit required information may result in civil monetary penalties.

In addition, several states now require prescription drug companies to report certain expenses relating to the marketing and promotion of drug products and to report gifts and payments to individual healthcare practitioners in these states. Other states prohibit various marketing-related activities, such as the provision of certain kinds of gifts or meals. Several states, including California, Connecticut, Nevada, and Massachusetts, require pharmaceutical companies to implement compliance programs and/or marketing codes. Still other states require the posting of information relating to clinical studies and their outcomes. A growing number of states require the reporting of certain drug pricing information, including information pertaining to and justifying price increases and the prices of newly launched drugs, or prohibit prescription drug price gouging. In addition, certain states require pharmaceutical companies to implement compliance programs and/or marketing codes. Certain states and local jurisdictions also require the registration of pharmaceutical sales and medical representatives. Compliance with these laws is difficult and time consuming, and companies that do not comply with these state laws face civil penalties.

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

U.S. Healthcare Reform

In the United States there have been, and continue to be, proposals by the federal government, state governments, regulators and third-party payors to control or manage the increased costs of health care and, more generally, to reform the U.S. healthcare system. The pharmaceutical industry has been a particular focus of these efforts and has been significantly affected by major legislative initiatives. For example, in March 2010, the ACA was enacted, which was intended to broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against fraud and abuse, add new transparency requirements for the healthcare and health insurance industries, impose new taxes and fees on the health industry and impose additional health policy reforms.

There have also been and continue to be a number of initiatives at the United States federal and state levels that seek to reduce healthcare costs, including the Budget Control Act (which, subject to certain temporary suspension periods, imposed 2% reductions in Medicare payments to providers per fiscal year starting April 1, 2013 and, due to subsequent legislative amendments to the statute, that will remain in effect through 2031, unless additional congressional action is taken). Further, in November 2020, the U.S. Department of Health and Human Services, or HHS, finalized a regulation removing safe harbor protection for price reductions from pharmaceutical manufacturers to plan sponsors under Part D, either directly or through pharmacy benefit managers, unless the price reduction is required by law. The rule also creates a new safe harbor for price reductions reflected at the point-of-sale, as well as a safe harbor for certain fixed fee arrangements between pharmacy benefit managers and manufacturers. The implementation of this final rule was delayed by the Biden administration until January 1, 2023 and subsequently delayed by the Inflation Reduction Act, or IRA, until January 1, 2032. In December 2020, CMS issued a final rule implementing significant manufacturer price reporting changes under the Medicaid Drug Rebate Program, including regulations that affect manufacturer-sponsored patient assistance programs subject to pharmacy benefit manager accumulator programs and Best Price reporting related to certain value-based purchasing arrangements. In addition, under the American Rescue Plan Act of 2021, effective January 1, 2024, the statutory cap on Medicaid Drug Rebate Program rebates that manufacturers pay to state Medicaid programs is eliminated. Elimination of this cap may require pharmaceutical manufacturers to pay more in rebates than they receive on the sale of products.

Several healthcare reform proposals recently culminated in the enactment of the IRA in August 2022, which will eliminate, beginning in 2025, the coverage gap under Medicare Part D by significantly lowering the enrollee maximum out-of-pocket cost and requiring manufacturers to subsidize, through a newly established manufacturer discount program, 10% of Part D enrollees' prescription costs for brand drugs below the out-of-pocket maximum, and 20% once the out-of-pocket maximum has been reached. among other things, The IRA also allows HHS to directly negotiate the selling price of a statutorily specified number of drugs and biologics each year that CMS reimburses under Medicare Part B and Part D. Only high-expenditure single-source drugs that have been approved for at least 7 years (11 years for biologics) are eligible to be selected by CMS for negotiation, with the negotiated price taking effect two years after the selection year. Negotiations for Medicare Part D products begin in 2024 with the negotiated price taking effect in 2026, and negotiations for Medicare Part B products begin in 2026 with the negotiated price taking effect in 2028. In August 2023, HHS announced the ten Medicare Part D drugs and biologics that it selected for negotiations. HHS will announce the negotiated maximum fair prices by September 1, 2024. This price cap, which cannot exceed a statutory ceiling price, will come into effect on January 1, 2026, and will represent a significant discount from average prices to wholesalers and direct purchasers. The IRA will imposes rebates on Medicare Part B and Part D drugs whose prices have increased at a rate greater than the rate of inflation. The IRA also extends enhanced subsidies for individuals purchasing health insurance coverage in ACA marketplaces through plan year 2025. The IRA permits the Secretary of HHS to implement many of these provisions through guidance, as opposed to regulation, for the initial years. Manufacturers that fail to comply with the IRA may be subject to various penalties, including civil monetary penalties. These provisions may be subject to legal challenges.

Additionally, on May 30, 2018, the Trickett Wendler, Frank Mongiello, Jordan McLinn, and Matthew Bellina Right to Try Act of 2017 was signed into law. The law, among other things, provides a federal framework for certain patients to access certain investigational new drug products that have completed a Phase 1 clinical trial and that are undergoing investigation for FDA approval. Under certain circumstances, eligible patients can seek treatment without enrolling in clinical trials and without obtaining FDA authorization under an FDA expanded access program; however, manufacturers are not obligated to provide investigational new drug products under the current federal right to try law.

Human Capital

Employees

As of December 31, 2023, we had 121 full-time employees. Of these employees, 52 have an M.D. or a Ph.D. From time to time, we also retain independent contractors to support our organization. None of our employees are represented by a labor union or covered by collective bargaining agreements, and we believe our relationship with our employees is good.

Diversity & Inclusion

We are committed to creating and maintaining a workplace free from discrimination or harassment on the basis of color, race, sex, national origin, ethnicity, religion, age, disability, sexual orientation, gender identification or expression or any other status protected by applicable law. Our management team and employees are expected to exhibit and promote honest, ethical and respectful conduct in the workplace. All of our employees must adhere to a code of conduct that sets standards for appropriate behavior and are required to attend annual training to help prevent, identify, report and stop any type of discrimination and harassment. Our recruitment, hiring, development, training, compensation and advancement at our company is based on qualifications, performance, skills and experience without regard to gender, race and ethnicity.

Competitive Pay & Benefits

We strive to provide pay, comprehensive benefits and services that help meet the varying needs of our employees. Our total rewards package includes competitive pay, comprehensive healthcare benefits package for employees; family medical leave and flexible work schedules. In addition, we offer every full-time employee, both exempt and non-exempt, the benefit of equity ownership in the company through stock option grants and our employee stock purchase plan. We sponsor a 401(k) plan and we match employee contributions up to a certain limit.

Employee Development & Training

We focus on attracting, retaining, and cultivating talented individuals. We emphasize employee development and training by providing access to a wide range of online and instructor-led development and continual learning programs. Employees are encouraged to attend scientific, clinical and technological meetings and conferences and have access to broad resources they need to be successful.

Safety

The safety, health and wellness of our employees is a top priority. We continue to monitor developments regarding health pandemics or other concerns, and will implement any safety protocols that may become necessary in the future.

Corporate Information

We were formed under the laws of the State of Delaware in August 2014 under the name Integrin Rock, LLC. We subsequently changed our name to Morphic Rock Holding, LLC in October 2014 and then to Morphic Holding, LLC in June 2016. On December 5, 2018, we completed a series of transactions, or the Reorganization, pursuant to which Morphic Holding, LLC was converted in a tax-free reorganization into Morphic Holding, Inc. and three wholly-owned subsidiaries, namely Lazuli, Inc., Tourmaline, Inc, and Phyllite, Inc, were merged with and into another wholly-owned subsidiary, Morphic Therapeutic, Inc. Our principal executive offices are located at 35 Gatehouse Drive, A2, Waltham, MA 02451, and our telephone number is (781) 996-0955. Our website address is www.morphictx.com. The information contained on, or that can be accessed through, our website is not part of, and is not incorporated by reference into, this Annual Report.

Available Information

We file annual, quarterly and current reports, proxy statements and other documents with the Securities and Exchange Commission, or SEC, under the Securities Exchange Act of 1934, as amended, or Exchange Act. The SEC maintains a website that contains reports, proxy and information statements, and other information regarding issuers, including us, that file electronically with the SEC. The public can obtain any documents that we file with the SEC at www.sec.gov. Copies of each of our filings with the SEC can also be viewed and downloaded free of charge at our website, www.morphictx.com, after the reports and amendments are electronically filed with or furnished to the SEC.

Item 1A. ***Risk Factors***

Investing in our common stock involves a high degree of risk. Before making your decision to invest in shares of our common stock, you should carefully consider the risks described below, together with the other information contained in this Annual Report on Form 10-K, including our consolidated financial statements and the related notes and "Management's Discussion and Analysis of Financial Condition and Results of Operations". The risks and uncertainties described below are not the only ones we face. Additional risks and uncertainties that we are unaware of, or that we currently believe are not material, may also become important factors that affect us. We cannot assure you that any of the events discussed below will not occur. These events could have a material and adverse impact on our business, financial condition, results of operations and prospects. If that were to happen, the trading price of our common stock could decline, and you could lose all or part of your investment.

Summary of Risk Factors

The below summary risks provide an overview of many of the risks we are exposed to in the normal course of our business activities. As a result, the below summary risks do not contain all of the information that may be important to you, and you should read the summary risks together with the more detailed discussion of risks set forth following this section under the heading "Risk Factors," as well as elsewhere in this Annual Report on Form 10-K under the heading "Management's Discussion and Analysis of Financial Condition and Results of Operations." Additional risks, beyond those summarized below or discussed in "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations," may apply to our activities or operations as currently conducted or as we may conduct them in the future or in the markets in which we operate or may in the future operate. Consistent with the foregoing, we are exposed to a variety of risks, including risks associated with:

- We are a clinical stage biopharmaceutical company with a limited operating history and no products approved for commercial sale. We have a history of significant losses and expect to continue to incur significant losses for the foreseeable future.
- We will need substantial additional funds to advance development of our product candidates, which may not be available on acceptable terms, or at all. Failure to obtain this necessary capital when needed may force us to delay, limit or terminate our product development programs, commercialization efforts or other operations.
- Our product candidates are in various stages of development and may fail in development or suffer delays that materially adversely affect their commercial viability. If we or our collaborators are unable to complete development of, or commercialize, our product candidates or experience significant delays in doing so, our business will be materially harmed.
- Our current and future clinical trials or those of any collaborators may reveal significant adverse events not seen in our preclinical studies and may result in a safety profile that could inhibit regulatory approval or market acceptance of any of our product candidates.
- We have historically entered into collaborations and may, in the future, seek to enter into collaborations with third parties for the discovery and development of our therapeutic candidates. If our future collaborators cease development efforts under collaboration agreements, or if those agreements are terminated, the collaborations may fail to lead to commercial products, and we may never receive milestone payments or future royalties under the agreements.
- We and/or our collaborators may be unable to obtain, or may be delayed in obtaining, U.S. or foreign regulatory approval and, as a result, unable to commercialize our product candidates.
- Any inability to attract and retain qualified key management and technical personnel would impair our ability to implement our business plan.
- Our principal stockholders and management own a significant percentage of our stock and will be able to control matters subject to stockholder approval.
- Even if we are able to commercialize any product candidate, such product candidate may become subject to unfavorable pricing regulations or third-party coverage and reimbursement policies, which would harm our business.
- We face competition from entities that have developed or may develop product candidates for autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer, including companies developing novel treatments and technology platforms. If these companies develop technologies or product candidates more rapidly than we do or their technologies are more effective, our ability to develop and successfully commercialize product candidates may be adversely affected.

- Anti-takeover provisions in our charter documents and under Delaware law could prevent or delay an acquisition of us, which may be beneficial to our stockholders, and may prevent attempts by our stockholders.
- The exclusive forum provision in our restated certificate of incorporation may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or any of our directors, officers, or other employees, which may discourage lawsuits with respect to such claims.

Risks Related to Our Financial Position and Need for Capital

We are a clinical stage biopharmaceutical company with a limited operating history and no products approved for commercial sale. We have a history of significant losses and expect to continue to incur significant losses for the foreseeable future.

We are a clinical stage biopharmaceutical company with a limited operating history. Biopharmaceutical product development is a highly speculative undertaking because it entails substantial upfront capital expenditures and significant risk that any potential product candidate will fail to demonstrate adequate effect or an acceptable safety profile, gain regulatory approval or become commercially viable.

Our lead product candidate, MORF-057, has completed a Phase 1 clinical trial in healthy volunteers. We continue our Phase 2 program for MORF-057, initially in UC, and in April 2023 presented positive data from the main cohort (n=35) of the EMERALD-1 open-label, single-arm Phase 2a trial of MORF-057 at a dose of 100 mg BID in patients with moderate to severe UC. We began dosing patients with moderate to severe UC under our EMERALD-2 global Phase 2b randomized controlled trial of MORF-057 in November 2022, and expect to initiate the Phase 2b study for MORF-057 in Crohn's disease in the first half of 2024. We have no products approved for commercial sale and have not generated any revenue from commercial product sales to date, and we will continue to incur significant research and development and other expenses related to our clinical development and ongoing operations. For the fiscal year ended December 31, 2023, we reported a net loss of $152.1 million. As of December 31, 2023, we had an accumulated deficit of approximately $449.2 million. Substantially all of our losses have resulted from expenses incurred in connection with our research and development programs and from general and administrative costs associated with our operations. We expect to incur significant losses for the foreseeable future, and we expect these losses to increase as we continue our research and development of our product candidates.

We anticipate that our expenses will increase substantially if, and as, we:

- conduct clinical trials for our current and any future product candidates;
- discover and develop new product candidates, and conduct research and development activities, preclinical studies and clinical trials on those candidates;
- manufacture, or have manufactured, preclinical, clinical and commercial supplies of our product candidates;
- seek regulatory approvals for our product candidates or any future product candidates;
- commercialize our current product candidates or any future product candidates, if approved;
- attempt to transition from a company with a research focus to a company capable of supporting commercial activities, including establishing sales, marketing and distribution infrastructure;
- hire additional clinical, scientific and management personnel;
- add operational, financial and management information systems and personnel, including international operations;
- identify additional compounds or product candidates and acquire rights from third parties to those compounds or product candidates through licenses; and
- experience any delays in our preclinical or clinical studies and efforts to obtain regulatory approval for our product candidates, whether as a result of regional conflicts around the world, recent instability in the banking sector, inflation and market volatility, interest rate fluctuations, uncertainty with respect to the federal debt ceiling and budget and the related potential for government shutdowns, cybersecurity events, the ongoing labor shortage, global supply chain disruptions, the weakening of the global and U.S. economies, or otherwise).

Even if we succeed in commercializing one or more product candidates, we may continue to incur substantial research and development and other expenditures to develop and market additional product candidates. We may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business. The size of our future net losses will depend, in part, on the rate of future growth of our expenses and our ability to generate revenue.

Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital.

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

Our ability to become and remain profitable depends on our ability to generate revenue. We do not expect to generate significant revenue unless and until we, either alone or with a collaborator, are able to obtain regulatory approval for, and successfully commercialize, our lead product candidate for our α4β7 program, or any other product candidates we may develop. Successful commercialization will require achievement of many key milestones, including demonstrating safety and efficacy in clinical trials, obtaining regulatory, including marketing, approval for these product candidates, manufacturing, marketing and selling those products for which we, or any of our current or future collaborators, may obtain regulatory approval, satisfying any post-marketing requirements and obtaining reimbursement for our products from private insurance or government payors. Because of the uncertainties and risks associated with these activities, we are unable to accurately and precisely predict the timing and amount of any future revenue, the extent of any further losses or if or when we might achieve profitability. We and any current or future collaborators may never succeed in these activities and, even if we do, or any collaborators do, we may never generate revenues that are large enough for us to achieve profitability. Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis.

Our failure to become and remain profitable may depress the market price of our common stock and could impair our ability to raise capital, expand our business or continue our operations. If we continue to suffer losses as we have in the past, investors may not receive any return on their investment and may lose their entire investment.

We will need substantial additional funds to advance development of our product candidates, which may not be available on acceptable terms, or at all. Failure to obtain this necessary capital when needed may force us to delay, limit or terminate our product development programs, commercialization efforts or other operations.

The development of biopharmaceutical product candidates is capital-intensive. As our product candidates enter and advance through preclinical studies and clinical trials, we will need substantial additional funds to expand or create our development, regulatory, manufacturing, marketing and sales capabilities. We have used substantial funds to develop our technology and product candidates to date, and will require significant funds to conduct further research and development and preclinical testing and clinical trials of our product candidates, to seek regulatory approvals for our product candidates and to manufacture and market products, if any, which are approved for commercial sale.

Since our inception, we have invested a significant portion of our efforts and financial resources in research and development activities and preclinical testing and clinical trials of our product candidates. As of December 31, 2023, we had $704.3 million in cash, cash equivalents and marketable securities. Based on our current operating plan, we believe that our existing cash, cash equivalents and marketable securities will be sufficient to fund our operating expenses and capital expenditure requirements into the second half of 2027. However, our future capital requirements and the period for which we expect our existing resources to support our operations and future capital requirements may vary significantly from what we expect, and we may need to seek additional funds sooner than planned. Because the length of time and activities associated with successful research and development of our product candidates is highly uncertain, we are unable to estimate the actual funds we will require for development and any marketing and commercialization activities for approved products. Our future funding requirements, both near- and long-term, will depend on many factors, including, but not limited to:

- the timing, cost and progress of preclinical and clinical development activities;
- the number and scope of preclinical and clinical programs we decide to pursue;
- the progress of the development efforts of parties with whom we have entered or may in the future enter into collaborations and/or research and development agreements;
- the timing and amount of milestone and other payments we may receive or make under any collaboration agreements;
- our ability to maintain our current licenses and research and development programs and to establish new collaboration arrangements;
- the costs involved in prosecuting and enforcing patent and other intellectual property claims;
- the costs of manufacturing our product candidates by third parties;
- the cost of regulatory submissions and timing of regulatory approvals;

- the cost of commercialization activities if our product candidates or any future product candidates are approved for sale, including marketing, sales and distribution costs;
- our efforts to enhance operational systems and hire additional personnel, including personnel to support development of our product candidates; and
- our need to implement additional internal systems and infrastructure, including financial and reporting systems to satisfy our obligations as a public company.

Our ability to raise additional funds may be adversely impacted by worsening global economic conditions, including as a result of disruptions to and volatility in the credit and financial markets in the United States and worldwide, increases in inflation, interest rate fluctuations, uncertainty with respect to the federal debt ceiling and budget and the related potential for government shutdowns, the ongoing labor shortage, disruptions to global supply chains, and regional conflicts around the world. Moreover, there has been recent turmoil in the global banking system. For example, on March 10, 2023, Silicon Valley Bank ("SVB"), was closed by the California Department of Financial Protection and Innovation, which appointed the Federal Deposit Insurance Corporation ("FDIC") as receiver for SVB. Similarly, on March 12, 2023, Silvergate Capital Corp. and Signature Bank were each swept into receivership. While the FDIC took steps to make depositors of SVB whole, First-Citizens Bank & Trust Company assumed our deposits from SVB, and we regained access to those funds, there is no guarantee that the federal government would similarly guarantee all depositors in the event of future bank closures. Continued instability in the global banking system may adversely impact our business and financial condition. Moreover, events such as the closure of SVB, in addition to global macroeconomic conditions discussed above, may cause further turbulence and uncertainty in the capital markets. Further deterioration of the macroeconomic environment and any regulatory action taken in response thereto may adversely affect our business, operating results, and financial condition. If we are unable to obtain funding on a timely basis or on acceptable terms, we may have to delay, reduce or terminate our research and development programs and preclinical studies or clinical trials, limit strategic opportunities or undergo reductions in our workforce or other corporate restructuring activities. To date, we have primarily financed our operations through payments received under our collaboration agreements, the sale of equity securities and debt financing.

We will be required to seek additional funding in the future and currently intend to do so through public or private equity offerings or debt financings, additional collaborations and/or licensing agreements, credit or loan facilities, or a combination of one or more of these funding sources. If we raise additional funds by issuing equity securities, including pursuant to our currently effective registration statement on Form S-3ASR, our stockholders may suffer dilution and the terms of any financing may adversely affect the rights of our stockholders.

In addition, as a condition to providing additional funds to us, future investors may demand, and may be granted, rights superior to those of existing stockholders. Our future debt financings, if any, are likely to involve restrictive covenants limiting our flexibility in conducting future business activities, and, in the event of insolvency, debt holders would be repaid before holders of our equity securities received any distribution of our corporate assets. If we raise additional funds through licensing or collaboration arrangements with third parties, we may have to relinquish valuable rights to our product candidates, or grant licenses on terms that are not favorable to us. We also could be required to seek collaborators for product candidates at an earlier stage than otherwise would be desirable or relinquish our rights to product candidates or technologies that we otherwise would seek to develop or commercialize ourselves. Failure to obtain capital when needed on acceptable terms or at all may force us to delay, limit or terminate our product development and commercialization of our current or future product candidates, which could have a material and adverse effect on our business, financial condition, results of operations and prospects.

Risks Related to Discovery, Development and Commercialization

Our business is heavily dependent on the success of our current and future product candidates, including our lead product candidate for our α4β7 program. Existing and future preclinical studies and clinical trials of these product candidates may not be successful, and if we are unable to commercialize these product candidates or experience significant delays in doing so, our business will be materially harmed.

We have invested a significant portion of our efforts and financial resources in the development of our α4β7-specific integrin inhibitors program. Our ability to generate commercial product revenues, which we do not expect will occur for many years, if ever, will depend heavily on the successful development and eventual commercialization of our lead product candidate for our α4β7 program. We have not previously submitted a new drug application, or NDA, to the FDA, or similar regulatory approval filings to comparable foreign authorities, for any product candidate, and we cannot be certain that our product candidates will be successful in clinical trials or receive regulatory approval. Further, our product candidates may not receive regulatory approval even if they are successful in clinical trials. In addition, regulatory authorities may not complete their review processes in a timely manner, or additional delays may result if an FDA Advisory Committee or

other regulatory authority recommends non-approval or restrictions on approval. In addition, we may experience delays or rejections based upon additional government regulation from future legislation or administrative action, or changes in regulatory authority policy during the period of product development, clinical trials and the review process. Regulatory authorities also may approve a product candidate for more limited indications than requested or with labeling that includes warnings, contraindications or precautions with respect to conditions of use. Regulatory authorities may also require Risk Evaluation and Mitigation Strategies, or REMS, or the performance of costly post-marketing clinical trials. If we do not receive regulatory approvals for our product candidates, we may not be able to continue our operations. Even if we successfully obtain regulatory approvals to market our product candidates, our revenues will be dependent, in part, upon the size of the markets in the territories for which we gain regulatory approval and have commercial rights. If the markets for patient subsets that we are targeting are not as significant as we estimate, we may not generate significant revenues from sales of such products, if approved.

We plan to seek regulatory approval to commercialize our product candidates both in the United States and in selected foreign countries. In order to obtain separate regulatory approvals in other countries, we must comply with numerous and varying regulatory requirements of such countries regarding safety and efficacy. Other countries also have their own regulations governing, among other things, clinical trials and commercial sales, as well as pricing and distribution of our product candidates, and we may be required to expend significant resources to obtain regulatory approval, which may not be successful, and to comply with ongoing regulations in these jurisdictions.

The success of our current and future product candidates will depend on many factors, including the following actions to be taken by us or our collaborators, as applicable:

- successful completion of necessary preclinical studies to enable the initiation of clinical trials;
- successful enrollment of patients in, and the completion of, our clinical trials with favorable results;
- receiving required regulatory authorizations for the development and approvals for the commercialization of our product candidates;
- establishing and maintaining arrangements with third-party manufacturers;
- obtaining and maintaining patent and trade secret protection and non-patent exclusivity for our product candidates and their components;
- enforcing and defending our intellectual property rights and claims;
- achieving desirable therapeutic properties for our product candidates' intended indications;
- launching commercial sales of our product candidates, if and when approved, whether alone or in collaboration with third parties;
- acceptance of our product candidates, if and when approved, by patients, the medical community and third-party payors;
- effectively competing with other therapies; and
- maintaining an acceptable safety profile of our product candidates through clinical trials and following regulatory approval.

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

Our product candidates are in various stages of development and may fail in development or suffer delays that materially adversely affect their commercial viability. If we are unable to complete development of, or commercialize, our product candidates or experience significant delays in doing so, our business will be materially harmed.

We have no products on the market and our product candidates are in various stages of clinical-stage development. Additionally, we have a portfolio of targets and programs that are in earlier stages of discovery and preclinical development and may never advance to clinical-stage development. Our ability to achieve and sustain profitability depends on obtaining regulatory approvals for and successfully commercializing our product candidates, either alone or with third parties, and we cannot guarantee you that we will ever obtain regulatory approval for any of our product candidates. We have limited experience in conducting and managing the clinical trials necessary to obtain regulatory approvals, including approval by the FDA. Before obtaining regulatory approval for the commercial distribution of our product candidates, we or any collaborator must conduct extensive preclinical tests and clinical trials to demonstrate the safety and efficacy in humans of our product candidates.

We may not have the financial resources to continue development of, or to enter into collaborations for, a product candidate if we experience any issues that delay or prevent regulatory approval of, or our ability to commercialize, product candidates, including:

- preclinical study results may show the product candidate to be less effective than desired or to have harmful or problematic side effects;
- preclinical studies conducted outside of the United States may be affected by tariffs or import/export restrictions imposed by the United States or other governments;
- delays in submitting INDs or comparable foreign applications or delays or failures in obtaining the necessary approvals from regulators to commence a clinical trial, or a suspension or termination of a clinical trial once commenced;
- conditions imposed by the FDA or comparable foreign authorities regarding the scope or design of our clinical trials;
- delays in enrolling patients in our clinical trials;
- high drop-out rates of our clinical trial patients;
- inadequate supply or quality of product candidate components or materials or other supplies necessary for the conduct of our clinical trials;
- inability to obtain alternative sources of supply for which we have a single source for product candidate components or materials;
- negative or inconclusive results from our clinical trials or the clinical trials of others for product candidates similar to ours, leading to a decision or requirement to conduct additional preclinical testing or clinical trials or abandon a program;
- product-related side effects experienced by patients in our clinical trials or by individuals using drugs or therapeutic biologics similar to our product candidates;
- our third-party manufacturers' inability to successfully manufacture our products;
- inability of any third-party contract manufacturer to scale up manufacturing of our product candidates and those of our collaborators to supply the needs of clinical trials or commercial sales;
- inability of our product candidates to meet efficacy endpoints during clinical trials;
- failure to demonstrate a benefit-risk profile acceptable to the FDA or other regulatory agencies;
- unfavorable FDA or other regulatory agency inspection and review of one or more clinical trial sites or manufacturing facilities used in the testing and manufacture of any of our product candidates;
- failure of our third-party contractors or investigators to comply with regulatory requirements or otherwise meet their contractual obligations in a timely manner, or at all;
- delays and changes in regulatory requirements, policy and guidelines, including the imposition of additional regulatory oversight around clinical testing generally or with respect to our trials in particular; or
- varying interpretations of our data by the FDA and comparable foreign regulatory agencies.

Our or any of our collaborators' inability to complete development of or to commercialize our product candidates, or significant delays in doing so due to one or more of these factors, could have a material and adverse effect on our business, financial condition, results of operations and prospects.

If we do not achieve our projected development goals in the time frames we announce and expect, the commercialization of our products may be delayed and, as a result, our stock price may decline.

From time to time, we estimate the timing of the anticipated accomplishment of various scientific, clinical, regulatory and other product development goals, which we sometimes refer to as milestones. These milestones may include the commencement or completion of scientific studies and clinical trials and the submission of regulatory filings. From time to time, we may publicly announce the expected timing of some of these milestones. All of these milestones are and will be based on numerous assumptions and estimates that may prove to be incorrect. The actual timing of these milestones can vary dramatically compared to our estimates, in some cases for reasons beyond our control. If we do not meet these milestones as publicly announced, or at all, the commercialization of our products may be delayed or never achieved and, as a result, our stock price may decline.

Our approach to the discovery and development of our therapeutic treatments is based on novel technologies that are unproven and may not result in marketable products.

We are developing a pipeline of product candidates using our MInT Platform. Historically, dozens of integrin-targeted oral small molecule candidates of other companies that entered late-stage clinical trials have failed to result in FDA or EMA approved medicines. Development efforts and clinical results of other companies exploring oral approaches to integrins may be unsuccessful, resulting in a negative perception of oral integrins and negatively impacting the regulatory approval process of our product candidates, which would have a material and adverse effect on our business. We believe that product candidates identified with our MInT Platform may offer an optimized therapeutic approach by taking advantage of conformational targeting next-generation physics-based technologies augmented with machine learning and artificial intelligence, which allow us to design, iterate and optimize leads in our discovery process. However, the scientific research that forms the basis of our efforts to develop product candidates using our MInT Platform is ongoing and may not result in viable product candidates.

We may ultimately discover that our MInT Platform and any product candidates resulting therefrom do not possess certain properties required for therapeutic effectiveness, including the ability to lock specific integrin conformations. Our product candidates may also be unable to remain stable in the human body for the period of time required for the drug to reach the target tissue or they may trigger immune responses that inhibit the ability of the product candidate to reach the target tissue or that cause adverse side effects in humans. In addition, product candidates based on our MInT Platform may demonstrate different chemical and pharmacological properties in patients than they do in laboratory studies. Our MInT Platform and any product candidates resulting therefrom may not demonstrate the same chemical and pharmacological properties in humans and may interact with human biological systems in unforeseen, ineffective or harmful ways. For example, AbbVie Biotechnology Ltd., or AbbVie, informed us that it did not intend to advance any of its selective oral αvβ6-specific integrin inhibitors under our collaboration agreement, or the AbbVie Agreement, due to a suspected on-target / αvβ6-mediated safety signal that was observed in preclinical testing, and subsequently exercised its right to terminate the AbbVie Agreement for convenience, which termination became effective in December 2022.

The regulatory approval process for novel product candidates such as ours can be more expensive and take longer than for other, better known or extensively studied product candidates. To our knowledge, no regulatory authority in the United States or Europe has granted approval for an oral small-molecule integrin inhibitor. We believe the FDA has limited experience with integrin-based therapeutics, which may increase the complexity, uncertainty and length of the regulatory approval process for our product candidates. We and our existing or future collaborators may never receive approval to market and commercialize any product candidate. Even if we or an existing or future collaborator obtains regulatory approval, the approval may be for targets, disease indications or patient populations that are not as broad as we or they intended or desired or may require labeling that includes significant use or distribution restrictions or safety warnings. We or an existing or future collaborator may be required to perform additional or unanticipated clinical trials to obtain approval or be subject to post-marketing testing requirements to maintain regulatory approval. If the products resulting from our MInT Platform and research programs prove to be ineffective, unsafe or commercially unviable, our MInT Platform and pipeline would have little, if any, value, which would have a material and adverse effect on our business, financial condition, results of operations and prospects.

Preclinical and clinical development involve a lengthy and expensive process, with an uncertain outcome, and results of earlier studies and trials may not be predictive of future trial results. We may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of our current product candidates or any future product candidates.

All of our product candidates are in preclinical or clinical development, and the risk of failure is high for all programs. It is impossible to predict accurately when or if any of our product candidates will receive regulatory approval. To obtain the requisite regulatory approvals to commercialize any product candidates, we must demonstrate through extensive preclinical studies and lengthy, complex and expensive clinical trials that our product candidates are safe and effective in humans. Clinical testing can take many years to complete, and its outcome is inherently uncertain. Failure can occur at any time during the clinical trial process. The results of preclinical studies and early clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials. We may be unable to establish clinical endpoints that applicable regulatory authorities would consider clinically meaningful. Differences in trial design between early-stage clinical trials and later-stage clinical trials make it difficult to extrapolate the results of earlier clinical trials to later clinical trials. Additionally, comparing the results from different trials may be unreliable due to different protocol designs, trial designs, patient selection and populations, number of patients, trial endpoints, trial objectives and other parameters that may not be the same between trials. Therefore, cross-study comparisons provide very limited information about the efficacy or safety of a drug. Moreover, clinical data are often susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in clinical trials have nonetheless failed to obtain marketing approval of their products. A number of companies in the biopharmaceutical industry have suffered significant setbacks in advanced clinical trials due to lack of efficacy or to unfavorable safety profiles, notwithstanding promising results in earlier trials. There is typically a high rate of failure of product candidates proceeding through clinical trials. Most product

candidates that commence clinical trials are never approved as products and there can be no assurance that any of our ongoing or future clinical trials will ultimately be successful or support clinical development of our current or any of our future product candidates.

Commencement of clinical trials is subject to finalizing the trial design and submitting an IND or similar submission to the FDA or comparable foreign regulatory authority. Even after we submit our IND or comparable submissions in other jurisdictions, the FDA or other regulatory authorities could disagree that we have satisfied their requirements to commence our clinical trials or disagree with our study design, which may require us to complete additional preclinical studies or amend our protocols or impose stricter conditions on the commencement of clinical trials.

We or any collaborators may experience delays in initiating or completing clinical trials. We or any collaborators also may experience numerous unforeseen events during, or as a result of, current or future clinical trials that we could conduct that could delay or prevent our ability to receive marketing approval or commercialize our integrin inhibitor programs or any future product candidates, including:

- regulators or institutional review boards, or IRBs, the FDA or ethics committees may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;
- we may experience delays in reaching, or fail to reach, agreement on acceptable terms with prospective trial sites and prospective CROs, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- clinical trial sites may deviate from a trial's protocol or drop out of a trial;
- clinical trials of any product candidates may fail to show safety or efficacy, produce negative or inconclusive results, and we may decide, or regulators may require us, to conduct additional preclinical studies or clinical trials or we may decide to abandon product development programs;
- the number of subjects required for clinical trials of any product candidates may be larger than we anticipate, enrollment in these clinical trials may be slower than we anticipate, or subjects may drop out of these clinical trials or fail to return for post-treatment follow-up at a higher rate than we anticipate;
- our third-party contractors may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all, or may deviate from the clinical trial protocol or drop out of the trial, which may require that we add new clinical trial sites or investigators;
- we may elect to, or regulators, IRBs, or ethics committees may require that we or our investigators, suspend or terminate clinical research or trials for various reasons, including noncompliance or perceived noncompliance with regulatory requirements or a finding that the participants in our trials are being exposed to unacceptable health risks;
- the cost of clinical trials of any of our product candidates may be greater than we anticipate;
- the quality of our product candidates or other materials necessary to conduct clinical trials of our product candidates may be inadequate to initiate or complete a given clinical trial;
- we or our third-party contract manufacturers may be unable to manufacture sufficient quantities of our product candidates for use in clinical trials;
- reports from clinical testing of other therapies may raise safety or efficacy concerns about our product candidates;
- we may fail to establish an appropriate safety profile for a product candidate based on clinical or preclinical data for such product candidate as well as data emerging from other molecules in the same class as our product candidate; and
- the FDA, EMA or other regulatory authorities may require us to submit additional data such as long-term toxicology studies or impose other requirements before permitting us to initiate a clinical trial.

Patient enrollment, a significant factor in the timing of clinical trials, is affected by many factors including the size and nature of the patient population, the number and location of clinical sites we enroll, the proximity of patients to clinical sites, the eligibility and exclusion criteria for the trial, the design of the clinical trial, the inability to obtain and maintain patient consents, the risk that enrolled participants will drop out before completion, competing clinical trials and clinicians' and patients' perceptions as to the potential advantages of the product candidate being studied in relation to other available therapies, including any new drugs or therapeutic biologics that may be approved for the indications being investigated by us. Furthermore, we expect to rely on any collaborators, CROs and clinical trial sites to ensure the proper and timely conduct of our current or future clinical trials, including the patient enrollment process, and we have limited influence over their performance. Additionally, we could encounter delays if treating physicians encounter unresolved ethical issues associated with enrolling patients in current or future clinical trials of our product candidates in lieu of prescribing existing treatments that have established safety and efficacy profiles.

We could also encounter delays if a clinical trial is suspended or terminated by us, the IRBs of the institutions in which such trials are being conducted, or the FDA, EMA or other regulatory authorities, or if a clinical trial is recommended for suspension or termination by the Data Safety Monitoring Board, or the DSMB, for such trial. A suspension or termination may be imposed due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA, EMA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a product or treatment, failure to establish or achieve clinically meaningful trial endpoints, changes in governmental regulations or administrative actions or lack of adequate funding to continue the clinical trial. Clinical studies may also be delayed or terminated as a result of ambiguous or negative interim results. Many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may also ultimately lead to the denial of regulatory approval of our product candidates. Further, the FDA, EMA or other regulatory authorities may disagree with our clinical trial design and our interpretation of data from clinical trials or may change the requirements for approval even after they have reviewed and commented on the design for our clinical trials.

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

Results of preclinical studies and early clinical trials may not be predictive of results of later clinical trials.

The outcome of preclinical studies and early clinical trials may not be predictive of the success of later clinical trials, and interim results of clinical trials. Many companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in late-stage clinical trials after achieving positive results in earlier development, and we could face similar setbacks. As is common for early trials, we may examine a number of efficacy measures without accounting for multiplicity, and positive results in early clinical trials, including nominally statistically significant results, may not be replicated in future trials with a different design or in other future trials. The design of a clinical trial can determine whether its results will support approval of a product, and flaws in the design of a clinical trial may not become apparent until the clinical trial is well advanced. We have limited experience in designing clinical trials and may be unable to design and execute a clinical trial to support marketing approval. In addition, preclinical and clinical data are often susceptible to varying interpretations and analyses. Many companies that believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval for the product candidates. Even if we, or future collaborators, believe that the results of clinical trials for our product candidates warrant marketing approval, the FDA or comparable foreign regulatory authorities may disagree and may not grant marketing approval of our product candidates.

In some instances, there can be significant variability in safety or efficacy results between different clinical trials of the same product candidate due to numerous factors, including differences in trial procedures set forth in protocols, including endpoints, differences in the size and characteristics of the patient populations, differences in and adherence to the dosing regimen and other clinical trial protocols and the rate of dropout among clinical trial patients. If we fail to receive positive results in clinical trials of our product candidates, the development timeline and regulatory approval and commercialization prospects for our product candidates, and, correspondingly, our business and financial prospects would be negatively impacted.

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

From time to time, we may publish interim and preliminary or topline data from our anticipated clinical trials. Data from prespecified interim analyses from clinical trials that we may complete are subject to the risk that one or more of the clinical outcomes may materially change as patient enrollment continues and more patient data become available. Preliminary or topline data also remain subject to audit and verification procedures that may result in the final data being materially different from the preliminary or topline data we previously published. As a result, interim and preliminary or topline data should be viewed with caution until the final data are available. Adverse differences between interim, preliminary or topline data and final data could significantly harm our reputation and business prospects.

Our current and future clinical trials or those of our current and future collaborators may reveal significant adverse events not seen in our preclinical studies and may result in a safety profile that could inhibit regulatory approval or market acceptance of any of our product candidates.

If significant adverse events or other side effects are observed in any of our clinical trials or the clinical trials of our collaborators, we may have difficulty recruiting patients to our clinical trials, patients may drop out of our trials, or we may be required to abandon the trials or our development efforts of one or more product candidates altogether. For example, PML has been observed by others as an adverse effect during late-stage clinical development of infusible antibody inhibitor of α4β1 integrin, natalizumab. This adverse effect was not observed in the preclinical studies or during early clinical development of natalizumab. We, the FDA, EMA or other applicable regulatory authorities, or an IRB may suspend clinical trials of a product candidate at any time for various reasons, including a belief that subjects or patients in such trials are being exposed to unacceptable health risks or adverse side effects. Some potential therapeutics developed in the biotechnology industry that initially showed therapeutic promise in early-stage trials have later been found to cause side effects that prevented their further development. Even if the side effects do not preclude the product candidate from obtaining or maintaining marketing approval, undesirable side effects may inhibit market acceptance of the approved product due to its tolerability versus other therapies. Any of these developments could materially harm our business, financial condition and prospects.

We may not be successful in our efforts to use our MInT Platform to expand our pipeline of product candidates and develop marketable products.

The success of our business depends in part upon our ability to discover, develop and commercialize products based on our MInT Platform. Our lead program for α4β7 and our research programs, or those of our collaborators, may fail to identify other potential product candidates for clinical development for a number of reasons. Our research methodology may be unsuccessful in identifying potential product candidates or our potential product candidates may be shown to have harmful side effects or may have other characteristics that may make the products unmarketable or unlikely to receive marketing approval. If any of these events occur, we may be forced to abandon our development efforts for a program or for multiple programs, which would materially harm our business and could potentially cause us to cease operations. Research programs to identify new product candidates require substantial technical, financial and human resources.

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

Because we have limited financial and managerial resources, we focus our research and development efforts on certain selected product candidates. For example, we are initially focused on our lead product candidate, MORF-057, in our α4β7-specific integrin inhibitor program. As a result, we may forgo or delay pursuit of opportunities with other product candidates that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable product candidates. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate.

We face competition from entities that have developed or may develop product candidates for autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer, including companies developing novel treatments and technology platforms. If these companies develop technologies or product candidates more rapidly than we do or their technologies or product candidates are more effective, our ability to develop and successfully commercialize product candidates may be adversely affected.

The development and commercialization of drugs is highly competitive. Our product candidates, if approved, will face significant competition and our failure to effectively compete may prevent us from achieving significant market penetration. Most of our competitors have significantly greater resources than we do, and we may not be able to successfully compete. We compete with a variety of multinational biopharmaceutical companies, specialized biotechnology companies and emerging biotechnology companies, as well as with technologies and product candidates being developed at universities and other research institutions. Our competitors have developed, are developing or will develop product candidates and processes competitive with our product candidates and processes. Competitive therapeutic treatments include those that have already been approved and accepted by the medical community and any new treatments, including those based on novel technology platforms that enter the market. We believe that a significant number of products are currently under development, and may become commercially available in the future, for the treatment of conditions for which we are trying, or may try, to develop product candidates. There is intense and rapidly evolving competition in the

biotechnology, biopharmaceutical and integrin and immunoregulatory therapeutics fields. Competition from many sources exists or may arise in the future. Our competitors include larger and better funded biopharmaceutical, biotechnological and therapeutics companies, including companies focused on therapeutics for autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer, as well as numerous small companies. Moreover, we also compete with current and future therapeutics developed at universities and other research institutions. Some of these companies and institutions are well-capitalized and, in contrast to us, have significant clinical experience, and may include our existing or future collaborators. In addition, these companies and institutions compete with us in recruiting scientific and managerial talent.

Our success will depend partially on our ability to develop and commercialize therapeutics that are safer and more effective than competing products. Our commercial opportunity and success will be reduced or eliminated if competing products are safer, more effective, or less expensive than the therapeutics we develop.

Despite significant biopharmaceutical industry investment, no oral integrin therapies have been approved in the United States or Europe. We are developing MORF-057, an oral small molecule α4β7-specific integrin inhibitor, for the treatment of IBD. Currently approved IBD therapies include Entyvio (vedolizumab), an injectable α4β7 monoclonal antibody marketed by Takeda Pharmaceutical Company Limited, as well as therapies with different mechanisms of action marketed by AbbVie, Johnson & Johnson, UCB, Biogen Inc., Pfizer Inc., and Bristol-Myers Squibb, in addition to other pharmaceutical companies, against which our product candidate may compete, if approved. Further, we are aware of oral α4β7 therapies in clinical development for IBD by Gilead Sciences, Inc, and EA Pharma Co. LTD, as well as therapies with different mechanisms of action in clinical development by AbbVie, Johnson & Johnson, Pfizer, Inc., Eli Lilly and Company, and Bristol-Myers Squibb, in addition to other pharmaceutical companies.

Our αvβ8-specific small molecule integrin inhibitor program is under development for the treatment of myelofibrosis and solid tumors. Currently approved myelofibrosis therapies include the oral JAK inhibitors Jakafi (ruxolitinib), marketed by Incyte Corp and Novartis International AG, Inrebic (fedratinib), marketed by Bristol-Myers Squibb, Vonjo (pacritinib), marketed by Swedish Orphan Biovitrum AB, and Ojjaara (momelotinib), marketed by GlaxoSmithKline plc. We are aware of myelofibrosis therapies in clinical development by MorphoSys AG, Incyte Corp, Geron Corporation, AbbVie, and Bristol-Myers Squibb in addition to other pharmaceutical companies. There are currently no approved αvβ8 inhibitors for any indication. We are aware of an anti-αvβ8 monoclonal antibody in clinical development for the treatment of solid tumors by Pfizer, Inc. In addition, we are aware of preclinical stage anti-αvβ8 monoclonal antibody programs for solid tumors from Corbus Pharmaceuticals Holdings, Inc., and a small molecule program from Pliant Therapeutics. Furthermore, there are multiple antibody and small molecule therapeutics targeting the TGF-β pathway for the treatment of solid tumors in development by Novartis International AG, AbbVie, Roche Holding AG, Merck & Co., Inc., Bristol-Myers Squibb, and Scholar Rock, in addition to other pharmaceutical companies.

Many of these competitors have significantly greater financial, technical, manufacturing, marketing, sales, and supply resources or experience than we have. If we successfully obtain approval for any product candidate, we will face competition based on many different factors, including the safety and effectiveness of our products, the ease with which our products can be administered and the extent to which patients accept relatively new routes of administration, the timing and scope of regulatory approvals for these products, the availability and cost of manufacturing, marketing and sales capabilities, price, reimbursement coverage, and patent position. Competing products could present superior treatment alternatives, including by being more effective, safer, less expensive or marketed and sold more effectively than any products we may develop. Competitive products may make any products we develop obsolete or noncompetitive before we recover the expense of developing and commercializing our product candidates. Such competitors could also recruit our employees, which could negatively impact our level of expertise and our ability to execute our business plan.

Our current product candidates or any future product candidates may not achieve adequate market acceptance among physicians, patients, healthcare third-party payors and others in the medical community necessary for commercial success, if approved, and we may not generate any future revenue from the sale or licensing of product candidates.

Even if regulatory approval is obtained for a product candidate, we may not generate or sustain revenue from sales of the product due to factors such as whether the product can be sold at a competitive cost and whether it will otherwise be accepted in the market. Historically, several injectable integrin inhibitors have been approved by the FDA for treatment of IBD, multiple sclerosis, psoriasis, acute coronary syndrome and dry eye disease. However, our product candidates are based on a novel approach to oral integrin therapies, and while integrins are a well-understood receptor family, to date, no oral small molecule integrin therapies have been approved by the FDA. Market participants with significant influence over acceptance of new treatments, such as physicians and third-party payors, may not adopt an orally bioavailable product based on our novel technologies, and we may not be able to convince the medical community and third-party payors to accept and use, or to provide favorable reimbursement for, any product candidates developed by us or any existing or future collaborators. Market acceptance of our product candidates will depend on, among other factors:

- the timing of our receipt of any marketing and commercialization approvals;

- the terms of any approvals and the countries in which approvals are obtained;
- the safety and efficacy of our product candidates as demonstrated in clinical trials;
- the prevalence and severity of any adverse side effects associated with our product candidates;
- limitations or warnings contained in any labeling approved by the FDA or other regulatory authority;
- relative convenience and ease of administration of our product candidates;
- the willingness of patients to accept any new methods of administration;
- unfavorable publicity relating to our current product candidates or any future product candidates;
- the success of our physician education programs;
- the effectiveness of sales and marketing efforts;
- the availability of coverage and adequate reimbursement from government and third-party payors;
- the pricing of our products, particularly as compared to alternative treatments; and
- the availability of alternative effective treatments for the disease indications our product candidates are intended to treat and the relative risks, benefits and costs of those treatments.

Sales of medical products also depend on the willingness of physicians to prescribe the treatment, which is likely to be based on a determination by these physicians that the products are safe, therapeutically effective and cost effective. In addition, the inclusion or exclusion of products from treatment guidelines established by various physician groups and the viewpoints of influential physicians can affect the willingness of other physicians to prescribe the treatment. We cannot predict whether physicians, physicians' organizations, hospitals, other healthcare providers, government agencies or private insurers will determine that our product is safe, therapeutically effective and cost effective as compared with competing treatments. If any product candidate is approved but does not achieve an adequate level of acceptance by such parties, we may not generate or derive sufficient revenue from that product candidate and may not become or remain profitable.

Because our product candidates are based on new technology, we expect that they will require extensive research and development and have substantial manufacturing and processing costs. In addition, our estimates regarding potential market size for any indication may be materially different from what we discover to exist at the time we commence commercialization, if any, for a product, which could result in significant changes in our business plan and have a material adverse effect on our business, financial condition, results of operations and prospects. Moreover, if any product candidate we commercialize fails to achieve market acceptance, it could have a material and adverse effect on our business, financial condition, results of operations and prospects.

If in the future we are unable to establish U.S. or global sales and marketing capabilities or enter into agreements with third parties to sell and market any of our product candidates that are approved, we may not be successful in commercializing such product candidates and may not be able to generate any revenue.

We currently do not have a marketing or sales team for the marketing, sales and distribution of any of our product candidates that are able to obtain regulatory approval. To commercialize any product candidates after approval, we will need to build, on a territory-by-territory basis, marketing, sales, distribution, managerial and other non-technical capabilities or arrange with third parties to perform these services, and we may not be successful in doing so. If our product candidates receive regulatory approval, we may decide to establish an internal sales or marketing team with technical expertise and supporting distribution capabilities to commercialize our product candidates, which would be expensive and time consuming and would require significant attention of our executive officers to manage. For example, some state and local jurisdictions have licensing and continuing education requirements for pharmaceutical sales representatives, which requires time and financial resources. Any failure or delay in the development of our internal sales, marketing and distribution capabilities would adversely impact the commercialization of any of our product candidates that we obtain approval to market.

With respect to the commercialization of our product candidates that obtain regulatory approval, if any, we may choose to collaborate, either globally or on a territory-by-territory basis, with third parties that have direct sales forces and established distribution systems, either to augment our own sales force and distribution systems or in lieu of our own sales force and distribution systems. If we are unable to enter into such arrangements when needed on acceptable terms, or at all, we may not be able to successfully commercialize any of our product candidates that receive regulatory approval, or any such commercialization may experience delays or limitations. If we are not successful in commercializing our product candidates, either on our own or through collaborations with one or more third parties, our future product revenue will suffer, and we may incur significant additional losses.

If any of our product candidates receives marketing approval and we or others later identify undesirable side effects caused by the product candidate, our ability to market and derive revenue from the product candidates could be compromised.

Undesirable side effects caused by our product candidates could cause regulatory authorities to interrupt, delay or halt clinical trials and could result in more restrictive labeling or the delay or denial of regulatory approval by the FDA or other regulatory authorities. Results of our clinical trials could reveal a high and unacceptable severity and prevalence of side effects. In such an event, our future clinical trials could be suspended or terminated, and the FDA or comparable foreign regulatory authorities could order us to cease further development of or deny approval of our product candidates for any or all targeted indications. Such side effects could also affect patient recruitment or the ability of enrolled patients to initiate or complete the clinical trial or result in potential product liability claims. Any of these occurrences may materially and adversely affect our business, financial condition, results of operations and prospects.

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

If any of our product candidates receive regulatory approval and we or others identify undesirable side effects caused by such product, any of the following adverse events could occur:

- regulatory authorities may withdraw their approval of the product or seize the product;
- we may be requested or required to recall the product or change the way the product is administered to patients;
- additional restrictions may be imposed on the marketing of the particular product or the manufacturing processes for the product or any component thereof;
- we may be subject to fines, injunctions or the imposition of civil or criminal penalties;
- regulatory authorities may require the addition of labeling statements, such as a boxed warning or a contraindication;
- we may be required to create a Medication Guide outlining the risks of such side effects for distribution to patients;
- we could be sued and held liable for harm caused to patients;
- the product may become less competitive; and
- our reputation may suffer.

Any of these occurrences could have a material and adverse effect on our business, financial condition, results of operations and prospects.

We anticipate that some of our product candidates may be studied in combination with third-party drugs, some of which may still be in development, and we have limited or no control over the supply, regulatory status, or regulatory approval of such drugs.

Some of our product candidates may be studied in combination with third-party drugs. The development of product candidates for use in combination with another product or product candidate may present challenges that are not faced for single agent product candidates. The FDA or other regulatory authorities may require us to use more complex clinical trial designs in order to evaluate the contribution of each product and product candidate to any observed effects. It is possible that the results of these trials could show that any positive previous trial results are attributable to the combination therapy and not our product candidates. Moreover, following product approval, the FDA or other regulatory authorities may require that products used in conjunction with each other be cross labeled for combined use. To the extent that we do not have rights to the other product, this may require us to work with a third party to satisfy such a requirement. Moreover, developments related to the other product may impact our clinical trials for the combination as well as our commercial prospects should we receive marketing approval. Such developments may include changes to the other product's safety or efficacy profile, changes to the availability of the approved product, and changes to the standard of care.

If we pursue such combination therapies, we cannot be certain that a steady supply of such drugs will be commercially available. Any failure to enter into such commercial relationships, or the expense of purchasing therapies in the market, may delay our development timelines, increase our costs and jeopardize our ability to develop our product candidates as commercially viable combination therapies. The occurrence of any of these could adversely affect our business, results of operations and financial condition.

In the event that any future collaborator or supplier becomes unable or unwilling to supply their products on commercially reasonable terms or at all, we would need to identify alternatives for accessing such products. Additionally, should the supply of products of any collaborator or supplier be interrupted, delayed or otherwise be unavailable to us, our clinical

trials may be delayed. In the event we are unable to source a supply of any alternative therapy, or are unable to do so on commercially reasonable terms, our business, results of operations and financial condition may be adversely affected.

Risks Related to Our Reliance on Third Parties

We have historically entered into collaborations and may, in the future, seek to enter into collaborations with third parties for the discovery and development of our therapeutic candidates. If our future collaborators cease development efforts under collaboration agreements, or if those agreements are terminated, the collaborations may fail to lead to commercial products, and we may never receive milestone payments or future royalties under the agreements.

We have in the past and may in the future seek to enter into collaboration agreements with third parties for the discovery or development of certain integrin-based therapeutics, and such collaborations could represent a significant portion of our product pipeline. We have derived substantially all of our revenue to date from collaboration agreements with third parties, and we may derive a portion of our future revenue from collaboration agreements or other similar agreements into which we may enter in the future. Revenue from research and development collaborations depends upon continuation of the collaborations, payments for research and development services and resulting options to acquire any licenses of successful product candidates, and the achievement of milestones, contingent payments and royalties, if any, derived from future products developed from our research. If we are unable to successfully advance the development of our product candidates or achieve milestones, or if our collaborations are otherwise not successful, revenue and cash resources from milestone payments under any collaboration agreements that we may enter into will be substantially less than expected. For example, in June 2022 AbbVie exercised its right to terminate the AbbVie Agreement for convenience, effective December 2022, due to a suspected on-target / αvβ6-mediated safety signal that was observed in preclinical testing. In January 2023, Janssen exercised its right to terminate the Janssen Agreement for convenience, effective March 2023, following a lack of target validation in the specific disease of Janssen's interest, and we have since focused efforts on a third integrin research program with Janssen that includes the potential development of integrin antibody activators.

In addition, we may in the future seek third-party collaborators for research, development and commercialization of other therapeutic technologies or product candidates. Biopharmaceutical companies are our prior and likely future collaborators for any marketing, distribution, development, licensing or broader collaboration arrangements. If we fail to enter into future collaborations on commercially reasonable terms, or at all, or such collaborations are not successful or are terminated, we may not be able to execute our strategy to develop certain targets, product candidates or disease areas that we believe could benefit from the resources of either larger biopharmaceutical companies or those specialized in a particular area of relevance.

With respect to collaboration agreements, we have historically had and expect to have in the future limited control over the amount and timing of resources that our collaborators dedicate to the development or commercialization of our product candidates. Moreover, our ability to generate revenues from these arrangements will depend on our collaborators' abilities to successfully perform the functions assigned to them in these arrangements.

Collaborations involving our product candidates currently pose, and will continue to pose, the following risks to us:

- collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations;
- collaborators may not pursue development and commercialization of our product candidates or may elect not to continue or renew development or commercialization programs based on preclinical studies or clinical trial results, changes in the collaborators' strategic focus or available funding, or external factors such as an acquisition that diverts resources or creates competing priorities;
- collaborators may delay clinical trials, provide insufficient funding for a clinical trial program, stop a clinical trial or abandon a product candidate, repeat or conduct new clinical trials or require a new formulation of a product candidate for clinical testing;
- collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our product candidates if the collaborators believe that competitive products are more likely to be successfully developed or can be commercialized under terms that are more economically attractive than ours;
- collaborators with marketing and distribution rights to one or more products may not commit sufficient resources to the marketing and distribution of such product or products;
- collaborators may not properly maintain or defend our intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our intellectual property or proprietary information or expose us to litigation or potential liability;

- collaborators may infringe the intellectual property rights of third parties, which may expose us to litigation and potential liability;
- disputes may arise between the collaborators and us that result in the delay or termination of the research, development or commercialization of our product candidates or that result in costly litigation or arbitration that diverts management attention and resources; and
- collaborations may be terminated and, if terminated, may result in a need for additional capital to pursue further development or commercialization of the applicable product candidates.

As a result of the foregoing, our current and any future collaboration agreements may not lead to development or commercialization of any or all of our product candidates in the most efficient manner or at all. If a collaborator of ours were to be involved in a business combination, the continued pursuit and emphasis on our product development or commercialization program could be delayed, diminished or terminated. Any failure to successfully develop or commercialize our product candidates pursuant to our current or any future collaboration agreements could have a material and adverse effect on our business, financial condition, results of operations and prospects.

Moreover, to the extent that any of our existing or future collaborators were to terminate a collaboration agreement, we may be forced to independently develop these product candidates, including funding preclinical studies or clinical trials, assuming marketing and distribution costs and defending intellectual property rights, or, in certain instances, abandon product candidates altogether, any of which could result in a change to our business plan and have a material adverse effect on our business, financial condition, results of operations and prospects.

Our existing discovery collaboration with Schrödinger is important to our business. If we are unable to maintain this collaboration, or if this collaboration is not successful, our business could be adversely affected.

In June 2015, we entered into a Collaboration Agreement with Schrödinger, which was subsequently amended in March 2018 and in May 2019, or the Schrödinger Agreement. Under the collaboration, Schrödinger uses its technology platform to perform virtual screens of members of the target class of human integrins, and we and Schrödinger collaborate to facilitate prioritization of targets, perform target validation and analysis, identify leads and perform lead optimization. Schrödinger has granted us an exclusive license for all intellectual property for our product candidates.

Because we currently rely on Schrödinger for a substantial portion of our discovery capabilities, if Schrödinger experiences delays in performance of or fails to perform its obligations under the Schrödinger Agreement, disagrees with our interpretation of the terms of the collaboration or our discovery plan or terminates the Schrödinger Agreement, our pipeline of product candidates would be adversely affected. Schrödinger may also fail to properly maintain or defend the intellectual property we have licensed from them, or even infringe upon, our intellectual property rights, leading to the potential invalidation of our intellectual property or subjecting us to litigation or arbitration, any of which would be time-consuming and expensive. Additionally, either party has the right to terminate the collaboration pursuant to the terms of the Schrödinger Agreement. If our collaboration with Schrödinger is terminated, especially during our discovery phase, the development of our product candidates would be materially delayed or harmed.

We may have conflicts with our collaborators that could delay or prevent the development or commercialization of our product candidates.

We may have conflicts with our collaborators, such as conflicts concerning the interpretation of preclinical or clinical data, the achievement of milestones, the interpretation of contractual obligations, payments for services, development obligations or the ownership of intellectual property developed during our collaboration. If any conflicts arise with any of our collaborators, such collaborator may act in a manner that is averse to our best interests. Any such disagreement could result in one or more of the following, each of which could delay or prevent the development or commercialization of our product candidates, and in turn prevent us from generating revenues: unwillingness on the part of a collaborator to pay us milestone payments or royalties we believe are due to us under a collaboration, which could require us to raise additional capital; uncertainty regarding ownership of intellectual property rights arising from our collaborative activities, which could prevent us from entering into additional collaborations; unwillingness by the collaborator to cooperate in the development or manufacture of the product, including providing us with product data or materials; unwillingness on the part of a collaborator to keep us informed regarding the progress of its development and commercialization activities or to permit public disclosure of the results of those activities; initiating of litigation or alternative dispute resolution options by either party to resolve the dispute; or attempts by either party to terminate the agreement.

We may engage in strategic transactions, including collaboration agreements, that could adversely affect our ability to develop and commercialize product candidates, impact our cash position, increase our expenses and present significant distractions to our management.

From time to time, we may consider strategic transactions, such as collaboration agreements, acquisitions of companies, asset purchases and out or in licensing of product candidates or technologies that we believe will complement or augment our existing business. In particular, we will evaluate and, if strategically attractive, seek to enter into collaboration agreements with third parties, including with major biotechnology or biopharmaceutical companies. The competition for collaborators is intense, and the negotiation process is time-consuming and complex. Any new collaboration may be on terms that are not optimal for us, and we may not be able to maintain any new collaboration if, for example, development or approval of a product candidate is delayed, sales of an approved product candidate do not meet expectations or the collaborator terminates the collaboration. In addition, a significant number of recent business combinations among large pharmaceutical companies has resulted in a reduced number of potential future strategic partners. Our collaborators may consider alternative product candidates or technologies for similar indications that may be available to collaborate on and whether such a collaboration could be more attractive than the one with us for our product candidate. Our ability to reach a definitive agreement for a collaboration will depend, among other things, upon our assessment of the strategic partner's resources and expertise, the terms and conditions of the proposed collaboration and the proposed strategic partner's evaluation of a number of factors. These factors may include the design or results of clinical trials, the likelihood of approval by the FDA or similar regulatory authorities outside the United States, the potential market for the subject product candidate, the costs and complexities of manufacturing and delivering such product candidate to patients, the potential of competing products, the existence of uncertainty with respect to our ownership of technology, which can exist if there is a challenge to such ownership without regard to the merits of the challenge and industry and market conditions generally. Moreover, if we acquire assets with promising markets or technologies, we may not be able to realize the benefit of acquiring such assets if we are not able to successfully integrate them with our existing technologies. We may encounter numerous difficulties in developing, testing, manufacturing and marketing any new products resulting from a strategic acquisition that delay or prevent us from realizing their expected benefits or enhancing our business.

We cannot assure you that following any such collaboration, or other strategic transaction, we will achieve the expected synergies to justify the transaction. For example, such transactions may require us to incur non-recurring or other charges, increase our near and long-term expenditures and pose significant integration or implementation challenges or disrupt our management or business. These transactions would entail numerous operational and financial risks, including exposure to unknown liabilities, disruption of our business and diversion of our management's time and attention in order to manage a collaboration or develop acquired products, product candidates or technologies, incurrence of substantial debt or dilutive issuances of equity securities to pay transaction consideration or costs, higher than expected collaboration, acquisition or integration costs, write-downs of assets or goodwill or impairment charges, increased amortization expenses, difficulty and cost in facilitating the collaboration or combining the operations and personnel of any acquired business, impairment of relationships with key suppliers, manufacturers or customers of any acquired business due to changes in management and ownership and the inability to retain key employees of any acquired business.

Accordingly, although there can be no assurance that we will undertake or successfully complete any transactions of the nature described above, any transactions that we do complete may be subject to the foregoing or other risks and would have a material and adverse effect on our business, financial condition, results of operations and prospects. Conversely, any failure to enter any additional collaboration or other strategic transaction that would be beneficial to us could delay the development and potential commercialization of our product candidates and have a negative impact on the competitiveness of any product candidate that reaches market.

We rely and expect to continue to rely on third parties to conduct certain of our preclinical studies or clinical trials. If those third parties do not perform as contractually required, fail to satisfy legal or regulatory requirements, miss expected deadlines or terminate the relationship, our development program could be delayed with potentially material and adverse effects on our business, financial condition, results of operations and prospects.

We rely and intend to rely in the future on third-party clinical investigators, CROs, clinical data management organizations and consultants to assist or provide the design, conduct, supervision and monitoring of preclinical studies and clinical trials of our product candidates. Because we rely on these third parties and will not have the ability to conduct all preclinical studies or clinical trials independently, we will have less control over the timing, quality and other aspects of preclinical studies and clinical trials than we would have had we conducted them on our own. These investigators, CROs and consultants will not be our employees and we will have limited control over the amount of time and resources that they dedicate to our programs. These third parties may have contractual relationships with other entities, some of which may be our competitors, which may draw time and resources from our programs. The third parties with which we may contract might not be diligent, careful or timely in conducting our preclinical studies or clinical trials, resulting in the preclinical studies or clinical trials being delayed or unsuccessful.

If we cannot contract with acceptable third parties on commercially reasonable terms, or at all, or if these third parties do not carry out their contractual duties, satisfy legal and regulatory requirements for the conduct of preclinical studies or clinical trials or meet expected deadlines, our clinical development programs could be delayed and otherwise adversely

affected. In all events, we will be responsible for ensuring that each of our preclinical studies and clinical trials are conducted in accordance with the general investigational plan and protocols for the trial as well as applicable legal and regulatory requirements. The FDA generally requires preclinical studies to be conducted in accordance with good laboratory practices and clinical trials to be conducted in accordance with good clinical practices, including for designing, conducting, recording and reporting the results of preclinical studies and clinical trials to assure that data and reported results are credible and accurate and that the rights, integrity and confidentiality of clinical trial participants are protected. Our reliance on third parties that we do not control will not relieve us of these responsibilities and requirements. Any adverse development or delay in our preclinical studies or clinical trials as a result of our reliance on third parties could have a material and adverse effect on our business, financial condition, results of operations and prospects.

If any of our relationships with these third-party CROs or others terminate, we may not be able to enter into arrangements with alternative CROs or other third parties or to do so on commercially reasonable terms. Switching or adding additional CROs involves additional cost and requires management time and focus. In addition, there is a natural transition period when a new CRO begins work. As a result, delays may occur, which can materially impact our ability to meet our desired clinical development timelines.

We rely on third-party manufacturers and suppliers to supply components of our product candidates. The loss of our third-party manufacturers or suppliers, or our or their failure to comply with applicable regulatory requirements or to supply sufficient quantities at acceptable quality levels or prices, or at all, would materially and adversely affect our business.

We do not own or operate facilities for drug manufacturing, storage, distribution or quality testing. We currently rely, and may continue to rely, on third-party contract manufacturers, including in the U.K. and China, to manufacture bulk drug substances, drug products, raw materials, samples, components, or other materials and reports. Reliance on third-party manufacturers may expose us to different risks than if we were to manufacture product candidates ourselves. There can be no assurance that our preclinical and clinical development product supplies will not be limited, interrupted, terminated or of satisfactory quality or continue to be available at acceptable prices. For example, a recent escalation of trade tensions between the U.S. and China has resulted in trade restrictions and calls for sanctions that could impact our ability to rely on our third-party manufacturers in China. Sustained uncertainty about, or a worsening of, current global economic conditions and further escalation of trade tensions between the U.S. and China could result in a global economic slowdown and long-term changes to global trade, including retaliatory trade restrictions. Any replacement of our manufacturers or suppliers could require significant effort and expertise because there may be a limited number of qualified replacements. If our third-party manufacturers and suppliers, or any third-party in the supply chain, are adversely impacted, including as a result of cybersecurity events or global supply chain disruptions, we may be unable to secure the supply of product candidates required for our preclinical studies.

The manufacturing process for a product candidate is subject to FDA and foreign regulatory authority review. We, and our suppliers and manufacturers, must meet applicable manufacturing requirements and undergo rigorous facility and process validation tests required by regulatory authorities in order to comply with regulatory standards, such as current Good Manufacturing Practices, or cGMPs. Securing marketing approval also requires the submission of information about the product manufacturing process to, and inspection of manufacturing facilities by, the FDA and foreign regulatory authorities. If our contract manufacturers cannot successfully manufacture material that conforms to our specifications and the strict regulatory requirements of the FDA or comparable foreign regulatory authorities, we may not be able to rely on their manufacturing facilities for the manufacture of elements of our product candidates. Moreover, we do not control the manufacturing process at our contract manufacturers and are completely dependent on them for compliance with current regulatory requirements. In the event that any of our manufacturers fails to comply with such requirements or to perform its obligations in relation to quality, timing or otherwise, or if our supply of components or other materials becomes limited or interrupted for other reasons, we may be forced to enter into an agreement with another third party, which we may not be able to do on reasonable terms, if at all. In some cases, the technical skills or technology required to manufacture our product candidates may be unique or proprietary to the original manufacturer and we may have difficulty transferring such to another third party. These factors would increase our reliance on such manufacturer or require us to obtain a license from such manufacturer in order to enable us, or to have another third party, manufacture our product candidates. If we are required to change manufacturers for any reason, we will be required to verify that the new manufacturer maintains facilities and procedures that comply with quality standards and with all applicable regulations and guidelines; and we may be required to repeat some of the development program. The delays associated with the validation of a new manufacturer could negatively affect our ability to develop product candidates in a timely manner or within budget.

We expect to continue to rely on third-party manufacturers if we receive regulatory approval for any product candidate. To the extent that we have existing, or enter into future, manufacturing arrangements with third parties, we will depend on these third parties to perform their obligations in a timely manner consistent with contractual and regulatory requirements, including those related to quality control and assurance. Any manufacturing facilities used to produce our products will be

subject to periodic review and inspection by the FDA and foreign regulatory authorities, including for continued compliance with cGMP requirements, quality control, quality assurance and corresponding maintenance of records and documents. If we are unable to obtain or maintain third-party manufacturing for product candidates, or to do so on commercially reasonable terms, we may not be able to develop and commercialize our product candidates successfully. Our or a third party's failure to execute on our manufacturing requirements, comply with cGMPs or maintain a compliance status acceptable to the FDA or foreign regulatory authorities could adversely affect our business in a number of ways, including:

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

Additionally, our contract manufacturers may experience manufacturing difficulties due to resource constraints or as a result of labor disputes, unstable political environments, epidemics or pandemics, cybersecurity events, or global supply chain disruptions. If our contract manufacturers were to encounter any of these difficulties, our ability to provide our product candidates to patients in preclinical and clinical trials, or to provide product for treatment of patients once approved, would be jeopardized.

For example, the U.K. formally left the European Union, or EU, on January 31, 2020, often referred to as Brexit, and the transition period ended on December 31, 2020. However, the EU and the U.K. have concluded a trade and cooperation agreement, or TCA, which has been approved by the UK Parliament, European Council and European Parliament.. The TCA includes specific provisions concerning pharmaceuticals, which include the mutual recognition of GMP, inspections of manufacturing facilities for medicinal products and GMP documents issued, but does not foresee wholesale mutual recognition of the U.K. and EU pharmaceutical regulations. As a result, companies now need to comply with a separate UK regulatory legal framework in order to commercialize medicinal products in Great Britain (England, Wales and Scotland). At present, Great Britain has implemented EU legislation on the marketing, promotion and sale of medicinal products through the Human Medicines Regulations 2012 (as amended) (under the Northern Ireland Protocol, the EU regulatory framework will continue to apply in Northern Ireland). While the regulatory regime in Great Britain therefore currently aligns in the most part with EU regulations, it is possible that these regimes will diverge in future now that Great Britain's regulatory system is independent from the EU and the TCA does not provide for mutual recognition of U.K. and EU pharmaceutical legislation. For example, the new Clinical Trials Regulation which became effective in the EU on January 31, 2022 and provides for a streamlined clinical trial application and assessment procedure covering multiple EU Member States has not been implemented into U.K. law, and a separate application will need to be submitted for clinical trial authorization in the U.K. Any delay in obtaining, or an inability to obtain, any marketing approvals, as a result of the trade and cooperation agreement or otherwise, could prevent us from commercializing any product candidates in the U.K. and/or the EU and restrict our ability to generate revenue and achieve and sustain profitability. If any of these outcomes occur, we may be forced to restrict or delay efforts to seek regulatory approval in the U.K. and/or EU for any product candidates, which could significantly and materially harm our business. The current lack of detail and resolution with regard to the Brexit implementation may result in a disruption of the manufacturing and supply of components of our product candidates in the U.K. and we are unable to confidently predict the effects of such disruption to the regulatory framework in Europe. Any adjustments we make to our business and operations as a result of Brexit could result in significant delays and additional expense. Any of the foregoing factors could have a material adverse effect on our business, results of operations, or financial condition.

We, or our third-party contract research organizations, face risks related to health epidemics, pandemics and other outbreaks, which could significantly disrupt our operations.

Our business could be adversely impacted by epidemics or pandemics. If there are closures or other restrictions in the places where we or our manufacturers and suppliers operate, we may experience disruptions to our operations. For example, we have in the past and may in the future experience impacts to certain of our suppliers as a result of the COVID-19 pandemic or other health epidemics or outbreaks occurring in one or more of these locations, which may materially and adversely affect our business, financial condition and results of operations. Further, our operation has in the past and may in the future experience disruptions, including in connection with temporary office closures and suspension of services by our suppliers, which may result in us having to procure the components for our product candidates from

alternate suppliers, which may materially and adversely affect our development timelines, and our business, financial condition and results of operations.

The manufacturing of our molecules is complex, and our third-party manufacturers may encounter difficulties in production. If we or any of our third-party manufacturers encounter such difficulties, our ability to provide supply of our product candidates for clinical trials, our ability to obtain marketing approval, or our ability to provide supply of our products for patients, if approved, could be delayed or stopped.

Our product candidates are biopharmaceuticals, and the process of manufacturing biopharmaceuticals is complex, time-consuming, highly regulated and subject to multiple risks. Our contract manufacturers must comply with legal requirements, cGMPs and guidelines for the manufacturing of biopharmaceuticals used in clinical trials and, if approved, marketed products. Our contract manufacturers may have limited experience in the manufacturing of cGMP batches.

Manufacturing biopharmaceuticals is highly susceptible to product loss due to contamination, equipment failure, improper installation or operation of equipment, vendor or operator error, inconsistency in yields, variability in product characteristics and difficulties in scaling the production process. Even minor deviations from normal manufacturing processes could result in reduced production yields, product defects and other supply disruptions. If microbial, viral or other contaminations are discovered at our third-party manufacturers' facilities, such facilities may need to be closed for an extended period of time to investigate and remedy the contamination, which could delay clinical trials and adversely harm our business. Moreover, if the FDA determines that our third-party manufacturers' facilities are not in compliance with FDA laws and regulations, including those governing cGMPs, the FDA may deny NDA approval until the deficiencies are corrected or we replace the manufacturer in our NDA with a manufacturer that is in compliance.

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

Scaling up a biopharmaceutical manufacturing process is a difficult and uncertain task, and our third-party manufacturers may not have the necessary capabilities to complete the implementation, manufacturing and development process. If we are unable to adequately validate or scale-up the manufacturing process at our current manufacturers' facilities, we will need to transfer to another manufacturer and complete the manufacturing validation process, which can be lengthy. If we are able to adequately validate and scale-up the manufacturing process for our product candidates with a contract manufacturer, we will still need to negotiate with such contract manufacturer an agreement for commercial supply and it is not certain we will be able to come to agreement on terms acceptable to us.

We cannot assure you that any stability or other issues relating to the manufacture of any of our product candidates or products will not occur in the future. If our third-party manufacturers were to encounter any of these difficulties, our ability to provide any product candidates to patients in planned clinical trials and products to patients, once approved, would be jeopardized. Any delay or interruption in the supply of clinical trial supplies could delay the completion of planned clinical trials, increase the costs associated with maintaining clinical trial programs and, depending upon the period of delay, require us to commence new clinical trials at additional expense or terminate clinical trials completely. Any adverse developments affecting clinical or commercial manufacturing of our product candidates or products may result in shipment delays, inventory shortages, lot failures, product withdrawals or recalls, or other interruptions in the supply of our product candidates or products. We may also have to take inventory write-offs and incur other charges and expenses for product candidates or products that fail to meet specifications, undertake costly remediation efforts or seek more costly manufacturing alternatives. Accordingly, failures or difficulties faced at any level of our supply chain could adversely affect our business and delay or impede the development and commercialization of any of our product candidates or products, if approved, and could have an adverse effect on our business, prospects, financial condition and results of operations.

As part of our process development efforts, we also may make changes to the manufacturing processes at various points during development, for various reasons, such as controlling costs, achieving scale, decreasing processing time, increasing manufacturing success rate or other reasons. Such changes carry the risk that they will not achieve their intended objectives, and any of these changes could cause our product candidates to perform differently and affect the results of our ongoing clinical trials or future clinical trials. In some circumstances, changes in the manufacturing process may require us to perform *ex vivo* comparability studies and to collect additional data from patients prior to undertaking more advanced

clinical trials. For instance, changes in our process during the course of clinical development may require us to show the comparability of the product used in earlier clinical phases or at earlier portions of a trial to the product used in later clinical phases or later portions of the trial.

Risks Relating to our Business and Operations

We will need to grow our organization, and we may experience difficulties in managing our growth and expanding our operations, which could adversely affect our business.

As of December 31, 2023, we had 121 full time employees. As our development and commercialization plans and strategies develop, we expect to expand our employee base for managerial, operational, financial and other resources. In addition, we have limited experience in product development. As our product candidates enter and advance through preclinical studies and clinical trials, we will need to expand our development and regulatory capabilities and contract with other organizations to provide manufacturing and other capabilities for us. In the future, we expect to have to manage additional relationships with collaborators or partners, suppliers and other organizations. Our ability to manage our operations and future growth will require us to continue to improve our operational, financial and management controls, reporting systems and procedures. We may not be able to implement improvements to our management information and control systems in an efficient or timely manner and may discover deficiencies in existing systems and controls. Our inability to successfully manage our growth and expand our operations could have a material and adverse effect on our business, financial condition, results of operations and prospects.

Any inability to attract and retain qualified key management and technical personnel would impair our ability to implement our business plan.

Our success largely depends on the continued service of Praveen P. Tipirneni, M.D., our chief executive officer, as well as other members of our management team, and other key employees and advisors. We currently do not maintain key person insurance on these individuals. On September 26, 2023, we announced that Dr. Tipirneni had experienced an unexpected medical event and was taking a temporary medical leave of absence. On January 3, 2024, we announced that Dr. Tipirneni had returned from leave and resumed his duties as Chief Executive Officer. The loss of one or more members of our management team or other key employees or advisors could delay our research and development programs and have a material and adverse effect on our business, financial condition, results of operations and prospects. The relationships that our key managers have cultivated within our industry make us particularly dependent upon their continued employment with us. We are dependent on the continued service of our technical personnel, and personnel involved with crystallization of integrins in particular, because of the highly technical nature of our product candidates and technologies related to our MInT Platform, and the specialized nature of the regulatory approval process. Because our management team and key employees are not obligated to provide us with continued service, they could terminate their employment with us at any time without penalty.

We conduct our operations at our facility in Waltham, Massachusetts. This region is headquarters to many other biopharmaceutical companies and many academic and research institutions. Competition for skilled personnel in our market is intense and may limit our ability to hire and retain highly qualified personnel on acceptable terms or at all. We face competition for personnel from other companies, universities, public and private research institutions, government entities and other organizations. Our future success will depend in large part on our continued ability to attract and retain other highly qualified scientific, technical and management personnel, as well as personnel with expertise in clinical testing, manufacturing, governmental regulation and commercialization. If we are unable to continue to attract and retain high-quality personnel, the rate at and success with which we can discover and develop product candidates will be limited, which could have a material and adverse effect on our business, financial condition, results of operations and prospects.

Our future growth may depend, in part, on our ability to operate in foreign markets, where we would be subject to additional regulatory burdens and other risks and uncertainties.

Our future growth may depend, in part, on our ability to develop and commercialize and/or promote our product candidates in foreign markets, for which we may rely on collaborations with third parties. We are not permitted to market or promote any of our product candidates in a foreign market before we receive regulatory approval from the applicable regulatory authority in that foreign market, and may never receive such regulatory approval for any of our product candidates. To obtain separate regulatory approval in many other countries, we must comply with numerous and varying regulatory requirements of such countries regarding safety and efficacy and governing, among other things, clinical trials and commercial sales, pricing and distribution of products, and we cannot predict success in these jurisdictions. If we fail to comply with the regulatory requirements in international markets and receive applicable marketing approvals, our target market will be reduced, our ability to realize the full market potential of our product candidates will be harmed and our business will be adversely affected. We may not obtain foreign regulatory approvals on a timely basis, or at all. Our failure to obtain approval of any of our product candidates by regulatory authorities in another country may significantly diminish

the commercial prospects of that product candidate and our business, financial condition, results of operations and prospects could be materially and adversely affected. Moreover, even if we obtain approval of our product candidates and ultimately commercialize our product candidates in foreign markets, we would be subject to the risks and uncertainties, including the burden of complying with complex and changing foreign regulatory, tax, accounting and legal requirements and reduced protection of intellectual property rights in some foreign countries.

Our business entails a significant risk of product liability and any inability to obtain sufficient insurance coverage could have a material and adverse effect on our business, financial condition, results of operations and prospects.

In connection with the conduct of clinical trials of our product candidates, we may be exposed to significant product liability risks inherent in the development and testing of therapeutic treatments. Product liability claims could delay or prevent completion of our development programs. If we succeed in marketing products, such claims could result in an FDA investigation of the safety and effectiveness of our products, our manufacturing processes and facilities and/or our marketing programs, and potentially a recall of our products or more serious enforcement action, limitations on the approved indications for which they may be used or suspension or withdrawal of approvals. Regardless of the merits or eventual outcome, liability claims may also result in increased difficulty enrolling participants in clinical trials, termination of clinical trial sites or entire trial programs, withdrawal of clinical trial participants, injury to our reputation and significant negative media attention, significant costs to defend the related litigation, a diversion of management's time and our resources from our business operations, substantial monetary awards to trial participants or patients, loss of revenue, the inability to commercialize and products that we may develop, and a decline in our stock price. We currently maintain general liability insurance with coverage up to $10.0 million. We may, however, need to obtain higher levels of product liability insurance for later stages of clinical development or marketing any of our product candidates. Any insurance we have or may obtain may not provide sufficient coverage against potential liabilities. Furthermore, clinical trial and product liability insurance is becoming increasingly expensive. As a result, we may be unable to obtain sufficient insurance at a reasonable cost to protect us against losses caused by product liability claims that could have a material and adverse effect on our business, financial condition, results of operations and prospects.

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

We are exposed to the risk of employee fraud or other illegal activity by our employees, independent contractors, consultants, commercial partners and vendors. Misconduct by these parties could include intentional, reckless and/or negligent conduct that fails to comply with FDA regulations, provide true, complete and accurate information to the FDA and other comparable foreign regulatory bodies, comply with manufacturing standards we may establish, comply with healthcare fraud and abuse laws and regulations, report financial information or data accurately or disclose unauthorized activities to us. If we obtain FDA approval of any of our product candidates and begin commercializing those products in the United States, our potential exposure under these laws will increase significantly, and our costs associated with compliance with these laws are likely to increase. In particular, sales, marketing and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Employee misconduct could also involve the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions and serious harm to our reputation. Additionally, we are subject to the risk that a person could allege such fraud or other misconduct, even if none occurred. It is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure or perceived failure to comply with such laws or regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a material and adverse effect on our business, financial condition, results of operations and prospects, including the imposition of significant civil, criminal and administrative penalties, damages, fines, disgorgement, imprisonment, the curtailment or restructuring of our operations, loss of eligibility to obtain approvals from the FDA, exclusion from participation in government contracting, healthcare reimbursement or other government programs, including Medicare and Medicaid, integrity oversight and reporting obligations, or reputational harm.

We depend on our information technology systems, and any failure of these systems, or those of our CROs or other contractors or consultants we may utilize, could harm our business. Security breaches, cyber-attacks, theft or exposure of confidential data, disruptions to our network and other information technology systems, and other incidents affecting the confidentiality, integrity, or availability of our data and systems could adversely affect our business, results of operations, financial condition and prospects, including by exposing us to liability and other legal risk.

We collect and maintain information in digital form that is necessary to conduct our business, and we are dependent on information technology systems and infrastructure to operate our business. In the ordinary course of our business, we collect, use and store, and transmit large amounts of confidential information, including intellectual property, proprietary business information, and personal data. It is critical that we do these things in a secure manner to maintain the confidentiality, integrity, and availability of such confidential information. We have established physical, electronic and organizational measures, and we rely on commercially available systems, software, tools, and monitoring, to safeguard, provide security, and otherwise protect our information technology systems and our collection, use and storage, and transmission of digital information. We have outsourced elements of our information technology infrastructure and, as a result, a number of third-party vendors have access to our confidential information. Our internal information technology systems and infrastructure, and those of our current and any future collaborators, contractors, consultants, vendors, and other third parties on which we rely, are vulnerable to cyber-attacks and other incidents which could adversely affect us. These cyber-attacks and other incidents may include unauthorized access to our network, information technology systems, and data, and those of our vendors; compromise of employee credentials and accounts; transmission of computer viruses and other malware; phishing and spamming attacks; ransomware attacks and other acts of cyber-extortion; and malicious actions by persons inside our organization and other insider threats ("cyber threats and incidents"). The increasing use of mobile devices for remote access to our systems and data also increases these vulnerabilities and risks. Our internal information technology systems and infrastructure and those of our vendors are also vulnerable to damage from natural disasters, acts of terrorism, war and other acts of foreign governments, and failures of telecommunication, electrical, and other critical systems. All of these potentially adverse incidents could compromise our ability to conduct and perform our business functions in a timely manner, could delay our financial reporting, and could materially adversely affect our operating results and financial condition.

The risk of a network intrusion or disruption, and data breach or other data loss, including by criminals and criminal enterprises, foreign governments and other state-sponsored actors, and terrorists and lone wolves, has increased as the number, intensity and sophistication of global attackers and attacks have increased. The prevalence of these threats may increase further as geopolitical tensions and warfare continue or escalate outside of the U.S., including due to regional conflicts around the world. While we have implemented security measures to protect our data security and information technology systems, our efforts may not always be successful, and the costs to us in responding to and mitigating cyber threats and incidents could be significant and problems could result in unexpected interruptions, delays, cessation of service and other harm to our business and our competitive position.

In August 2023, we suffered a network intrusion when a third party gained unauthorized access to our network and downloaded files from certain of our online depositories. The costs associated with responding to and mitigating the incident were not material and were primarily covered under an insurance policy as part of our corporate risk program. Further, in April 2023, we were notified by one of our vendors that they had suffered a security breach and that some of our data, including data related to our manufacturing processes and intellectual property, was among the information downloaded and/or extracted by an unknown third party. We did not experience any significant disruption to our business, nor do we expect any significant disruption to our future prospects, as a result of the August 2023 and April 2023 cybersecurity incidents. To date, these cybersecurity incidents have not had a material impact on our financial condition, results of operations or liquidity. However, in the future, if such an event were to lead to exposure of sensitive information or cause interruptions in our operations or those of our third-party collaborators, it could result in a material disruption of our drug development programs and potential financial losses. 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 Economic and Clinical Health Act of 2009, or HITECH, and its implementing rules and regulations, or HIPAA, as well as regulations promulgated by the Federal Trade Commission and state breach notification laws. In addition, such cyber-attacks, data breaches or destruction or loss of data could result in violation of applicable international privacy, data protection and other laws, resulting in exposure to material civil and/or criminal liability. Further, our general liability insurance and corporate risk program may not cover all potential claims to which we are exposed and may not be adequate to indemnify us for all liability that may be imposed and could materially adversely affect our business, results of operations, financial condition and prospects. In addition, we may suffer reputational harm or face litigation or adverse regulatory action as a result of cyber-attacks or other data security breaches and may incur significant additional expense to implement further data protection measures.

Further, on July 26, 2023, the SEC adopted new cybersecurity disclosure rules for public companies that require disclosure regarding cybersecurity risk management (including the board's role in overseeing cybersecurity risks, management's role

and expertise in assessing and managing cybersecurity risks, and processes for assessing, identifying and managing cybersecurity risks) in annual reports on Form 10-K. The new cybersecurity disclosure rules also require the disclosure of material cybersecurity incidents by Form 8-K, within four business days of determining that an incident is material. We are subject to such annual report disclosure requirements starting with this Annual Report on Form 10-K for the year ended December 31, 2023 and we have been subject to such Form 8-K disclosure requirements since December 18, 2023. Complying with these new cybersecurity disclosure obligations, or any additional new disclosure requirements that may apply to us in the future, could cause us to incur substantial costs and could increase negative publicity surrounding any incident that we are required to disclose.

If we do not comply with laws regulating the protection of the environment and health and human safety, our business could be adversely affected.

Our research and development activities include the use of hazardous chemicals and materials, including radioactive materials. We maintain quantities of various flammable and toxic chemicals in our facilities in Waltham, Massachusetts that are required for our research and development activities. We are subject to federal, state and local laws and regulations governing the use, manufacture, storage, handling and disposal of these hazardous chemicals and materials. Although we believe that our procedures for storing, handling and disposing such materials in our facilities comply with the standards mandated by applicable regulations and guidelines, the risk of accidental contamination or injury from these materials cannot be eliminated. If an accident occurs, we could be held liable for resulting damages, which could be substantial. We are also subject to numerous environmental, health and workplace safety laws and regulations, including those governing laboratory procedures, exposure to blood-borne pathogens and the handling of animals and biohazardous materials. Although we maintain workers' compensation insurance, this insurance may not provide adequate coverage against potential liabilities resulting from our employees' use of these materials, in connection with which we may incur significant costs and expenses. We also may incur substantial costs to comply with, and substantial fines or penalties if we violate, applicable laws and regulations related to health and human safety and the use, manufacture, storage, handling, and disposal of hazardous chemicals and materials.

Our current operations are concentrated in one location, and we or the third parties upon whom we depend may be adversely affected by extreme weather events or other natural disasters, and our business continuity and disaster recovery plans may not adequately protect us from a serious disaster.

Our current operations are concentrated in Waltham, Massachusetts. Any unplanned event, such as a flood, fire, explosion, earthquake, extreme weather condition such as a hurricane or heavy snowstorm, medical epidemic or pandemic, power shortage, telecommunication failure or other natural or manmade accidents or incidents that result in us being unable to fully utilize our facilities, or the manufacturing facilities of our third-party contract manufacturers, may have a material and adverse effect on our ability to operate our business, particularly on a daily basis, and have significant negative consequences on our financial and operating conditions. Loss of access to our facilities or the manufacturing facilities of our third-party contract manufacturers may result in increased costs, delays in the development of our product candidates or interruption of our business operations. If a natural disaster, power outage or other event occurs that prevents us from using all or a significant portion of our headquarters, that damages critical infrastructure, such as our research facilities or the manufacturing facilities of our third-party contract manufacturers, or that otherwise disrupts operations, it may be difficult or, in certain cases, impossible, for us to continue our business for a substantial period of time. The disaster recovery and business continuity plans we have in place may prove inadequate in the event of a serious disaster or similar event. We may incur substantial expenses as a result of the limited nature of our disaster recovery and business continuity plans, which could have a material adverse effect on our business. In addition, the long-term effects of climate change on general economic conditions and the pharmaceutical industry in particular are unclear and may heighten or intensify the existing risk of natural disasters. As part of our risk management policy, we maintain insurance coverage at levels that we believe are appropriate for our business. However, we cannot assure you that such insurance coverage will be sufficient to satisfy any damages and losses we may experience. If our facilities, or the manufacturing facilities of our third-party contract manufacturers, are unable to operate for any reason, even for a short period of time, any or all of our research and development programs may be harmed. Any business interruption could have a material and adverse effect on our business, financial condition, results of operations and prospects.

We are subject to complex tax rules relating to our business, and any audits, investigations or tax proceedings could have a material adverse effect on our business, results of operations and financial condition.

We are subject to income and non-income taxes in the United States. Income tax accounting often involves complex issues, and judgment is required in determining our provision for income taxes and other tax liabilities. We may operate in other non-United States jurisdictions in the future. We could become subject to income and non-income taxes in non-United States jurisdictions as well. In addition, many jurisdictions have detailed transfer pricing rules, which require that all

transactions with non-resident related parties be priced using arm's length pricing principles within the meaning of such rules. The application of withholding tax, goods and services tax, sales taxes and other non-income taxes is not always clear and we may be subject to tax audits relating to such withholding or non-income taxes. We believe that our tax positions are reasonable. We are currently not subject to any tax audits. However, the Internal Revenue Service or other taxing authorities may disagree with our positions. If the Internal Revenue Service or any other tax authorities were successful in challenging our positions, we may be liable for additional tax and penalties and interest related thereto or other taxes, as applicable, in excess of any reserves established therefor, which may have a significant impact on our results and operations and future cash flow.

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

As of December 31, 2023, we had net operating loss, or NOL, carryforwards for federal and state income tax purposes of $201.6 million and $237.4 million, respectively, which begin to expire in 2037. As of December 31, 2023, we also had available tax credit carryforwards for federal and state income tax purposes of $17.3 million and $7.4 million, respectively, which begin to expire in 2032. To the extent that our taxable income exceeds any current year operating losses, we plan to use our carryforwards to offset income that would otherwise be taxable. However, utilization of carryforwards generated in tax years beginning after December 31, 2017 is limited to a maximum of 80% of the taxable income for such year determined without regard to such carryforwards. In addition, under Section 382 of the Internal Revenue Code (the "Code"), changes in our ownership may limit the amount of our net operating loss carryforwards and tax credit carryforwards that could be utilized annually to offset our future taxable income, if any. This limitation would generally apply in the event of a cumulative change in ownership of our company of more than 50% within a three-year period. We have not performed an analysis to determine whether there has been an ownership change pursuant to Section 382 of the Code. Any such limitation may significantly reduce our ability to utilize our net operating loss carryforwards and tax credit carryforwards before they expire. Private placements, our IPO and other transactions that have occurred since our inception or that may occur in the future could result in such an ownership change pursuant to Section 382 of the Internal Revenue Code. Any such limitation, whether as the result of our IPO, prior private placements, sales of our common stock by our existing stockholders or additional sales of our common stock by us, could have a material adverse effect on our results of operations in future years. There is also a risk that due to regulatory changes at the state level, such as suspensions on the use of NOLs, or other unforeseen reasons, our existing NOLs could expire or otherwise be unavailable to offset future income tax liabilities.

We may be subject to adverse legislative or regulatory tax changes that could negatively impact our financial condition.

The rules dealing with U.S. federal, state and local income taxation are constantly under review by persons involved in the legislative process and by the Internal Revenue Service and the U.S. Treasury Department. Changes to tax laws (which changes may have retroactive application) could adversely affect our stockholders or us. We assess the impact of various tax reform proposals and modifications to existing tax treaties in all jurisdictions where we have operations to determine the potential effect on our business and any assumptions we have made about our future taxable income. We cannot predict whether any specific proposals will be enacted, the terms of any such proposals or what effect, if any, such proposals would have on our business if they were to be enacted. Beginning in 2022, the Tax Cuts and Jobs Act of 2017 eliminates the currently available option to deduct research and development expenditures and requires taxpayers to amortize them generally over five years. The U.S. Congress is considering legislation that would restore the current deductibility of research and development expenditures, however, we have no assurance that the provision will be repealed or otherwise modified.

Risks Related to Intellectual Property

If we are not able to obtain, maintain, and enforce patent protection for our technologies or product candidates, development and commercialization of our product candidates may be adversely affected.

Our success depends in part on our ability to obtain and maintain patents and other forms of intellectual property rights, including in-licenses of intellectual property rights of others, for our product candidates, as well as our ability to preserve our trade secrets, to prevent third parties from infringing upon our proprietary rights and to operate without infringing upon the proprietary rights of others. As of December 31, 2023, we solely owned various issued patents and pending patent applications protecting our integrin therapeutic compounds across multiple programs (including our product candidates) in the U.S. and many other major jurisdictions worldwide, including Europe, Japan and China. In addition, we hold an exclusive, worldwide license agreement with the Children's Medical Center Corporation, or the CMCC Agreement, to certain U.S. patents and related pending U.S. patent application(s) relating to modified integrin polypeptides, crystallizable dimers comprising a modified integrin polypeptide, and related methods. We may not be able to apply for patents on certain aspects of our product candidates in a timely fashion or at all. Further, we may not be able to prosecute all necessary

or desirable patent applications, or maintain, enforce and license any patents that may issue from such patent applications, at a reasonable cost or in a timely manner. It is also possible that we will fail to identify patentable aspects of our research and development output before it is too late to obtain patent protection. We may not have the right to control the preparation, filing and prosecution of all patent applications that we license from third parties, or to maintain the rights to patents licensed to third parties. Therefore, these patents and applications may not be prosecuted and enforced in a manner consistent with the best interests of our business. Future patents we obtain may not be sufficiently broad to prevent others from using our technology or from developing competing products and technology. There is no guarantee that any of our pending patent applications will result in issued or granted patents, that any of our future issued or granted patents will not later be found to be invalid or unenforceable or that any future issued or granted patents will include claims that are sufficiently broad to cover our product candidates or to provide meaningful protection from our competitors. Moreover, the patent position of biotechnology and biopharmaceutical companies can be highly uncertain because it involves complex legal and factual questions. We will be able to protect our proprietary rights from unauthorized use by third parties only to the extent that our current and future proprietary technology and product candidates are covered by valid and enforceable patents, or are effectively maintained as trade secrets. If third parties disclose or misappropriate our proprietary rights, it may materially and adversely affect our position in the market.

Our pending patent applications cannot be enforced against third parties practicing the technology claimed in such applications unless and until a patent issues from such applications. Assuming the other requirements for patentability are met, currently, the first inventor to file a patent application is generally entitled to the patent. However, prior to March 16, 2013, in the United States, the first to invent the claimed invention was entitled to the patent. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we, our licensors or collaborators, or any future strategic partners were the first to make the inventions claimed in our owned or licensed patents or pending patent applications, or that we, our licensors or collaborators, or any future strategic partners were the first to file for patent protection of such inventions.

The U.S. Patent and Trademark Office, or USPTO, and various foreign governmental patent agencies require compliance with a large number of procedural, documentary, fee payment and other provisions during the patent process. There are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case. The standards applied by the USPTO and foreign patent offices in granting patents are not always applied uniformly or predictably. For example, there is no uniform worldwide policy regarding patentable subject matter or the scope of claims allowable in biotechnology and biopharmaceutical patents. As such, we do not know the degree of future protection that we will have on our proprietary products and technology. The process of obtaining patents is time consuming, expensive and sometimes unpredictable.

Once granted, for a given period after allowance or grant patents may remain open to opposition, interference, re-examination, post-grant review, *inter partes* review, nullification, or derivation action in court or before patent offices or similar proceedings, during which time third parties can raise objections against such initial grant. Such proceedings may continue for a protracted period of time and an adverse determination in any such proceedings could reduce the scope of the allowed or granted claims thus attacked, or could result in our patents being invalidated in whole or in part, or being held unenforceable, which could allow third parties to commercialize our product candidates and compete directly with us without payment to us. In addition, there can be no assurance that:

- others will not or may not be able to make, use or sell compounds that are the same as or similar to our product candidates but that are not covered by the claims of the patents that we own or license;
- we or our licensors, or our existing or future collaborators are the first to make the inventions covered by each of our issued patents and pending patent applications that we own or license;
- we or our licensors, or our existing or future collaborators are the first to file patent applications covering certain aspects of our inventions;
- others will not independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights;
- a third party may not challenge our patents and, if challenged, a court would hold that our patents are valid, enforceable and infringed;
- any issued patents that we own or have licensed or that we may license in the future will provide us with any competitive advantages, or will not be challenged by third parties;
- we may develop additional proprietary technologies that are patentable;

- the patents of others will not have a material or adverse effect on our business, financial condition, results of operations and prospects; and
- our competitors do not conduct research and development activities in countries where we do not have enforceable patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets.

If we or our licensors or collaborators fail to maintain the patents and patent applications covering our product candidates, our competitors might be able to enter the market, which could have a material and adverse effect on our business, financial condition, results of operations and prospects. In addition, if the breadth or strength of protection provided by our patents and patent applications is threatened, regardless of the outcome, it could dissuade companies from collaborating with us to license, develop or commercialize current or future product candidates.

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

In addition to seeking patent protection for certain aspects of our product candidates, we also consider trade secrets, including confidential and unpatented know-how, important to the maintenance of our competitive position. Our reliance on third parties requires us to share our trade secrets, which increases the possibility that a competitor will discover them or that our trade secrets will be misappropriated or disclosed. We seek to protect trade secrets and confidential and unpatented know-how, in part, by entering into non-disclosure and confidentiality agreements with parties who have access to such knowledge, such as our employees, corporate collaborators, outside scientific collaborators, CROs, contract manufacturers, consultants, advisors and other third parties. We also enter into confidentiality and invention or patent assignment agreements with our employees and consultants that obligate them to maintain confidentiality and assign their inventions to us. Despite these efforts, any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret is difficult, expensive and time-consuming, and the outcome is unpredictable. In addition, some courts in the United States and certain foreign jurisdictions are less willing or unwilling to protect trade secrets. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor, we would have no right to prevent them from using that technology or information to compete with us. Furthermore, we expect that, over time, our trade secrets, know-how and proprietary information may be disseminated within the industry through independent development, the publication of journal articles and the movement of personnel to and from academic and industry scientific positions. Consequently, without costly efforts to protect our proprietary technology, we may be unable to prevent others from exploiting that technology, which could affect our ability to expand in domestic and international markets. If any of our trade secrets were to be disclosed to or independently developed by a competitor, our competitive position would be harmed which could have a material and adverse effect on our business, financial condition, results of operations and prospects.

Other companies or organizations may challenge our or our licensors' patent rights or may assert patent rights that prevent us from developing and commercializing our products, if approved.

Oral integrin therapies in fibrosis and IBD or other disease areas are a relatively new scientific field. We have applied for and have obtained a license from a third party on an exclusive basis to U.S. patent filings related to our MInT Platform. Other pending patent applications in the United States and in key markets around the world that we own or license claim many different methods, compositions and processes relating to the discovery, development, and manufacture of small-molecule integrin inhibitor-based and other therapeutics.

As the field of small-molecule integrin inhibitor-based therapeutics continues to mature, patent applications are being processed by national patent offices around the world. There is uncertainty about which patents will issue and, if they do, as to when, to whom, and with what claims. In addition, third parties may attempt to invalidate our intellectual property rights. Even if our rights are not directly challenged, disputes could lead to the weakening of our intellectual property rights. Our defense against any attempt by third parties to circumvent or invalidate our intellectual property rights could be costly to us, could require significant time and attention of our management and could have a material and adverse effect on our business, financial condition, results of operations and prospects or our ability to successfully compete. If we are found to infringe a third party's intellectual property rights, we could be forced, including by court order, to cease developing, manufacturing or commercializing the infringing product candidate or product.

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

Filing, prosecuting, defending and enforcing patents covering our technology in the United States and in other jurisdictions worldwide would be extremely costly, and our or our licensors' or collaborators' intellectual property rights may not exist in some countries outside the United States or may be less extensive in some countries than in the United States. In

jurisdictions where we or our licensors or collaborators have not obtained patent protection, competitors may seek to use our or our licensors' or collaborators' technology to develop competing products and further, may export otherwise infringing products to territories where we have patent protection, but where it is more difficult to enforce a patent as compared to the United States. Competitor products may compete with our future products in jurisdictions where we do not have issued or granted patents or where our or our licensors' or collaborators' issued or granted patent claims or other intellectual property rights are not sufficient to prevent competitor activities in these jurisdictions. The legal systems of certain countries, particularly certain developing countries, make it difficult to enforce patents and such countries may not recognize other types of intellectual property protection, particularly relating to pharmaceuticals or biopharmaceuticals. This could make it difficult for us or our licensors or collaborators to prevent the infringement of our or their patents or marketing of competing products in violation of our or their proprietary rights generally in certain jurisdictions. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial cost and divert our and our licensors' or collaborators' efforts and attention from other aspects of our business, could put our and our licensors' or collaborators' patents at risk of being invalidated or interpreted narrowly and our and our licensors' or collaborators' patent applications at risk of not issuing and could provoke third parties to assert claims against us or our licensors or collaborators. We or our licensors or collaborators may not prevail in any lawsuits that we or our licensors or collaborators initiate, and the damages or other remedies awarded, if any, may not be commercially meaningful.

When we elect to pursue patent protection on an invention, we generally first file a U.S. provisional patent application (a priority filing) at the USPTO. An international patent application under the Patent Cooperation Treaty, or PCT, and/or a national application in a non-PCT country may then be filed within twelve months after the priority filing. Based on the PCT filing, national and regional patent applications may be filed in one or more PCT member countries. We have thus far not filed for patent protection in all national and regional jurisdictions where such protection may be available. In addition, we may decide to abandon national and regional patent applications before grant. Finally, the grant proceeding of each national or regional patent office is an independent proceeding, which may lead to situations in which patent applications might in some jurisdictions be refused by the relevant registration authorities, while granted by others. It is also quite common that, depending on the country, different scopes of patent protection may be granted on the same product candidate or technology.

The laws of some jurisdictions do not protect intellectual property rights to the same extent as the laws in the United States, and many companies have encountered significant difficulties in protecting and defending such rights in such jurisdictions. If we or our licensors or collaborators encounter difficulties in protecting, or are otherwise precluded from effectively protecting, the intellectual property rights important for our business in such jurisdictions, the value of these rights may be diminished and we may face additional competition from others in those jurisdictions. Many countries have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In addition, many countries limit the enforceability of patents against government agencies or government contractors. In these countries, the patent owner may have limited remedies, which could materially diminish the value of such a patent. If we or any of our licensors or collaborators are forced to grant a license to third parties with respect to any patents relevant to our business, our competitive position in the relevant jurisdiction may be impaired and our business, financial condition, results of operations and prospects may be adversely affected.

If we fail to comply with our obligations under any license, collaboration or other agreements, we may be required to pay damages and could lose intellectual property rights that are necessary for developing and protecting our product candidates or we could lose certain rights to grant sublicenses.

We are dependent on patents, know-how and proprietary technology, both our own and licensed from others. Any termination of our licenses could result in the loss of significant rights and could harm our ability to develop our product candidates. Our current licenses impose, and any future licenses we enter into are likely to impose, various development, commercialization, funding, milestone, royalty, diligence, sublicensing, insurance, patent prosecution and enforcement and/or other obligations on us. If we breach any of these obligations, or use the intellectual property licensed to us in an unauthorized manner, we may be required to pay damages and the licensor may have the right to terminate the license, which could result in us being unable to develop, manufacture and sell any future products that are covered by the licensed technology or enable a competitor to gain access to the licensed technology. Moreover, our licensors may own or control intellectual property that has not been licensed to us and, as a result, we may be subject to claims, regardless of their merit, that we are infringing or otherwise violating a licensor's rights. In addition, while we cannot determine currently the amount of the royalty obligations we would be required to pay on sales of future products, if any, the amounts may be significant. The amount of our future royalty obligations will depend on the technology and intellectual property we use in products that we successfully develop and commercialize, if any. Therefore, even if we successfully develop and commercialize products, we may be unable to achieve or maintain profitability.

Moreover, disputes may arise regarding intellectual property subject to a licensing agreement, including:

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

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

We, our licensors or collaborators, or any future strategic partners may need to resort to litigation to protect or enforce our patents, if and when granted, or other proprietary rights, all of which could be costly and time consuming, delay or prevent the development and commercialization of our product candidates, or put our patents, if and when granted, patent applications and other proprietary rights at risk.

Competitors may infringe our owned or licensed patents, if and when granted, patent applications or other intellectual property. If we were to initiate legal proceedings against a third party to enforce a patent covering one of our product candidates or our technology, the defendant could counterclaim that our patent is invalid or unenforceable. In patent litigation in the United States, defendant counterclaims alleging invalidity or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, including lack of novelty, lack of adequate written description, obviousness or non-enablement. Grounds for an unenforceability assertion could be an allegation that an individual connected with prosecution of the patent withheld relevant information from the USPTO, or made a misleading statement, during prosecution. The outcome following legal assertions of invalidity or unenforceability during patent litigation is unpredictable. With respect to the validity question, for example, we cannot be certain that there is no invalidating prior art, of which we and the patent examiner were unaware during prosecution. If a defendant were to prevail on a legal assertion of invalidity or unenforceability, we would lose at least part, and perhaps all, of the patent protection on one or more of our product candidates or certain aspects of our platform technology. Such a loss of patent protection could have a material and adverse effect on our business, financial condition, results of operations and prospects. Interference or derivation proceedings provoked by third parties or brought by us or declared by the USPTO may be necessary to determine the inventorship or priority of inventions with respect to our patents or patent applications. An unfavorable outcome could require us to cease using the related technology or to attempt to license rights to it from the prevailing party. Our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms or at all, or if a non-exclusive license is offered and our competitors gain access to the same technology. In addition, the uncertainties associated with litigation could have a material adverse effect on our ability to raise the funds necessary to continue our clinical trials, continue our research programs, license necessary technology from third parties, or enter into development partnerships that would help us bring our product candidates to market. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation. There could also be public announcements of the results of hearings, motions, or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a material adverse effect on the price of our common stock. Patents and other intellectual property rights will not protect our technology if competitors design around our protected technology without legally infringing our patents or other intellectual property rights.

Intellectual property rights of third parties could adversely affect our ability to commercialize our product candidates, and we, our licensors or collaborators, or any future strategic partners may become subject to third party claims or litigation alleging infringement of patents or other proprietary rights or seeking to invalidate patents or other proprietary rights. We might be required to litigate or obtain licenses from third parties in order to develop or market our product candidates. Such litigation or licenses could be costly or not available on commercially reasonable terms.

We, our licensors or collaborators, or any future strategic partners, may be subject to third-party claims for infringement or misappropriation of patent or other proprietary rights. There is a substantial amount of litigation, both within and outside the United States, involving patent and other intellectual property rights in the biotechnology and pharmaceutical industries, including patent infringement lawsuits, interferences, derivations, oppositions and *inter partes* review proceedings before the USPTO, and corresponding foreign patent offices. There may be issued patents and pending patent applications that claim aspects of our targets, our MInT Platform, or our product candidates and modifications that we may need to apply to our product candidates. There may be issued patents that claim integrin inhibitors which may be relevant to the products we wish to develop. Thus, it is possible that one or more organizations will hold patent rights to which we will need a license. If those organizations refuse to grant us a license to such patent rights on reasonable terms, we may not be able to market products or perform research and development or other activities covered by these patents, which could have a material and adverse effect on our business, financial condition, results of operations and prospects. If we, our licensors or collaborators, or any future strategic partners are found to infringe a third-party patent or other intellectual property rights, we could be required to pay damages, potentially including treble damages and attorneys' fees if we or they are found to have infringed willfully. In addition, we, our licensors or collaborators, or any future strategic partners may choose to seek, or be required to seek, a license from a third party, which may not be available on acceptable terms, if at all. Even if a license can be obtained on acceptable terms, the rights may be non-exclusive, which could give our competitors access to the same technology or intellectual property rights licensed to us. If we fail to obtain a required license, we or our existing or future collaborators may be unable to effectively market product candidates based on our technology, which could limit our ability to generate revenue or achieve profitability and possibly prevent us from generating revenue sufficient to sustain our operations. In addition, we may find it necessary to pursue claims or initiate lawsuits to protect or enforce our patent or other intellectual property rights. The cost to us in defending or initiating any litigation or other proceeding relating to patent or other proprietary rights, even if resolved in our favor, could be substantial, and litigation could divert our management's attention. Some of our competitors may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could delay our research and development efforts and limit our ability to continue our operations.

Because the integrin-based therapeutics landscape is still evolving, it is difficult to conclusively assess our freedom to operate without infringing on third-party rights. There are numerous companies that have pending patent applications and issued patents broadly covering integrins generally, covering integrins directed against the same targets as, or targets similar to, those we are pursuing, or covering compounds similar to our product candidates. Failure to receive a license could delay commercialization of our product candidates. Our competitive position may suffer if patents issued to third parties or other third-party intellectual property rights cover our products, if approved, or product candidates or elements thereof, or our manufacture or uses relevant to our development plans. In such cases, we may not be in a position to develop or commercialize products or product candidates until such patents expire or unless we successfully pursue litigation to nullify or invalidate the third-party intellectual property right concerned, or enter into a license agreement with the intellectual property right holder, if available on commercially reasonable terms. There may be issued patents of which we are not aware, held by third parties that, if found to be valid and enforceable, could be alleged to be infringed by our MInT Platform and product candidates. There also may be pending patent applications of which we are not aware that may result in issued patents, which could be alleged to be infringed by our MInT Platform and product candidates. If such an infringement claim should be brought and be successful, we may be required to pay substantial damages, including potentially treble damages and attorneys' fees for willful infringement, and we may be forced to abandon our product candidates or seek a license from any patent holders. No assurances can be given that a license will be available on commercially reasonable terms, if at all.

It is also possible that we have failed to identify relevant third-party patents or applications. For example, U.S. applications filed before November 29, 2000, and certain U.S. applications filed after that date that will not be filed outside the United States remain confidential unless and until corresponding patents issue. Patent applications in the United States and elsewhere are published approximately 18 months after the earliest filing for which priority is claimed, with such earliest filing date being commonly referred to as the priority date. Therefore, patent applications covering our product candidates or MInT Platform could have been filed by others without our knowledge. Additionally, pending patent applications that have been published can, subject to certain limitations, be later amended in a manner that could cover our MInT Platform, our product candidates or the use of our product candidates. Third-party intellectual property right holders may also actively bring infringement claims against us. We cannot guarantee that we will be able to successfully settle or otherwise resolve such infringement claims. If we are unable to successfully settle future claims on terms acceptable to us, we may be required to engage in or continue costly, unpredictable and time-consuming litigation and may be prevented from or experience substantial delays in marketing our products, if approved. Parties making claims against us may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation or administrative proceedings, there is a risk that some of our confidential information could be compromised by

disclosure. In addition, any uncertainties resulting from the initiation and continuation of any litigation could have a material adverse effect on our ability to raise additional funds or otherwise have a material adverse effect on our business, results of operations, financial condition and prospects. If we fail in any such dispute, in addition to being forced to pay damages, we may be temporarily or permanently prohibited from commercializing any of our product candidates that are held to be infringing. We might, if possible, also be forced to redesign product candidates so that we no longer infringe the third-party intellectual property rights. Any of these events, even if we were ultimately to prevail, could require us to divert substantial financial and management resources that we would otherwise be able to devote to our business and could have a material and adverse effect on our business, financial condition, results of operations and prospects.

Intellectual property litigation could cause us to spend substantial resources and distract our personnel from their normal responsibilities.

Litigation and other legal proceedings relating to intellectual property claims, with or without merit, are unpredictable and generally expensive and time consuming and are likely to divert significant resources from our core business, including distracting our technical and management personnel from their normal responsibilities. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Moreover, such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing or distribution activities.

We may not have sufficient financial or other resources to adequately conduct such litigation or proceedings. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios. Accordingly, despite our efforts, we may not be able to prevent third parties from infringing upon or misappropriating or from successfully challenging our intellectual property rights. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace.

We may be subject to claims that we or our employees or consultants have wrongfully used or disclosed alleged trade secrets of our employees' or consultants' former employers or their clients. These claims may be costly to defend and if we do not successfully do so, we may be required to pay monetary damages and may lose valuable intellectual property rights or personnel.

Many of our employees, including our management, were previously employed at universities or biotechnology or biopharmaceutical companies, including our competitors or potential competitors. Some of these employees executed proprietary rights, non-disclosure and non-competition agreements in connection with such previous employment. Although no claims against us are currently pending, we may be subject to claims that these employees, employees of our licensors or collaborators or we have inadvertently or otherwise used or disclosed trade secrets or other proprietary information of their former employers. Litigation may be necessary to defend against these claims. If we or our licensors or collaborators fail in defending such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. A loss of key research personnel or their work product could hamper our ability to develop and ultimately commercialize, or prevent us from developing and commercializing, our product candidates, which could severely harm our business. Even if we or our licensors or collaborators are successful in defending against these claims, litigation could result in substantial costs and be a distraction to management.

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

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

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

Periodic maintenance fees, renewal fees, annuity fees and various other governmental fees on patents and/or applications will be due to be paid to the USPTO and various governmental patent agencies outside of the United States in several stages over the lifetime of the patents and/or applications. We have systems in place to remind us to pay these fees, and we employ consultants and an outside firm and/or rely on our outside counsel to pay these fees due to the USPTO and non-U.S. patent agencies. The USPTO and various non-U.S. governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process. We employ reputable law firms and other professionals to help us comply, and in many cases an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with the applicable rules. However, there are situations in which non-compliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, our competitors might be able to enter the market and this circumstance would have a material adverse effect on our business.

Changes in U.S. patent and ex-U.S. patent laws could diminish the value of patents in general, thereby impairing our ability to protect our product candidates.

Changes in either the patent laws or interpretation of the patent laws in the United States or in other jurisdictions could increase the uncertainties and costs surrounding the prosecution of patent applications and the enforcement or defense of issued patents. In the United States, numerous recent changes to the patent laws and proposed changes to the rules of the USPTO may have a significant impact on our ability to protect our technology and enforce our intellectual property rights. We cannot assure you that subsequent rulings will not adversely impact our patents or patent applications. In addition to increasing uncertainty regarding our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents, once granted. For example, the U.S. Supreme Court, in the case Amgen v. Sanofi, held that broad functional antibody claims are invalid for lack of enablement. In addition, in Juno v. Kite, the Federal Circuit held broad antibody and chimeric antigen receptor claims supported by few examples invalid for lack of written description. Recently, the Federal Circuit issued a precedential decision in In re Cellect (No. 22-1293) that could shorten or eliminate extended patent term awarded under Patent Term Adjustment if challenged on the basis of Obvious-Type Double Patenting. Depending on decisions by the U.S. Congress, the federal courts and the USPTO, and similar legislative and regulatory bodies in other countries in which may pursue patent protection, the laws and regulations governing patents could change in unpredictable ways, particularly with respect to pharmaceutical patent protection, that would weaken our ability to obtain new patents or to enforce our or our licensors' or collaborators' existing patents and patents that we might obtain in the future.

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

Our common law trademarks or trade names may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. We may not be able to protect our rights to these trademarks and trade names or may be forced to stop using these names, which we need for name recognition by potential partners or customers in our markets of interest. If we are unable to establish name recognition based on our trademarks and trade names, we may not be able to compete effectively which could have a material and adverse effect on our business, financial condition, results of operations and prospects.

Risks Related to Government Regulation

We and/or our collaborators may be unable to obtain, or may be delayed in obtaining, U.S. or foreign regulatory approval and, as a result, unable to commercialize our product candidates.

Our product candidates are subject to extensive governmental regulations relating to, among other things, research, testing, development, manufacturing, approval, recordkeeping, reporting, labeling, storage, packaging, advertising and promotion, pricing, post-approval monitoring, marketing and distribution of drugs. Rigorous preclinical testing and clinical trials and an extensive regulatory approval process are required to be completed successfully in the United States and in many foreign jurisdictions before a new drug can be marketed. Satisfaction of these and other regulatory requirements is costly, time consuming, uncertain and subject to unanticipated delays. It is possible that none of the product candidates we may develop, either alone or with our collaborators, will obtain the regulatory approvals necessary for us or our existing or future collaborators to begin selling them.

We have no prior experience in conducting and managing the clinical trials necessary to obtain regulatory approvals, including approval by the FDA. The time required to obtain FDA and other approvals is unpredictable but typically takes many years following the commencement of clinical trials, depending upon the type, complexity and novelty of the product candidate. The standards that the FDA and its foreign counterparts use when regulating us require judgment and can change, which makes it difficult to predict with certainty their application. Any analysis we perform of data from preclinical and clinical activities is subject to confirmation and interpretation by regulatory authorities, which could delay,

limit or prevent regulatory approval. We or our collaborators may also encounter unexpected delays or increased costs due to new government regulations, for example, from future legislation or administrative action, or from changes in FDA policy during the period of product development, clinical trials and FDA regulatory review. Such disruptions could divert healthcare resources away from, or materially delay review by, the FDA and comparable foreign regulatory agencies. It is unknown how long these disruptions could continue, were they to occur. Any elongation or de-prioritization of preclinical studies or clinical trials or delay in regulatory review resulting from such disruptions could materially affect the development and study of our product candidates. It is impossible to predict whether additional legislative changes will be enacted, or whether FDA or foreign regulations, guidance or interpretations will be changed, or the impact of such changes, if any.

Given that the product candidates we are developing, either alone or with our collaborators, represent a new therapeutic approach, the FDA and its foreign counterparts may not have established any definitive policies, practices or guidelines in relation to these product candidates. Moreover, the FDA may respond to any NDA that we may submit by defining requirements that we do not anticipate. Such responses could delay clinical development of our product candidates. In addition, because there may be approved treatments for some of the diseases for which we may seek approval, in order to receive regulatory approval, we may need to demonstrate through clinical trials that the product candidates we develop to treat these diseases, if any, are not only safe and effective, but safer or more effective than existing products. Furthermore, in recent years, there has been increased public and political pressure on the FDA with respect to the approval process for new drugs, and FDA standards, especially regarding product safety.

Any delay or failure in obtaining required approvals could have a material and adverse effect on our ability to generate revenues from the particular product candidate for which we are seeking approval. Furthermore, any regulatory approval to market a product may be subject to limitations on the approved uses for which we may market the product or on the labeling or other restrictions.

We are also subject to or may in the future become subject to numerous foreign regulatory requirements governing, among other things, the conduct of clinical trials, manufacturing and marketing authorization, pricing and third-party reimbursement. The foreign regulatory approval process varies among countries and may include all of the risks associated with the FDA approval process described above, as well as risks attributable to the satisfaction of local regulations in foreign jurisdictions. Moreover, the time required to obtain approval may differ from that required to obtain FDA approval. FDA approval does not ensure approval by regulatory authorities outside the United States and vice versa. Any delay or failure to obtain U.S. or foreign regulatory approval for a product candidate could have a material and adverse effect on our business, financial condition, results of operations and prospects.

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

Any regulatory approvals that we or our existing or future collaborators obtain for our product candidates may also be subject to limitations on the approved indicated uses for which a product may be marketed or to the conditions of approval, or contain requirements for potentially costly post-marketing testing and surveillance to monitor the safety and efficacy of the product candidate.

In addition, if the FDA or a comparable foreign regulatory authority approves any of our product candidates, the manufacturing processes, labeling, packaging, distribution, post-approval monitoring and adverse event reporting, storage, import, export, advertising, promotion and recordkeeping for the product will be subject to extensive and ongoing regulatory requirements. The FDA has significant post-market authority, including the authority to require labeling changes based on new safety information and to require post-market studies or clinical trials to evaluate safety risks related to the use of a product or to require withdrawal of the product from the market. The FDA also has the authority to require a REMS after approval, which may impose further requirements or restrictions on the distribution or use of an approved drug. The manufacturing facilities we use to make a future product, if any, will also be subject to periodic review and inspection by the FDA and other regulatory agencies, including for continued compliance with cGMP requirements. The discovery of any new or previously unknown problems with our third-party manufacturers, manufacturing processes or facilities may result in restrictions on the product, manufacturer or facility, including withdrawal of the product from the market. If we rely on third-party manufacturers, we will not have control over compliance with applicable rules and regulations by such manufacturers. Any product promotion and advertising will also be subject to regulatory requirements and continuing regulatory review. The FDA imposes stringent restrictions on manufacturers' communications regarding use of their products. If we promote our product candidates in a manner inconsistent with FDA-approved labeling or otherwise not in compliance with FDA regulations, we may be subject to enforcement action. In addition, unless we conduct head-to-head comparative clinical trials for our product candidates, we will be unable to make comparative claims

regarding any other products in the promotional materials for our product candidates. If we or our existing or future collaborators, manufacturers or service providers fail to comply with applicable continuing regulatory requirements in the United States or foreign jurisdictions in which we seek to market our products, we or they may be subject to, among other things, fines, warning letters, holds on clinical trials, delay of approval or refusal by the FDA or comparable foreign regulatory bodies to approve pending applications or supplements to approved applications, suspension or withdrawal of regulatory approval, product recalls and seizures, administrative detention of products, refusal to permit the import or export of products, operating restrictions, injunction, civil penalties and criminal prosecution.

Subsequent discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with our third-party manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may result in, among other things:

- restrictions on the marketing or manufacturing of the product, withdrawal of the product from the market or voluntary or mandatory product recalls;
- fines, warning or untitled letters or holds on clinical trials;
- refusal by the FDA to approve pending applications or supplements to approved applications filed by us or our strategic partners;
- suspension or revocation of product license approvals;
- product seizure or detention or refusal to permit the import or export of products; and
- injunctions or the imposition of civil or criminal penalties.

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

We also cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative or executive action, either in the United States or abroad. Changes in FDA staffing could result in delays in the FDA's responsiveness or in its ability to review submissions or applications, issue regulations or guidance, or implement or enforce regulatory requirements in a timely fashion or at all. Similar consequences would also result in the event of another significant shutdown of the federal government such as the one that occurred from December 22, 2018 through January 25, 2019. It is difficult to predict how these requirements will be implemented, and the extent to which they will impact the FDA's ability to exercise its regulatory authority. If any legislation, executive orders, or lapses in agency funding impose constraints on the FDA's ability to engage in oversight and implementation activities in the normal course, our business may be negatively impacted.

We may face difficulties from healthcare legislative reform measures.

Existing regulatory policies may change and additional government regulations may be enacted that could affect pricing and third-party payment for our product candidates, which could negatively affect our business, financial condition and prospects. We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative action, either in the United States or abroad. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained and we may not achieve or sustain profitability.

In the United States, there have been and continue to be a number of legislative initiatives to contain healthcare costs. For example, in March 2010, the Patient Protection and Affordable Care Act, as amended by the Healthcare and Education Reconciliation Act, or together, the ACA, was enacted, which was intended to broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against fraud and abuse, add new transparency requirements for health care and health insurance industries, impose new taxes and fees on the health industry and impose additional health policy.

While there have been legislative and judicial efforts to modify, repeal, or otherwise invalidate all, or certain provisions of, the ACA, the ACA remains in effect in its current form. It is possible that the ACA will be subject to judicial or congressional challenges in the future. It is unclear how any such efforts to repeal, replace, amend or invalidate the ACA or its implementing regulations, or portions thereof, will impact the ACA or our business. There have also been and continue to be a number of initiatives at the United States federal and state levels that seek to reduce healthcare costs, including the Budget Control Act (which, subject to certain temporary suspension periods, imposed 2% reductions in Medicare payments

to providers per fiscal year starting April 1, 2013 and, due to subsequent legislative amendments to the statute, that will remain in effect through 2031, unless additional Congressional action is taken). Moreover, the American Taxpayer Relief Act of 2012 among other things, further reduced Medicare payments to several types of providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. If federal spending is further reduced, anticipated budgetary shortfalls may also impact the ability of relevant agencies, such as the FDA or the National Institutes of Health to continue to function at current levels. Amounts allocated to federal grants and contracts may be reduced or eliminated. These reductions may also impact the ability of relevant agencies to timely review and approve research and development, manufacturing, and marketing activities, which may delay our ability to develop, market and sell any products we may develop.

Further, in November 2020, the U.S. Department of Health and Human Services, or HHS, finalized a regulation removing safe harbor protection for price reductions from pharmaceutical manufacturers to plan sponsors under Part D, either directly or through pharmacy benefit managers, unless the price reduction is required by law. The rule also creates a new safe harbor for price reductions reflected at the point-of-sale, as well as a safe harbor for certain fixed fee arrangements between pharmacy benefit managers and manufacturers. The implementation of this final rule was delayed by the Biden administration until January 1, 2023 and subsequently delayed by the Inflation Reduction Act, or IRA, until January 1, 2032. In December 2020, CMS issued a final rule implementing significant manufacturer price reporting changes under the Medicaid Drug Rebate Program, including regulations that affect manufacturer-sponsored patient assistance programs subject to pharmacy benefit manager accumulator programs and Best Price reporting related to certain value-based purchasing arrangements. Under the American Rescue Plan Act of 2021, effective January 1, 2024, the statutory cap on Medicaid Drug Rebate Program rebates that manufacturers pay to state Medicaid programs is eliminated. Elimination of this cap may require pharmaceutical manufacturers to pay more in rebates than they receive on the sale of products. It is unclear to what extent these new requirements will be implemented and to what extent these regulations or any future legislation or regulations by the Biden administration will have on our business, including our ability to generate revenue and achieve profitability.

Moreover, payment methodologies may be subject to changes in healthcare legislation and regulatory initiatives.

There has been heightened governmental scrutiny over the manner in which manufacturers set prices for their marketed products, which has resulted in several presidential executive orders, Congressional inquiries and proposed and enacted federal and state legislation designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, reduce the costs of drugs under Medicare, and reform government program reimbursement methodologies for drug products.

Recently, several healthcare reform initiatives culminated in the enactment of the IRA in August 2022, which allows, among other things, the HHS to negotiate the selling price of a statutorily specified number of drugs and biologics each year that CMS reimburses under Medicare Part B and Part D. Only high-expenditure single-source drugs that have been approved for at least 7 years (11 years for single-source biologics) can qualify for negotiation, with the negotiated price taking effect two years after the selection year. Negotiations for Medicare Part D products begin in 2024 with the negotiated price taking effect in 2026, and negotiations for Medicare Part B products begin in 2026 with the negotiated price taking effect in 2028. In August 2023, HHS announced the ten Medicare Part D drugs and biologics that it selected for negotiations, and by October 1, 2023, each manufacturer of the selected drugs signed a manufacturer agreement to participate in the negotiations. HHS will announce the negotiated maximum fair price by September 1, 2024, and this price cap, which cannot exceed a statutory ceiling price, will come into effect on January 1, 2026. A drug or biological product that has an orphan drug designation for only one rare disease or condition will be excluded from the IRA's price negotiations requirements, but loses that exclusion if it has designations for more than one rare disease or condition, or if is approved for an indication that is not within that single designated rare disease or condition, unless such additional designation or such disqualifying approvals are withdrawn by the time CMS evaluates the drug for selection for negotiation. The IRA also penalizes drug manufacturers that increase prices of Medicare Part B and Part D drugs at a rate greater than the rate of inflation and eliminates the "donut hole" under Medicare Part D beginning in 2025 by significantly lowering the beneficiary maximum out-of-pocket cost through a newly established manufacturer discount program, which requires manufacturers that wish for their drugs to be covered by Medicare Part D to provide statutorily defined discounts to Part D enrollees. The IRA permits the Secretary of HHS to implement many of these provisions through guidance, as opposed to regulation, for the initial years. Manufacturers that fail to comply with the IRA may be subject to various penalties, some significant, including civil monetary penalties. The IRA also extends enhanced subsidies for individuals purchasing health insurance coverage in ACA marketplaces through plan year 2025. These provisions are taking effect progressively starting in 2023, although they may be subject to legal challenges. For example, the provisions related to the negotiation of selling prices of high-expenditure single-source drugs and biologics have been challenged in multiple lawsuits. Thus, while it is unclear how the IRA will be implemented, it will likely have a significant impact on the pharmaceutical industry and the pricing of our products and product candidates. The adoption of restrictive price controls

in new jurisdictions, more restrictive controls in existing jurisdictions or the failure to obtain or maintain timely or adequate pricing could also adversely impact revenue. We expect pricing pressures will continue globally.

At the state level, legislatures are increasingly enacting laws and implementing regulations designed to control pharmaceutical and biological product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. Additional state and federal healthcare reform measures may be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services, which could result in reduced demand for our product candidates or companion diagnostics or additional pricing pressures.

We expect that the ACA and IRA, as well as other healthcare reform measures that may be adopted in the future, may result in more rigorous coverage criteria and in additional downward pressure on the price that we receive for any approved product. The implementation of cost containment measures or other healthcare reforms may prevent us from being able to generate revenue, attain profitability, or commercialize our products.

Our operations and relationships with healthcare providers, healthcare organizations, customers and third-party payors will be subject to applicable anti-bribery, anti-kickback, fraud and abuse, transparency and other healthcare and privacy laws and regulations, which could expose us to, among other things, enforcement actions, criminal sanctions, civil penalties, contractual damages, reputational harm, administrative burdens and diminished profits and future earnings.

Our current and future arrangements with healthcare providers, healthcare organizations, third-party payors and customers expose us to broadly applicable anti-bribery, fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we research, market, sell and distribute our product candidates. In addition, we may be subject to patient data privacy and security regulation by the U.S. federal government and the states and the foreign governments of countries in which we conduct our business. Restrictions under applicable federal and state anti-bribery and healthcare laws and regulations, include the following:

- the federal Anti-Kickback Statute, which prohibits, among other things, individuals and entities from knowingly and willfully soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, order or recommendation of, any good or service, for which payment may be made under a federal and state healthcare program such as Medicare and Medicaid. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- the federal criminal and civil false claims and civil monetary penalties laws, including the federal False Claims Act, which can be enforced through civil whistleblower or qui tam actions against individuals or entities, prohibits, among other things, knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent, knowingly making, using or causing to be made or used, a false record or statement material to a false or fraudulent claim, or from knowingly making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government. In addition, certain marketing practices, including off-label promotion, may also violate false claims laws. Moreover, the government may assert that a claim including items and services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal False Claims Act;
- HIPAA, which imposes criminal and civil liability, prohibits, among other things, knowingly and willfully executing, or attempting to execute a scheme to defraud any healthcare benefit program, or knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services; similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- HIPAA and its respective implementing regulations, including the Final Omnibus Rule published on January 25, 2013, which impose obligations on certain healthcare providers, health plans, and healthcare clearinghouses, known as covered entities, as well as their business associates that perform certain services involving the storage, use or disclosure of individually identifiable health information, including mandatory contractual terms, with respect to safeguarding the privacy, security, and transmission of individually identifiable health information, and require notification to affected individuals and regulatory authorities of certain breaches of security of individually identifiable health information; the federal legislation commonly referred to as Physician Payments Sunshine Act, enacted as part of the ACA, and its implementing regulations, which requires certain manufacturers of covered drugs, devices, biologics and medical supplies that are reimbursable under Medicare, Medicaid, or the Children's Health Insurance

Program, with certain exceptions, to report annually to CMS information related to certain payments and other transfers of value to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors), physician assistants, certain types of advance practice nurses and teaching hospitals, as well as ownership and investment interests held by the physicians described above and their immediate family members, with the information made publicly available on a searchable website;

- state privacy laws and regulations that impose restrictive requirements regulating the use and disclosure of health information and other sensitive personal information that is not subject to HIPAA. For example, in June 2018, California enacted the California Consumer Privacy Act of 2018, as amended by the California Privacy Rights Act of 2020, or CPRA, which gives California residents expanded rights to access and delete their personal information, restrict processing of sensitive personal information, opt out of certain personal information sharing and receive detailed information about how their personal information is used, and provides for civil penalties for violations, as well as a private right of action that may lead to an increased probability for data breach litigation, all of which will result in increased compliance costs and potential liability. The CPRA also created a new privacy regulator called the California Privacy Protection Agency, which is charged with enforcement as well as drafting and promulgating new privacy regulations. Following California's lead, several other state enacted privacy laws that took effect in 2023: the Colorado Privacy Act, the Connecticut Personal Data Privacy and Online Monitoring Act, the Utah Consumer Privacy Act, and the Virginia Consumer Data Protection Act. Additional state privacy laws are to take effect in 2024: the Florida Digital Bill of Rights (July 1, 2024), Montana's Consumer Data Privacy Act (October 1, 2024), Oregon's protections for the personal data of consumer enacted through SB 619 (July 1, 2024), and the Texas Data Privacy and Security Act (July 1, 2024);
- the U.S. Foreign Corrupt Practices Act of 1977, as amended, which prohibits, among other things, U.S. companies and their employees and agents from authorizing, promising, offering, or providing, directly or indirectly, corrupt or improper payments or anything else of value to foreign government officials, employees of public international organizations and foreign government owned or affiliated entities, candidates for foreign political office, and foreign political parties or officials thereof;
- analogous state and foreign laws and regulations, such as state anti-kickback and false claims laws, that may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers; and
- certain state laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government in addition to requiring drug manufacturers to report information related to payments to physicians and other healthcare providers or marketing expenditures and drug pricing information, state and local laws that require the registration of pharmaceutical sales representatives, and state laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

If we or our collaborators, manufacturers or service providers fail to comply with applicable federal, state or foreign laws or regulations, we could be subject to enforcement actions, which could affect our ability to develop, market and sell our products successfully and could harm our reputation and lead to reduced acceptance of our products by the market. These enforcement actions include, among others:

- exclusion from participation in government-funded healthcare programs; and
- exclusion from eligibility for the award of government contracts for our products.

Privacy laws, rules and regulations evolve frequently, and their scope may continually change through new legislation, amendments to existing legislation, and changes in enforcement, and may be inconsistent from one jurisdiction to another. The interpretation and application of consumer, health-related and data protection laws, especially with respect to genetic samples and data, in the United States, the European Union and elsewhere, are often uncertain, contradictory and in flux. As a result, implementation standards and enforcement practices are likely to remain uncertain for the foreseeable future, and we cannot determine the impact such future laws, regulations and standards may have on our business. We cannot provide assurance that current or future legislation will not prevent us from generating or maintaining personal data or that patients will consent to the use of their personal data (as necessary); either of these circumstances may prevent us from undertaking or publishing essential research and development, manufacturing, and commercialization, which could have a material adverse effect on our business, results of operations, financial condition and prospects.

Efforts to ensure that our current and future business arrangements with third parties comply with applicable healthcare laws and regulations could involve substantial costs. It is possible that governmental authorities will conclude that our

business practices do not comply with current or future statutes, regulations, agency guidance or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our operations are found to be in violation of any such requirements, we may be subject to significant penalties, including civil, criminal and administrative penalties, damages, fines, disgorgement, imprisonment, the curtailment or restructuring of our operations, loss of eligibility to obtain approvals from the FDA, exclusion from participation in government contracting, healthcare reimbursement or other government programs, including Medicare and Medicaid, integrity oversight and reporting obligations, or reputational harm, any of which could adversely affect our financial results.

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.

Even if we are able to commercialize any product candidate, such product candidate may become subject to unfavorable pricing regulations or third-party coverage and reimbursement policies, which would harm our business.

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

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

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

Interim reimbursement levels for new drugs, if applicable, may also be insufficient to cover our costs and may not be made permanent. Reimbursement rates may be based on payments allowed for lower cost drugs that are already reimbursed, may be incorporated into existing payments for other services and may reflect budgetary constraints or imperfections in Medicare data. Net prices for drugs may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that presently restrict imports of drugs from countries where they may be sold at lower prices than in the United States. Further, no uniform policy for coverage and reimbursement exists in the United States, and coverage and reimbursement can differ significantly from payor to payor. As a result, obtaining coverage and reimbursement approval of a product from a third-party payor is a time consuming and costly process that could require us to provide to each payor supporting scientific, clinical and cost effectiveness data for the use of our products on a payor-by-payor basis, with no assurance that coverage and adequate reimbursement will be obtained. There is significant uncertainty related to the insurance coverage and reimbursement of newly approved products. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own reimbursement rates, but also have their own methods and approval process apart from Medicare determinations. Our inability to promptly obtain coverage and adequate reimbursement rates from both government-funded and private payors for new drugs that we develop and for which we obtain regulatory approval could have a material and adverse effect on our business, financial condition, results of operations and prospects.

If we decide to pursue a Fast Track Designation by the FDA, it may not lead to a faster development or regulatory review or approval process.

We may seek Fast Track Designation for one or more of our product candidates. If a drug is intended for the treatment of a serious or life-threatening condition and the drug demonstrates the potential to address unmet medical needs for this condition, the product sponsor may apply for FDA Fast Track Designation. The FDA has broad discretion whether or not to grant this designation, so even if we believe a particular product candidate is eligible for this designation, we cannot assure you that the FDA would decide to grant it. Even if we do receive Fast Track Designation, we may not experience a faster development process, review or approval compared to conventional FDA procedures. The FDA may withdraw Fast Track Designation if it believes that the designation is no longer supported by data from our clinical development program.

If we decide to seek Orphan Drug Designation for one or more of our product candidates, we may be unsuccessful or may be unable to maintain the benefits associated with Orphan Drug Designation, including the potential for supplemental market exclusivity.

As part of our business strategy, we may seek Orphan Drug Designation for one or more of our product candidates, and we may be unsuccessful. Regulatory authorities in some jurisdictions, including the United States and Europe, may designate drugs for relatively small patient populations as orphan drugs. Under the Orphan Drug Act, the FDA may designate a drug as an orphan drug if it is a drug intended to treat a rare disease or condition, which is generally defined as a patient population of fewer than 200,000 individuals in the United States, or a patient population greater than 200,000 in the United States where there is no reasonable expectation that the cost of developing the drug will be recovered from sales in the United States. In the United States, Orphan Drug Designation entitles a party to financial incentives such as tax advantages and user fee waivers. In addition, if a product that has Orphan Drug Designation subsequently receives the first FDA approval for the disease for which it has such designation, the product is entitled to orphan drug exclusivity, which means that the FDA may not approve any other applications to market the same product for the same indication for seven years, except in limited circumstances, such as a showing of clinical superiority to the product with orphan drug exclusivity or where the manufacturer is unable to assure sufficient product quantity.

Even if we obtain Orphan Drug Designation for our product candidates in specific indications, we may not be the first to obtain marketing approval of these product candidates for the orphan-designated indication due to the uncertainties associated with developing pharmaceutical products. In addition, exclusive marketing rights in the United States may be limited if we seek approval for an indication broader than the orphan-designated indication or may be lost if the FDA later determines that the request for designation was materially defective or if the manufacturer is unable to assure sufficient quantities of the product to meet the needs of patients with the rare disease or condition. Further, even if we obtain orphan drug exclusivity for a product, that exclusivity may not effectively protect the product from competition because different drugs with different active moiety can be approved for the same condition. Even after an orphan product is approved, the FDA can subsequently approve the same drug with the same active moiety for the same condition if the FDA concludes that the later drug is safer, more effective or makes a major contribution to patient care. Orphan Drug Designation neither shortens the development time or regulatory review time of a drug nor gives the drug any advantage in the regulatory review or approval process. In addition, while we may seek Orphan Drug Designation for our product candidates, we may never receive such designations.

Tax reform legislation, which was signed into law on December 22, 2017, reduced the amount of the qualified clinical research costs for a designated orphan product that a sponsor may claim as a credit from 50% to 25%. This may further limit the advantage and may impact our future business strategy of seeking the Orphan Drug Designation.

We are subject to U.S. and certain foreign export and import controls, sanctions, embargoes, anti-corruption laws, and anti-money laundering laws and regulations. Compliance with these legal standards could impair our ability to compete in domestic and international markets. We can face criminal liability and other serious consequences for violations, which can harm our business.

We are subject to export control and import laws and regulations, including the U.S. Export Administration Regulations, U.S. Customs regulations, various economic and trade sanctions regulations administered by the U.S. Treasury Department's Office of Foreign Assets Controls, the U.S. Foreign Corrupt Practices Act of 1977, as amended, or FCPA, the U.S. domestic bribery statute contained in 18 U.S.C. § 201, the U.S. Travel Act, the USA PATRIOT Act, and other state and national anti-bribery and anti-money laundering laws in the countries in which we conduct activities. Anti-corruption laws are interpreted broadly and prohibit companies and their employees, agents, contractors, and other collaborators from authorizing, promising, offering, or providing, directly or indirectly, improper payments or anything else of value to recipients in the public or private sector. We may engage third parties to sell our products sell our products outside the United States, to conduct clinical trials, and/or to obtain necessary permits, licenses, patent registrations, and other regulatory approvals. We have direct or indirect interactions with officials and employees of government agencies or

government-affiliated hospitals, universities, and other organizations. We can be held liable for the corrupt or other illegal activities of our employees, agents, contractors, and other collaborators, even if we do not explicitly authorize or have actual knowledge of such activities. Any violations of the laws and regulations described above may result in substantial civil and criminal fines and penalties, imprisonment, the loss of export or import privileges, debarment, tax reassessments, breach of contract and fraud litigation, reputational harm, and other consequences.

Governments outside the United States tend to impose strict price controls, which may adversely affect our revenue, if any.

In some countries, particularly member states of the EU the pricing of prescription drugs is subject to governmental control. In these countries, pricing negotiations with governmental authorities can take considerable time after receipt of marketing approval for a product. In addition, there can be considerable pressure by governments and other stakeholders on prices and reimbursement levels, including as part of cost containment measures. Political, economic and regulatory developments may further complicate pricing negotiations, and pricing negotiations may continue after reimbursement has been obtained. Reference pricing used by various EU member states and parallel distribution, or arbitrage between low-priced and high-priced member states, can further reduce prices. To obtain coverage and reimbursement or pricing approvals in some countries, we or current or future collaborators may be required to conduct a clinical trial or other studies that compare the cost-effectiveness of our therapeutic candidates to other available therapies in order to obtain or maintain reimbursement or pricing approval. Publication of discounts by third-party payors or authorities may lead to further pressure on the prices or reimbursement levels within the country of publication and other countries. If reimbursement of any product candidate approved for marketing is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our business, financial condition, results of operations or prospects could be materially and adversely affected.

European data collection is governed by restrictive regulations governing the use, processing, and cross-border transfer of personal information.

The collection and use of personal health data in the EU is governed by the General Data Protection Regulation, or GDPR. The GDPR imposes several requirements relating to the consent of the individuals to whom the personal data relates, the information provided to the individuals, notification of data processing obligations to the competent national data protection authorities and the security and confidentiality of the personal data. Additionally, the United Kingdom (the "U.K.") implemented its own Data Protection Act, effective in May 2018 and statutorily amended in 2019, that is further supplemented by the U.K. GDPR which took effect on January 1, 2021. The U.K. GDPR is based on the GDPR that had applied previously in the U.K. but with changes, including its own derogations, for how the GDPR is applied in the U.K. From the beginning of 2021 (when the transitional period following Brexit expired), we have had to continue to comply with the GDPR as well as the U.K.'s Data Protection Act and the U.K. GDPR. The GDPR and U.K. GDPR also impose strict rules on the transfer of personal data out of the EU to the United States. These laws increase the scrutiny of transfers of personal data, such as from clinical trial sites, located in the European Economic Area, the United Kingdom, and Switzerland to jurisdictions that the European Commission does not recognize as having "adequate" data protection laws, such as the United States. On June 4, 2021, the European Commission finalized revised versions of the Standard Contractual Clauses that can be used to transfer personal data out of the EU to the United States. The U.K. Information Commissioner's Office of the Data Protection Authority published the U.K. version of the Standard Contractual Clauses, which we will be required to use for transfers of U.K. residents' personal data to a foreign country that does not have adequate data protection. Also, effective July 10, 2023, the new EU-U.S. Data Privacy Framework, or DPF, has been recognized as adequate under EU law to allow transfers of personal data from the EU (as well as the U.K. and Switzerland) to certified companies in the U.S. However, the DPF is likely subject to face legal challenge at the Court of Justice of the European Union which could cause the legal requirements for personal data transfers from the Europe to the U.S. to become uncertain once again. EU data protection authorities have and may again block the use of certain U.S.-based services that involve the transfer of personal data to the U.S. In the EU and other markets, potential new rules and restrictions on the flow of data across borders could increase the cost and complexity of doing business in those regions, thus it is possible that the ability to transfer personal data from the European Union to the United States may become restricted. We and many other companies may be required to adopt additional measures to accomplish and maintain legitimate means for the transfer and receipt of personal data from the European Union to the United States and other third-party countries. Failure to comply with the requirements of the GDPR, the U.K. GDPR, and the related national data protection laws of the EU Member States and the United Kingdom may result in fines (for example, of up to €20,000,000 or up to 4% of the total worldwide annual turnover of the preceding financial year (whichever is higher)) and other administrative penalties. Future GDPR regulations may impose additional responsibility and liability in relation to personal data that we process, and we may be required to put in place additional mechanisms ensuring compliance with the new data protection rules. This may be onerous and adversely affect our business, financial condition, results of operations and prospects. As a result of the implementation of the GDPR, we may be required to put in place additional mechanisms

ensuring compliance with the new data protection rules. There remains uncertainty related to the manner in which data protection authorities will seek to enforce compliance with GDPR. For example, it is not clear if the authorities will conduct random audits of companies doing business in the EU, or if the authorities will wait for complaints to be filed by individuals who claim their rights have been violated. Enforcement uncertainty and the costs associated with ensuring GDPR compliance be onerous and adversely affect our business, financial condition, results of operations and prospects.

Risks Related to Ownership of Our Common Stock

Our quarterly operating results may fluctuate significantly or may fall below the expectations of investors or securities analysts, each of which may cause our stock price to fluctuate or decline.

Our quarterly and annual operating results, including our collaboration revenue, net loss and cash flow, may fluctuate significantly from period to period, which makes it difficult for us to predict our future operating results. Our operating results are and will be affected by numerous factors, many of which are outside of our control including:

- variations in the level of expense related to the ongoing development of our MInT Platform, product candidates or future development programs;
- results of preclinical and clinical trials, or the addition or termination of existing or future clinical trials or funding support by us, or existing or future collaborators or licensing partners;
- our execution of any additional collaboration, licensing or similar arrangements, and the timing of payments we may make or receive under existing or future arrangements or the termination or modification of any such existing or future arrangements;
- any intellectual property infringement lawsuit or opposition, interference or cancellation proceeding in which we may become involved;
- additions and departures, or leaves of absences, of key personnel;
- strategic decisions by us, our collaborators or our competitors, such as acquisitions, divestitures, spin-offs, joint ventures, strategic investments or changes in business strategy;
- if any of our product candidates receives regulatory approval, the terms of such approval and market acceptance and demand for such product candidates;
- regulatory developments affecting our product candidates or those of our competitors; and
- changes in general market and economic conditions, including due to regional conflicts around the world, recent instability in the banking sector, inflation and market volatility, interest rate fluctuations, uncertainty with respect to the federal debt ceiling and budget and the related potential for government shutdowns, cybersecurity events, the ongoing labor shortage,global supply chain disruptions, the weakening of the global and U.S. economies, or otherwise.

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

The market price of our stock may be volatile, and you could lose all or part of your investment.

The trading price of our common stock and the common stock of other biopharmaceutical companies have been and may continue to be highly volatile and subject to wide fluctuations in response to various factors, many of which we cannot control. The market price for our common stock may be influenced by many factors, including the other risks described in this section and elsewhere in this report and the following:

- results of preclinical studies and clinical trials of our product candidates, or those of our competitors or our existing or future collaborators;
- regulatory or legal developments in the United States and other countries, especially changes in laws or regulations applicable to our product candidates;
- the success of competitive products or technologies;
- introductions and announcements of new products by us, our future commercialization partners, or our competitors, and the timing of these introductions or announcements;
- actions taken by regulatory agencies with respect to our products, clinical studies, manufacturing process or sales and marketing terms;

- actual or anticipated variations in our financial results or those of companies that are perceived to be similar to us;
- the success of our efforts to acquire or in-license additional technologies, products or product candidates;
- developments concerning any future collaborations, including but not limited to those with development and commercialization partners;
- market conditions in the pharmaceutical and biotechnology sectors;
- announcements by us or our competitors of significant acquisitions, strategic collaborations, joint ventures or capital commitments;
- developments or disputes concerning patents or other proprietary rights, including patents, litigation matters and our ability to obtain patent protection for our product candidates and products;
- our ability or inability to raise additional capital and the terms on which we raise it;
- the recruitment or departure of key personnel;
- changes in the structure of healthcare payment systems;
- actual or anticipated changes in earnings estimates or changes in stock market analyst recommendations regarding our common stock, other comparable companies or our industry generally;
- our failure or the failure of our competitors to meet analysts' projections or guidance that we or our competitors may give to the market;
- fluctuations in the valuation of companies perceived by investors to be comparable to us;
- announcement and expectation of additional financing efforts;
- speculation in the press or investment community;
- share price and fluctuations of trading volume of our common stock, which may affect our trading liquidity and public float;
- sales of our common stock by us, insiders or our stockholders;
- the concentrated ownership of our common stock;
- changes in accounting principles;
- actions instituted by activist shareholders or others;
- terrorist acts, acts of war or periods of widespread civil unrest, and regional conflicts around the world;
- natural disasters and other calamities, including global pandemics;
- cybersecurity events; and
- general economic, industry and market conditions, including recent instability in the banking sector, inflation and market volatility, interest rate fluctuations, uncertainty with respect to the federal debt ceiling and budget and the related potential for government shutdowns, and the ongoing labor shortage, global supply chain disruptions, the weakening of the global and U.S. economies, or otherwise.

In addition, the stock market in general, and the markets for pharmaceutical, biopharmaceutical and biotechnology stocks in particular, have experienced extreme price and volume fluctuations that have been often unrelated or disproportionate to the operating performance of the issuer. These broad market and industry factors may seriously harm the market price of our common stock, regardless of our actual operating performance. The realization of any of the above risks or any of a broad range of other risks, including those described in this "Risk Factors" section, could have a dramatic and adverse impact on the market price of our common stock. In addition, it may be more difficult for stockholders to sell a substantial number of shares for the same price at which stockholders could sell a smaller number of shares.

In the past, securities class action litigation has often been brought against a company following a decline in the market price of its securities. This risk is especially relevant for biopharmaceutical companies, which have experienced significant stock price volatility in recent years. Market volatility may lead to increased shareholder activism if we experience a market valuation that they believe are not reflective of our stock's intrinsic value. Activist campaigns that contest or conflict with our strategic direction or seek changes in the composition of our board of directors could have an adverse effect on our operating results and financial condition.

A sale of a substantial number of shares of our common stock may cause the price of our common stock to decline.

Sales of a substantial number of shares of our common stock in the public market could occur at any time. If our stockholders sell, or the market perceives that our stockholders intend to sell, substantial amounts of our common stock in the public market the market price of our common stock could decline significantly.

We cannot predict what effect, if any, sales of our shares in the public market or the availability of shares for sale will have on the market price of our common stock. However, future sales of substantial amounts of our common stock in the public market, including shares issued upon exercise of our outstanding options, or the perception that such sales may occur, could adversely affect the market price of our common stock.

We also expect that significant additional capital may be needed in the future to continue our planned operations. To raise capital, we may sell common stock, convertible securities or other equity securities in one or more transactions at prices and in a manner that we determine from time to time. To the extent that additional capital is raised through the sale and issuance of shares or other securities convertible into shares, our stockholders will be diluted. These sales, or the perception in the market that the holders of a large number of shares intend to sell shares, could reduce the market price of our common stock.

We are party to an "at-the-market" offering of our common stock pursuant to a sales agreement, as amended from time to time, between us and Jefferies. Subject to certain limitations in the sales agreement and compliance with applicable law, we may, in our sole discretion, deliver a placement notice to Jefferies at any time throughout the term of the sales agreement. The number of shares that are sold by Jefferies upon our delivery of a placement notice will fluctuate based on the market price of our common stock during the sales period and limits we set with Jefferies. Because the price per share of each share sold will fluctuate based on the market price of our common stock during the sales period, it is not possible to predict the number of shares that will be ultimately issued, if any, pursuant to the sales agreement. Issuances of any shares sold pursuant to the sales agreement will have a dilutive effect on our existing stockholders. Further, if we sell common stock, preferred stock, convertible securities and other equity securities in other transactions pursuant to our shelf registration statement on Form S-3ASR, existing investors may be materially diluted by such subsequent sales and new investors could gain rights superior to our existing stockholders.

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

Based on the beneficial ownership of our common stock as of December 31, 2023, our executive officers, directors, holders of 5% or more of our capital stock and their respective affiliates beneficially owned approximately 64% of our outstanding voting stock. As a result, these stockholders, if acting together, will continue to have control over the outcome of corporate actions requiring stockholder approval, including the election of directors, amendment of our organizational documents, any merger, consolidation or sale of all or substantially all of our assets and any other significant corporate transaction. The interests of these stockholders may not be the same as or may even conflict with your interests. For example, these stockholders could delay or prevent a change of control of our company, even if such a change of control would benefit our other stockholders, which could deprive our stockholders of an opportunity to receive a premium for their common stock as part of a sale of our company or our assets and might affect the prevailing market price of our common stock. The significant concentration of stock ownership may adversely affect the trading price of our common stock due to investors' perception that conflicts of interest may exist or arise.

Anti-takeover provisions in our charter documents and under Delaware law could prevent or delay an acquisition of us, which may be beneficial to our stockholders, and may prevent attempts by our stockholders to replace or remove our current management.

Our restated certificate of incorporation and our amended and restated bylaws contain provisions that could delay or prevent a change in control of our company. These provisions could also make it difficult for stockholders to elect directors who are not nominated by current members of our board of directors or take other corporate actions, including effecting changes in our management. These provisions:

- establish a classified board of directors so that not all members of our board are elected at one time;
- permit only the board of directors to establish the number of directors and fill vacancies on the board;
- provide that directors may only be removed "for cause" and only with the approval of two-thirds of our stockholders;
- require super-majority voting to amend some provisions in our restated certificate of incorporation and amended and restated bylaws;
- authorize the issuance of "blank check" preferred stock that our board could use to implement a stockholder rights plan;

- eliminate the ability of our stockholders to call special meetings of stockholders;
- prohibit stockholder action by written consent, which requires all stockholder actions to be taken at a meeting of our stockholders;
- prohibit cumulative voting; and
- establish advance notice requirements for nominations for election to our board or for proposing matters that can be acted upon by stockholders at annual stockholder meetings.

The exclusive forum provision in our restated certificate of incorporation may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or any of our directors, officers, or other employees, which may discourage lawsuits with respect to such claims.

Our restated certificate of incorporation, to the fullest extent permitted by law, provides that the Court of Chancery of the State of Delaware is the exclusive forum for: any derivative action or proceeding brought on our behalf; any action asserting a breach of fiduciary duty; any action asserting a claim against us arising pursuant to the Delaware General Corporation Law, or the DGCL, our restated certificate of incorporation, or our amended and restated bylaws; or any action asserting a claim against us that is governed by the internal affairs doctrine. This exclusive forum provision does not apply to suits brought to enforce a duty or liability created by the Exchange Act. It could apply, however, to a suit that falls within one or more of the categories enumerated in the exclusive forum provision.

This choice of forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or any of our directors, officers, or other employees, which may discourage lawsuits with respect to such claims. Alternatively, if a court were to find the choice of forum provisions contained in our restated certificate of incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions, which could harm our business, results of operations and financial condition.

In addition, Section 203 of the DGCL may discourage, delay or prevent a change in control of our company. Section 203 imposes certain restrictions on mergers, business combinations and other transactions between us and holders of 15% or more of our common stock.

Section 22 of the Securities Act of 1933, as amended, or the Securities Act, creates concurrent jurisdiction for federal and state courts over all claims brought to enforce any duty or liability created by the Securities Act or the rules and regulations thereunder. In March 2020, we amended and restated our restated bylaws to provide that the federal district courts of the United States of America will, to the fullest extent permitted by law, be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, or a Federal Forum Provision. Our decision to adopt a Federal Forum Provision followed a decision by the Supreme Court of the State of Delaware holding that such provisions are facially valid under Delaware law. While there can be no assurance that federal or state courts will follow the holding of the Delaware Supreme Court or determine that the Federal Forum Provision should be enforced in a particular case, application of the Federal Forum Provision means that suits brought by our stockholders to enforce any duty or liability created by the Securities Act must be brought in federal court and cannot be brought in state court.

Section 27 of the Exchange Act creates exclusive federal jurisdiction over all claims brought to enforce any duty or liability created by the Exchange Act or the rules and regulations thereunder. In addition, neither the exclusive forum provision nor the Federal Forum Provision applies to suits brought to enforce any duty or liability created by the Exchange Act. Accordingly, actions by our stockholders to enforce any duty or liability created by the Exchange Act or the rules and regulations thereunder must be brought in federal court.

Our stockholders will not be deemed to have waived our compliance with the federal securities laws and the regulations promulgated thereunder.

Any person or entity purchasing or otherwise acquiring or holding any interest in any of our securities shall be deemed to have notice of and consented to our exclusive forum provisions, including the Federal Forum Provision. These provisions may limit a stockholders' ability to bring a claim in a judicial forum of their choosing for disputes with us or our directors, officers, or other employees, which may discourage lawsuits against us and our directors, officers, and other employees.

Because we do not anticipate paying any cash dividends on our capital stock in the foreseeable future, capital appreciation, if any, will be your sole source of gain.

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all of our future earnings, if any, to finance the growth and development, operation and expansion of our business and do not anticipate declaring or paying any cash dividends for the foreseeable future. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future.

General Risk Factors

If securities or industry analysts do not publish research or reports about our business, or if they issue an adverse or misleading opinion regarding our stock, our stock price and trading volume could decline.

The trading market for our common stock will be influenced by the research and reports that industry or securities analysts publish about us or our business. We do not have any control over the industry or securities analysts, or the content and opinions included in their reports. If any of the analysts who cover us issue an adverse or misleading opinion regarding us, our business model, our intellectual property or our stock performance, or if our preclinical studies and clinical trials and operating results fail to meet the expectations of analysts, our stock price would likely decline. If one or more of such analysts cease coverage of us or fail to publish reports on us regularly, we could lose visibility in the financial markets, which in turn could cause a decline in our stock price or trading volume.

If we fail to maintain an effective system of internal control over financial reporting in the future, we may not be able to accurately report our business, results of operations, financial condition and cash flows and future prospects, which may adversely affect investor confidence in us and, as a result, the value of our common stock.

The Sarbanes-Oxley Act requires, among other things, that we maintain effective internal controls for financial reporting and disclosure controls and procedures and that we furnish a report by management on, among other things, the effectiveness of our internal control over financial reporting. This assessment needs to include disclosure of any material weaknesses identified by our management in our internal control over financial reporting. A material weakness is a deficiency, or combination of deficiencies, in internal control over financial reporting that results in more than a reasonable possibility that a material misstatement of annual or interim financial statements will not be prevented or detected on a timely basis.

Our compliance with Section 404 will require that we incur substantial accounting expense and expend significant management efforts. We currently do not have an internal audit group and we rely on limited accounting and finance staff to compile the system and process documentation necessary to perform the annual evaluation needed to comply with Section 404. We may not be able to complete our annual evaluation, testing and any required remediation in a timely fashion. During the evaluation and testing process, if we fail to identify and to remediate any significant deficiencies or material weaknesses that may be identified, or encounter problems or delays in the evaluation of internal control over financial reporting, we will be unable to assert that our internal control over financial reporting is effective. We cannot assure you that there will not be material weaknesses or significant deficiencies in our internal control over financial reporting in the future. Any failure to maintain internal control over financial reporting could severely inhibit our ability to accurately report our financial condition, results of operations or cash flows. If we are unable to conclude that our internal control over financial reporting is effective, or if our independent registered public accounting firm determines we have a material weakness or significant deficiency in our internal control over financial reporting, we could lose investor confidence in the accuracy and completeness of our financial reports, the market price of our common stock could decline, and we could be subject to sanctions or investigations by the Nasdaq Stock Market LLC, or NASDAQ, the SEC or other regulatory authorities. Failure to remedy any material weakness in our internal control over financial reporting, or to maintain other effective control systems required of public companies, could also restrict our future access to the capital markets.

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

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

These inherent limitations include the realities that judgments in decision-making can be faulty, and that breakdowns can occur because of simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people or by an unauthorized override of the controls. Accordingly, because of the inherent limitations in our control system, misstatements or insufficient disclosures due to error or fraud may occur and not be detected.

ESG factors may impose additional costs and expose us to new risks.

There is an increasing focus from certain investors, regulators, employees, customers and other stakeholders concerning corporate responsibility, specifically related to environmental, social, and governance, or ESG, matters. Some investors

may use these non-financial performance factors to guide their investment strategies and, in some cases, may choose not to invest in us if they believe our policies and actions relating to corporate responsibility are inadequate. The growing investor demand for measurement of non-financial performance is addressed by third-party providers of sustainability assessment and ratings on companies. The criteria by which our corporate responsibility practices are assessed may change due to the constant evolution of the sustainability landscape, which could result in greater expectations of us and cause us to undertake costly initiatives to satisfy such new criteria. If we elect not to or are unable to satisfy such new criteria, investors may conclude that our policies and/or actions with respect to corporate social responsibility are inadequate. We may face reputational damage in the event that we do not meet the ESG standards set by various constituencies. In addition, the SEC has proposed new rules that, if adopted in their current form, would impose new disclosure requirements regarding, among other ESG topics, climate-related risks, greenhouse gas emissions data and any publicly set climate-related targets or goals. Efforts to comply with these or any additional new regulatory requirements, or our failure to do so, could have adverse impacts on our business, operating results and financial condition.

Furthermore, in the event that we communicate certain initiatives and goals regarding ESG matters, we could fail, or be perceived to fail, in our achievement of such initiatives or goals, or we could be criticized for the scope, target and timelines of such initiatives or goals. If we fail to satisfy the expectations of investors, regulators, customers, employees and other stakeholders, if our initiatives are not executed as planned, or if we fail to implement sufficient oversight or accurately capture and disclose ESG matters, our reputation and business, operating results and financial condition could be adversely impacted.

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

None.

Item 1C. ***Cybersecurity***

We have integrated our cybersecurity risk management processes into our overall risk management framework. Cybersecurity risks are considered alongside other operational, financial, and strategic risks, enabling the development of a comprehensive and cohesive enterprise-wide risk mitigation strategy. Our cybersecurity risk management program is managed by a team comprised of key members of management and our information technology department, including our Chief Financial Officer, Chief Accounting Officer, General Counsel, and Senior Director of Information Technology. This team is responsible for leading our enterprise-wide cybersecurity strategy and managing our processes for preventing, detecting, mitigating, and remediating cybersecurity incidents, including through policy development, the establishment and implementation of standards, processes, and technical safeguards designed to protect our information systems from cybersecurity threats and efforts to educate our employees, consultants and other third parties we work with on cybersecurity threats and the Company's policies and procedures in this area. The team also engages in continuous monitoring, regular reporting, testing, and collaboration with external entities to stay informed about evolving threats. The individuals listed above possess relevant expertise in information technology and cybersecurity and background knowledge, and our Senior Director of Information Technology has served in various roles in information technology and information security for approximately twenty-five years.

Our Board of Directors ("Board") oversees our overall enterprise risk management process, and the Audit Committee of the Board (the "Audit Committee") supports the Board in its oversight of cybersecurity and other information technology risks, controls and procedures, including our plans to mitigate cybersecurity risks and respond to data breaches. The Board and the Audit Committee each receive periodic presentations and reports on cybersecurity risks, which address a wide range of topics including recent developments, evolving standards, vulnerability assessments, third-party and independent reviews, the threat environment, technological trends and information security considerations arising with respect to our peers and third parties. The Board and the Audit Committee also receive prompt and timely information regarding any cybersecurity incident that meets established reporting thresholds, as well as ongoing updates regarding any such incident until it has been addressed.

To enhance the effectiveness of its cybersecurity processes, we also engage third-party assessors, consultants, and auditors with specialized expertise. These third-parties conduct independent evaluations, providing an additional layer of scrutiny to identify and address potential vulnerabilities, and testing. Our cybersecurity risk management program is regularly evaluated by our own information technology employees and these third-parties with the results of those reviews reported to management and the Audit Committee. These reports include updates on the Company's cyber risks and threats, the status of projects to strengthen our information security systems, assessments of the information security program, and the emerging threat landscape.

To date, we have not identified any risks from known cybersecurity threats, including as a result of any prior cybersecurity incidents, that have materially affected or are reasonably likely to materially affect us, including our operations, business strategy, operating results, or financial condition. However, we acknowledge the dynamic nature of cyber threats and the potential for future incidents to have a material impact. If we were to experience a material cybersecurity incident in the future, such incident may have a material effect, including on our operations, business strategy, operating results, or financial condition. For more information regarding cybersecurity risks that we face and potential impacts on our business related thereto, see the section titled "Risk Factors" in Part I, Item 1A of this Annual Report on Form 10-K.

Item 2. ***Properties***

Our principal executive office is located in Waltham, Massachusetts. In August 2021, we exercised our one-time extension right through May 2025 for our existing lease for a total of approximately 32,405 square feet of office and laboratory space in three buildings that we use for our administrative, research and development and other activities.

Item 3. ***Legal Proceedings***

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

Item 4. ***Mine Safety Disclosures***

Not Applicable.

PART II—OTHER INFORMATION

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

Market Information

Our common stock is traded on the Nasdaq Global Market under the symbol "MORF". Trading of our common stock commenced on June 26, 2019, following the completion of our initial public offering. Prior to that time, there was no established public trading market for our common stock.

Stockholders

As of February 20, 2024, there were 14 stockholders of record of our common stock. This number does not include beneficial owners whose shares are held in street name.

Dividends

We have never declared or paid any dividends to our stockholders since our inception and we do not plan to declare or pay cash dividends in the foreseeable future. We currently anticipate that we will retain all available funds and any future earnings for the operation and expansion of our business. Any future determination related to dividend policy will be made at the discretion of our board of directors and will depend on, among other factors, our results of operations, financial condition, capital requirements, contractual restrictions, business prospects and other factors our board of directors may deem relevant. Investors should not purchase our common stock with the expectation of receiving cash dividends.

Recent Unregistered Sales of Equity Securities

None.

Securities Authorized for Issuance under Equity Compensation Plans

Information regarding our equity compensation plans and the securities authorized for issuance thereunder is set forth in Part III, Item 12 of this Annual Report on Form 10-K.

Stock Performance Graph

As a "smaller reporting company" as defined by Item 10 of Regulation S-K for the 2022 annual determination, we have elected to use the scaled down disclosure requirement available to us for this December 31, 2023 Form 10-K.

Issuer Purchases of Equity Securities

None.

Item 6. ***Reserved.***

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

You should read the following discussion of our financial condition and results of operations in conjunction with our consolidated financial statements and the related notes and other financial information included elsewhere in this Annual Report on Form 10-K.

In addition to historical financial information, this discussion contains forward-looking statements based upon current expectations that involve risks and uncertainties, such as statements of our plans, objectives, expectations, intentions and belief. Our actual results could differ materially from those anticipated in these forward-looking statements as a result of various factors, including those set forth in the section titled "Risk Factors" under Part I, Item 1A. These forward-looking statements may include, but are not limited to, statements regarding our future results of operations and financial position, our business strategy, market size, potential growth opportunities, our preclinical and clinical development activities, the efficacy and safety profile of our product candidates, use of net proceeds from our offerings, our ability to maintain and recognize the benefits of certain designations received by product candidates, the timing and results of preclinical studies and clinical trials, commercial collaborations with third parties, the receipt and timing of potential regulatory designations, approvals and commercialization of product candidates, and the impact of risks and uncertainties in connection with the current macroeconomic and geopolitical environments, increases in inflation, interest rate fluctuations, uncertainty with respect to the federal debt ceiling and budget and the related potential for government shutdowns, the ongoing labor shortage, disruptions to global supply chains, and regional conflicts around the world. The words "believe," "may," "will," "potentially," "estimate," "continue," "anticipate," "predict," "target," "intend," "could," "would," "should," "project," "plan," "expect," and similar expressions that convey uncertainty of future events or outcomes are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words.

These statements are based upon information available to us as of the date of this Annual Report on Form 10-K, and while we believe such information forms a reasonable basis for such statements, such information may be limited or incomplete, and our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all potentially available relevant information. These statements are inherently uncertain, and investors are cautioned not to unduly rely upon these statements.

Overview

We are a biopharmaceutical company applying our proprietary insights into integrins to discover and develop a pipeline of potentially first-in-class oral small molecule integrin therapeutics. Integrins are a target class with multiple approved injectable blockbuster drugs for the treatment of serious chronic diseases, including autoimmune, cardiovascular and metabolic diseases, fibrosis and cancer. To date, no oral small molecule integrin therapies have been approved by the U.S. Food and Drug Administration, or FDA. Despite this, we believe our unique platform can unlock the potential to reliably generate high-quality oral molecules against specific integrin targets. The Morphic integrin technology platform, or MInT Platform, was created leveraging our unique understanding of integrin structure and function to develop novel product candidates designed to achieve the potency, high selectivity, and pharmaceutical properties required for oral administration.

We are advancing our pipeline, including our lead product candidate, MORF-057, an orally administered α4β7-specific integrin inhibitor affecting inflammation, into clinical development for the treatment of inflammatory bowel disease, or IBD, an indication for which there is significant unmet need. Only about one in five patients achieve clinical remission with approved advanced therapies, and approximately half of those patients lose response over time. As such, even newer biologic and oral agents may not adequately control tissue inflammation or symptoms for many of the sicker patients, and some will therefore develop complications that require surgical removal of the colon and rectum. In addition, many patients with moderate-severe IBD do not receive adequate treatment for their disease due to the inconvenience and fear of injectable biologics, or the safety profile of systemically immunosuppressive therapies. We believe that MORF-057 has the potential to address these unmet needs in the IBD treatment landscape as an orally administered agent with gastrointestinal, or GI, targeted immunosuppression that can avoid concerns associated with other approved drug classes. Furthermore, as the IBD treatment landscape evolves from monotherapy to combination therapy in order to increase therapeutic response rates in certain patient populations, we believe that MORF-057's profile is ideal as a foundational backbone for next generation therapeutic regimens. We submitted an investigational new drug application, or IND, for MORF-057 in July 2020, and the FDA permitted the study submitted under the IND to proceed in August 2020. In September 2020, we initiated a Phase 1 clinical trial of MORF-057 in healthy volunteers to establish our clinical program and select doses for our Phase 2 program in IBD with an initial focus on ulcerative colitis, or UC.

The MORF-057 Phase 1 study included single ascending dose, or SAD, multiple ascending dose, or MAD, and food effect, or FE, cohorts evaluating MORF-057 safety, pharmacokinetics, or PK, and pharmacodynamics, or PD. Healthy subjects were randomized 3:1 to receive a single dose of MORF-057 at 25, 50, 100, 150 and 400 mg or matching placebo in the SAD cohorts; or twice daily, or BID, doses of 25, 50 and 100 mg MORF-057 or matching placebo for a total of 14 days in the MAD cohorts. A total of 67 eligible healthy subjects were enrolled into the studies, with 36 in the SAD, nine in the FE and 22 in the MAD cohorts. 66 subjects completed study treatment and one from the 50 mg BID MAD cohort withdrew consent for personal reasons.

MORF-057 was well tolerated in all cohorts and no safety signals were identified. MORF-057 demonstrated a favorable PK profile, where target engagement was confirmed, and a clear PK and PD relationship was established. MORF-057 was rapidly absorbed and systemic exposure was confirmed to increase approximately dose proportionally. A slight reduction in exposure without effect on trough concentrations was observed upon administration with a high fat meal in the FE study. The results suggest food intake has no significant effect on trough MORF-057 levels and that MORF-057 can be administered without regard to food in planned studies in patients.

The α4β7 receptor occupancy, or RO, increased with dose and study day, achieving saturation (>99% RO) in individual patients from all cohorts above 25 mg by day 14. In the 100 mg BID cohort, MORF-057 saturated the α4β7 receptor (mean RO >99%). Dose-and time-dependent changes in biomarkers including specific α4β7 high expressing immune cell populations were observed, adding to evidence of proof of biology for MORF-057. These changes were consistent with those reported with other integrin inhibitors including the antibody drug vedolizumab which is approved for the treatment of IBD.

In an additional MORF-057 Phase 1 study, subjects were dosed up to 200 mg BID and those receiving MORF-057 at 100 BID or 200 mg BID demonstrated α4β7 receptor saturation and statistically significant increases in circulating central memory, effector memory T lymphocyte and switched memory B lymphocyte populations compared with placebo. At the 25 mg and 50 mg BID exploratory doses, directionally increasing trends were also observed in key PD measures. All doses were well tolerated, no safety signals were identified, and a favorable PK profile was observed. In both single doses of 200 mg MORF-057 and 200 mg BID over the 14 days, MORF-057 demonstrated α4β7 receptor saturation at C_{trough}. Statistically significant changes in lymphocyte subset populations and CCR9 mRNA were observed, consistent with previous studies.

Based on the results from the Phase 1 studies, we initiated a Phase 2 clinical program of MORF-057 in March 2022. EMERALD-1, which is an open-label, single-arm multi-center Phase 2a trial designed to evaluate the efficacy, safety and tolerability of MORF-057 in adults with moderate to severe UC, completed targeted enrollment in October 2022, with 30 patients enrolled in the study. Additionally, patients that were undergoing screening at the time the study completed targeted enrollment were enrolled in the study for a total of 35 patients enrolled in the main cohort. We elected to stop enrollment of an exploratory cohort at four patients who have previously failed treatment with vedolizumab. Patients enrolled in the EMERALD-1 study are being treated with 100 mg BID at sites in the United States and Poland. The primary endpoint of the trial was the change in Robarts Histopathology Index, or RHI, a validated instrument that measures histological disease activity in UC at 12 weeks compared to baseline. Patients will then continue for an additional 40 weeks of maintenance therapy followed by a 52-week assessment. Additional outcome measures in the EMERALD-1 study include change in the modified Mayo clinic score, safety, PK parameters and key PD measures. In April 2023, we announced topline results from the main cohort of the EMERALD-1 Phase 2a clinical trial of MORF-057, which met the primary endpoint and demonstrated a statistically significant reduction of 6.4 points (p=0.002) from baseline at week 12 in the RHI score. In the study, 25.7% of patients achieved clinical remission by modified Mayo Clinic Score, or mMCS. MORF-057 was generally well tolerated at the dose of 100 mg BID with no serious adverse events, or SAEs, and no safety signal observed. Additionally, MORF-057 achieved saturation of α4β7 receptor and demonstrated changes in α4β7 lymphocyte subsets that are consistent with Phase 1 MORF-057 data. In August 2023, we announced the acceptance of a moderated poster presentation describing the EMERALD-1 study at UEG Week 2023 in October in Copenhagen. We presented the moderated poster presentation for the EMERALD-1 trial at UEG Week 2023, including 12 weeks of safety, PK parameters and key PD measures compared to baseline. On October 12, 2023, we presented additional data from the EMERALD-1 trial including 44 weeks of safety, PK parameters and key PD measures compared to baseline.

EMERALD-2, which is a global Phase 2b randomized controlled trial of MORF-057 began dosing patients in November 2022. Patients enrolled in the EMERALD-2 study are randomized to receive one of three active doses or a placebo: 100 mg BID, 200 mg BID, QD (once daily), or a placebo that will crosses over to MORF-057 after the 12-week induction phase. The primary endpoint of the trial is the clinical remission rate as measured by the mMCS at 12 weeks. The secondary endpoints include the change in RHI, PK and PD measures, as well as safety parameters. Following the 12-week induction phase, patients will move to a 40-week maintenance phase. We believe that we will achieve complete analysis of the data for the primary endpoint from the EMERALD-2 Phase 2b trial of MORF-057 in patients with moderate to severe UC in the first half of 2025.

Launch activities are underway for GARNET, which is a global Phase 2b randomized controlled trial of MORF-057 in Crohn's disease, and we expect the first patients to be dosed in the first half of 2024. Patients enrolled in the GARNET study will be randomized to receive one of two active doses or a placebo: 200 mg BID, 100 mg BID or a placebo that will cross over to MORF-057 after the 14-week induction phase. The primary endpoint of the trial is the proportion of participants in endoscopic response (>=50% reduction) at week 14 as determined using Simple Endoscopic Score for Crohn's Disease, or SES-CD. The secondary endpoints will include the change in Crohn's Disease Activity Index, or CDAI, measures, as well as safety parameters. Following the 14-week induction phase, patients will move to a 38-week maintenance phase. We continue to expand our α4β7 portfolio and have positioned next-generation α4β7 small molecule development candidates for clinical studies in the future.

Beyond our lead molecule, MORF-057, we are using our MInT Platform to advance a broad pipeline of preclinical programs across a variety of therapeutic areas, all of which aim to harness the potential of inhibition or activation of an integrin receptor. Additional wholly-owned programs have advanced to the lead optimization phase of discovery. We presented positive preclinical data from our αvβ8 program at the American Association for Cancer Research Annual Meeting in April 2021. Based on the data we have generated to date and the potential role of TGF-β in treating myelofibrosis, we have nominated MORF-088, a selective small molecule inhibitor of αvβ8, as a development candidate for myelofibrosis. Further pre-clinical research is ongoing with MORF-088 in the treatment of myelofibrosis to create a robust translational plan to efficiently measure if this mechanism will be effective in patients. We also have an additional research stage program ongoing against α5β1 in pulmonary hypertensive diseases, including pulmonary arterial hypertension, or PAH. We have determined that α5β1 promotes cell proliferation, survival, hypertrophic growth and fibrosis, which are key elements in the progression of PAH.

Since June, 2015 we have had an exclusive integrin focused collaboration agreement in place with Schrödinger, a leader in chemical simulation, machine learning models and in silico drug discovery. We have successfully used their technology platform to perform virtual screens on members of the target class of human integrins, and we and Schrödinger collaborate to facilitate prioritization of integrin targets, perform target validation and analysis, identify leads, and perform lead optimization to establish a portfolio of integrin programs. We believe that our collaboration with Schrödinger enables us to undertake accelerated drug discovery through design, iteration and optimization of leads using a variety of next-generation physics-based computational and machine learning technologies.

With our internal proven capabilities in structural biology, medicinal chemistry and screening, the Schrödinger platform accelerates our ability to design molecules with atomic precision utilizing our significant expertise in advanced structure-guided drug design technology, and machine learning protocols. In December 2022, we expanded our access as a special Schrödinger software customer enabling utilization of their full software suite beyond the scope of integrins. As a result, in 2023, we began advancing additional clinically validated targets with a focus in the inflammation and immunology therapeutic areas, which are highly complementary to our current assets within the integrin space. Specifically, we have initiated projects targeting the IL23 and TL1A pathways, among others. Injectable inhibitors of these targets have been shown to provide significant clinical benefits to IBD patients. Utilizing our expertise in small molecule drug design and optimization, we are pursuing inhibitors against these targets. If we are successful, we believe these agents could be important monotherapy agents as well as optimal to combine with MORF-057 to achieve enhanced clinical efficacy in IBD patients.

In March 2021, we announced an upsized underwritten public offering of 3,500,000 shares of our common stock at a price to the public of $70.00 per share, resulting in net proceeds of approximately $230.0 million, after deducting underwriting discounts, commissions and other offering expenses paid by us.

In July 2020, we entered into an Open Market Sale Agreement, or the Original Agreement, with Jefferies LLC, or Jefferies, with respect to an at-the-market offering program, or the Previous ATM, under which we could offer and sell, from time to time at our sole discretion, shares of our common stock having an aggregate offering amount of up to $75,000,000, referred to as Placement Shares, through Jefferies as sales agent. In August 2021, we entered into Amendment No. 1 to the Original Agreement with Jefferies, or the New ATM, to increase the total value of Placement Shares subject to offer and sale to up to an aggregate offering amount of up to $150,000,000. We refer to the Previous ATM and the New ATM, collectively, as the ATM. During the year ended December 31, 2023, 1,518,759 shares were issued under the New ATM for net proceeds of $84.5 million, after deducting offering commissions and expenses. As of December 31, 2023, we had approximately $10.9 million of common stock remaining available for sale under the New ATM. We may not sell any Placement Shares under the Previous ATM.

In February 2023, we entered into a securities purchase agreement with existing investors, consisting of a board member and holder of more than 5% of the Company's common stock and a holder of more than 5% of the Company's common stock, pursuant to which we agreed to sell and issue, in a private placement, 848,655 shares of common stock at a price of $35.35 per share and pre-funded warrants to purchase up to 1,980,198 shares of common stock at a purchase price of $35.3499 per pre-funded warrant, or the Pre-Funded Warrants, where each Pre-Funded Warrant had an exercise price of $0.0001 per share. We received aggregate proceeds of approximately $100.0 million before deducting costs and offering expenses payable by us. The Pre-Funded Warrants were exercisable at any time after their original issuance and did not have an expiration date. Per their terms, the Pre-Funded Warrants generally could not be exercised if the holder's aggregate beneficial ownership would be more than 9.99% of the total issued and outstanding shares of our common stock following such exercise. The exercise price per share and number of shares of common stock issuable upon the exercise of the Pre-Funded Warrants were subject to adjustment in the event of any stock dividends and splits, recapitalization, reorganization or similar transaction, as described in the Pre-Funded Warrants. During the year ended December 31, 2023, 1,980,188 shares of common stock were issued upon the net exercise of 1,980,198 Pre-Funded Warrants. As of December 31, 2023 there were no Pre-Funded Warrants outstanding.

In May 2023, we completed an underwritten public offering of shares of our common stock, which included the exercise in full of the underwriters' option to purchase additional shares of common stock. We received gross proceeds from the secondary

offering of approximately $276.0 million, before deducting underwriting discounts, commissions and other offering expenses payable by us of approximately $16.9 million, resulting in net proceeds of approximately $259.1 million.

Since inception, our operations have focused on organizing and staffing our company, business planning, raising capital, establishing our intellectual property portfolio, and performing research to discover and develop oral small-molecule integrin therapeutics. Revenue generation activities to date have been limited to payments received from our collaboration agreements with AbbVie Biotechnology Ltd, or AbbVie, and Janssen Pharmaceuticals, Inc., or Janssen, discussed further in Note 12 of the accompanying consolidated financial statements appearing elsewhere in this Annual Report on Form 10-K. We do not have any products approved for sale and have not generated any revenue from product sales to date. From inception through December 31, 2023, we raised an aggregate of approximately $1.2 billion of gross proceeds primarily through the issuance of equity, including our convertible preferred equity securities, our initial public offering, our underwritten public offering in March 2021, our private issuance of common stock and pre-funded warrants in February 2023, our underwritten public offering in May 2023 and sales of shares of our common stock under the ATM, along with payments received under our collaboration agreements.

Since inception, we have incurred significant operating losses. As of December 31, 2023, we had an accumulated deficit of $449.2 million. We expect to continue to incur significant and increasing expenses and operating losses for the foreseeable future, as we advance our current and future product candidates through preclinical and clinical development, seek regulatory approval for them, maintain and expand our intellectual property portfolio, hire additional research and development and business personnel, and operate as a public company.

We will not generate revenue from product sales unless and until we successfully complete clinical development and obtain regulatory approval for our product candidates. In addition, if we obtain regulatory approval for our product candidates and do not enter into a third-party commercialization partnership, we expect to incur significant expenses related to developing our commercialization capability to support product sales, marketing, manufacturing, and distribution activities.

As a result, we will need substantial additional funding to support our continuing operations and pursue our growth strategy. Until we can generate significant revenue from product sales, if ever, we expect to finance our operations through a combination of public or private equity offerings and debt financings or other sources, such as additional collaboration agreements. We may be unable to raise additional funds or enter into such other agreements or arrangements when needed on acceptable terms, or at all. Our failure to raise capital or enter into such agreements as, and when, needed, could have a material adverse effect on our business, results of operations, and financial condition.

As of December 31, 2023, we had cash, cash equivalents, and marketable securities of $704.3 million. Based on our current operating plan, we believe that our existing cash, cash equivalents and marketable securities will be sufficient to fund our operating expenses and capital expenditure requirements into the second half of 2027.

Risks and Uncertainties

We are subject to continuing risks and uncertainties in connection with the current macroeconomic and geopolitical environments, including risks related to supply chain disruptions, increases in consumer prices, inflation, market volatility, interest rate fluctuations, recent instability in the banking sector, uncertainty with respect to the federal debt ceiling and budget and the related potential for government shutdowns, labor shortages, cybersecurity events and ongoing regional conflicts around the world. We are closely monitoring the impact of these factors on all aspects of our operational and financial performance. To date, we have not experienced much of an impact on our business, excluding minor changes to our development timelines. Our future results of operations and liquidity could be adversely impacted by a variety of factors, including those discussed in the section titled “Risk Factors” included elsewhere in this Annual Report on Form 10-K. As of the date of issuance of these consolidated financial statements, the extent to which the current macroeconomic and geopolitical environments may materially impact our financial condition, liquidity, or results of operations remains uncertain.

Financial Operations Overview

Collaboration Revenue

We do not have any products approved for sale, and as a result, we have not generated any revenue from product sales and do not expect to generate any revenue from the sale of products in the foreseeable future.

To date, all of our collaboration revenue has been derived from collaboration agreements with AbbVie and Janssen. Our collaborations with AbbVie and Janssen are now concluded, and prospectively we remain open to opportunistically evaluating and entering into strategic partnerships around certain therapeutic candidates, geographic markets or disease areas. We expect that our revenue, until we have a marketed product, will be derived primarily from payments under collaboration and license agreements that we may enter into in the future, if any.

Collaboration Revenue — Janssen

In February 2019, we entered into a research collaboration and option agreement with Janssen, or the Janssen Agreement, to discover and develop novel integrin therapeutics for patients with conditions not adequately addressed by current therapies. The Janssen Agreement focused on three integrin targets, each target the subject of a research program, with the ability to substitute up to two integrin targets not explored by us. In consideration for certain rights granted under the Janssen Agreement, during 2019 Janssen paid us an upfront commencement fee of $10.0 million for each of the first two research programs, and in February 2021 Janssen paid us an upfront commencement fee of $5.0 million for the third research program. In December 2021, Janssen informed us that it had decided not to exercise the options on the first two integrin targets which resulted in a reduction in scope of our responsibilities under the Janssen Agreement. In January 2023, Janssen informed us that it had decided to exercise its right to terminate the Janssen Agreement for convenience, which termination became effective in March 2023.

Expenses

Research and Development

Research and development expenses consist primarily of costs incurred for our research and development activities, including our product candidate discovery efforts and preclinical studies under our research programs, which include:

- employee-related expenses, including salaries, benefits, and equity-based compensation expense for our research and development personnel;
- costs of funding research performed by third parties that conduct research and development and preclinical activities on our behalf;
- costs of manufacturing clinical supply related to any of our current or future product candidates;
- expenses incurred under agreements with contract research organizations, or CROs and investigative sites that conduct our clinical trials;
- costs of conducting preclinical studies of any of our current or future product candidates;
- consulting and professional fees related to research and development activities, including equity-based compensation to non-employees;
- costs of purchasing laboratory supplies and non-capital equipment used in our preclinical studies;
- costs related to compliance with clinical regulatory requirements;
- facility costs and other allocated expenses, which include expenses for rent and maintenance of facilities, insurance, depreciation and other supplies; and
- fees for maintaining licenses and other amounts due under our third-party licensing agreements.

Research and development costs are expensed as incurred. Costs for certain activities are recognized based on an evaluation of the progress to completion of specific tasks using data such as information provided to us by our vendors and analyzing the progress of our preclinical studies or other services performed. Judgments and estimates are made in determining the accrued expense balances at the end of any reporting period. Non-refundable advance payments for research and development goods or services to be received in the future from third parties are capitalized and expensed as the related goods are delivered or the services are performed.

The successful development of our product candidates is highly uncertain. As such, at this time, we cannot reasonably estimate or know the nature, timing, and costs of the efforts that will be necessary to complete the clinical development process for our product candidates. We are also unable to predict when, if ever, material net cash inflows will commence from the sale of our product candidates, if approved. This is due to the numerous risks and uncertainties associated with developing product candidates, including the uncertainty of:

- the scope, rate of progress, and expenses of our ongoing research activities as well as any additional preclinical studies and clinical trials and other research and development activities;
- establishing an appropriate safety profile;
- successful enrollment in and completion of clinical trials;
- whether our product candidates show safety and efficacy in our clinical trials;
- receipt of marketing approvals from applicable regulatory authorities, if any;
- establishing commercial manufacturing capabilities or making arrangements with third-party manufacturers;
- obtaining and maintaining patent and trade secret protection and regulatory exclusivity for our product candidates;
- commercializing the product candidates, if and when approved, whether alone or in collaboration with others; and
- continued acceptable safety profile of the products following any regulatory approval.

A change in the outcome of any of these variables with respect to the development of our current and future product candidates would significantly change the costs and timing associated with the development of those product candidates.

Research and development activities are central to our business model. Product candidates in later stages of clinical development generally have higher development costs than those in earlier stages of clinical development, primarily due to the increased size and duration of later-stage clinical trials. We expect research and development costs to increase significantly for the foreseeable future as we continue the development of our product candidates. However, we do not believe that it is possible at this time to accurately project total program-specific expenses through commercialization. There are numerous factors associated with the successful commercialization of any of our product candidates, including future trial design and various regulatory requirements, many of which cannot be determined with accuracy at this time based on our stage of development. Additionally, future commercial and regulatory factors beyond our control will impact our clinical development programs and plans.

General and Administrative

General and administrative expenses consist primarily of employee-related expenses, including salaries, benefits, and equity-based compensation expenses for personnel in executive, finance, accounting, business development, legal, information technology and human resources functions. Other significant general and administrative expenses include facility costs not otherwise included in research and development expenses, legal fees relating to patent and corporate matters, and fees for accounting and consulting services.

We anticipate that our general and administrative expenses will increase in the future as our business expands to support expected growth in research and development activities, including our future clinical programs. These increases will likely include increased costs related to the hiring of additional personnel and fees to outside consultants, among other expenses. We also incur expenses associated with being a public company, including costs for audit, legal, regulatory, and tax-related services related to compliance with the rules and regulations of the SEC, listing standards applicable to companies listed on Nasdaq, director and officer compensation and insurance premiums, and investor relations costs. In addition, if we obtain regulatory approval for any of our product candidates and do not enter into a third-party commercialization collaboration, we expect to incur significant general and administrative expenses related to supporting product sales, marketing and distribution activities.

Interest Income, Net

Interest income, net consists primarily of interest income earned on our cash, cash equivalents and marketable securities.

Provision for Income Tax Expense

We record a provision for income taxes on pre-tax income or loss based on our effective tax rate for the year. For additional details about the current year tax provision, refer to the Notes to the Consolidated Financial Statements appearing elsewhere in this Annual Report on Form 10-K.

Results of Operations

Comparison of the years ended December 31, 2023 and 2022

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

	Year Ended December 31,		Change	
	2023	2022	$	%
	(in thousands, except percentages)			
Collaboration revenue	$ 521	$ 70,808	$ (70,287)	(99)%
Operating expenses:				
Research and development	140,384	102,062	38,322	38 %
General and administrative	38,823	32,142	6,681	21 %
Total operating expenses	179,207	134,204	45,003	34 %
Loss from operations	(178,686)	(63,396)	(115,290)	182 %
Other income:				
Interest income, net	26,969	4,567	22,402	491 %
Other income (expense), net	2	(145)	147	(101)%
Total other income, net	26,971	4,422	22,549	510 %
Loss before provision for income taxes	$ (151,715)	$ (58,974)	$ (92,741)	157 %
Provision for income taxes	(380)	(67)	(313)	467 %
Net loss	$ (152,095)	$ (59,041)	$ (93,054)	158 %

Collaboration Revenue

The decrease in collaboration revenue of $70.3 million is attributable the conclusion of the AbbVie Agreement and Janssen Agreement in December 2022 and March 2023, respectively.

Research and Development Expenses

Research and development expense increased by $38.3 million, or 38% from $102.1 million for the year ended December 31, 2022 to $140.4 million for the year ended December 31, 2023. A significant portion of our research and development costs have been external clinical and preclinical CRO costs, which we track on a program-by-program basis related to a clinical product candidate, once the candidate has been identified. Our internal research and development costs are primarily personnel-related costs and other indirect costs. The following table summarizes our research and development expense for the years ended December 31, 2023 and 2022:

	Year Ended December 31,		Change	
	2023	2022	$	%
	(in thousands, except percentages)			
External costs by program:				
MORF-057	$ 56,362	$ 37,826	$ 18,536	49 %
MORF-088	7,198	11,899	(4,701)	(40)%
AbbVie Agreement programs	—	155	(155)	(100)%
Janssen Agreement programs	51	1,263	(1,212)	(96)%
Other early development candidates and unallocated costs	18,786	10,149	8,637	85 %
Total external costs	82,397	61,292	21,105	34 %
Internal costs:				
Employee compensation and benefits	53,202	36,673	16,529	45 %
Facility and other	4,785	4,097	688	17 %
Total internal costs	57,987	40,770	17,217	42 %
Total research and development expense	$ 140,384	$ 102,062	$ 38,322	38 %

The changes in research and development expense were primarily attributable to the following:

- The $21.1 million increase in external costs from the year ended December 31, 2022 to the year ended December 31, 2023 primarily related to costs associated with the ongoing Phase 2 clinical studies and other development activities for MORF-057, as well as other external research costs to support our early development candidates. These increases were partially offset by decreases in activity under the AbbVie Agreement and the Janssen Agreement. The decrease in activity under MORF-088 is primarily a result of the timing of incurring manufacturing costs and other development activities.
- The $17.2 million increase in internal costs from the year ended December 31, 2022 to the year ended December 31, 2023 was primarily driven by an increase in headcount, subscriptions and non-cash equity-based compensation expense to support the ongoing clinical activity for MORF-057 as well as our early-stage pipeline candidates.

General and Administrative Expenses

General and administrative expense increased by $6.7 million, or 21%, from $32.1 million for the year ended December 31, 2022 to $38.8 million for the year ended December 31, 2023. The increase in general and administrative expense was primarily attributable to a $5.8 million increase in non-cash equity-based compensation expense and a $1.4 million increase in personnel related costs, partially offset by $0.5 million and $0.3 million decreases in insurance and consulting expenses, respectively.

Interest Income, Net

Interest income increased by $22.4 million due to an increase in effective interest rates on cash equivalents and marketable securities and an increase in invested marketable securities during the year ended December 31, 2023 compared to the year ended December 31, 2022.

Comparison of the years ended December 31, 2022 and 2021

The following table summarizes our results of operations for the years ended December 31, 2022 and 2021:

	Year Ended December 31,		Change	
	2022	2021	$	%
	(in thousands, except percentages)			
Collaboration revenue	$ 70,808	$ 19,794	$ 51,014	258 %
Operating expenses:				
Research and development	102,062	87,789	14,273	16 %
General and administrative	32,142	27,811	4,331	16 %
Total operating expenses	134,204	115,600	18,604	16 %
Loss from operations	(63,396)	(95,806)	32,410	(34)%
Other income:				
Interest income, net	4,567	272	4,295	1,579 %
Other expense	(145)	(8)	(137)	1,713 %
Total other income, net	4,422	264	4,158	1,575 %
Loss before provision for income taxes	$ (58,974)	$ (95,542)	$ 36,568	(38)%
Provision for income taxes	(67)	—	(67)	— %
Net loss	$ (59,041)	$ (95,542)	$ 36,501	(38)%

Collaboration Revenue

The increase in collaboration revenue of $51.0 million is attributable the conclusion of the AbbVie Agreement and reduction in the scope of the Janssen Agreement. In Q2 2022, we decreased our estimates to complete the remaining performance obligations under the AbbVie Agreement and recorded a cumulative catch-up to revenue based on AbbVie's notification of exercise of their option to terminate the AbbVie Agreement effective December 2022. In Q4 2022, we decreased our estimates to complete the remaining performance obligations under the Janssen Agreement based on changes in expected effort and the timing of the research services for the third integrin research program.

Research and Development Expenses

Research and development expense increased by $14.3 million, or 16% from $87.8 million for the year ended December 31, 2021 to $102.1 million for the year ended December 31, 2022. A significant portion of our research and development costs to date have been external clinical and preclinical CRO costs, which we track on a program-by-program basis related to a clinical product candidate, once the candidate has been identified. Our internal research and development costs are primarily personnel-related costs, depreciation, and other indirect costs. The following table summarizes our research and development expense for the years ended December 31, 2022 and 2021:

	Year Ended December 31,		Change	
	2022	2021	$	%
	(in thousands, except percentages)			
External costs by program:				
MORF-057	$ 37,826	$ 31,467	$ 6,359	20 %
AbbVie Agreement programs	155	2,759	(2,604)	(94)%
Janssen Agreement programs	1,263	1,751	(488)	(28)%
MORF-088	11,899	8,924	2,975	33 %
Other early development candidates and unallocated costs	10,149	6,516	3,633	56 %
Total external costs	61,292	51,417	9,875	19 %
Internal costs:				
Employee compensation and benefits	36,673	32,150	4,523	14 %
Facility and other	4,097	4,222	(125)	(3)%
Total internal costs	40,770	36,372	4,398	12 %
Total research and development expense	$ 102,062	$ 87,789	$ 14,273	16 %

The changes in research and development expense were primarily attributable to the following:

- The $9.9 million increase in external costs from the year ended December 31, 2021 to the year ended December 31, 2022 primarily related to costs associated with the ongoing Phase 2 clinical studies and other development activities for MORF-057 and development milestone fees due to our collaborators as well as other external research costs to support our early development candidates, including MORF-088. These increases were partially offset by decreases in activity under the AbbVie Agreement and the Janssen Agreement.
- The $4.4 million increase in internal costs from the year ended December 31, 2021 to the year ended December 31, 2022 was primarily driven by an increase in non-cash equity-based compensation expense, subscriptions and executive searches to support the ongoing clinical activity for MORF-057 as well as our early-stage pipeline candidates.

General and Administrative Expenses

General and administrative expense increased by $4.3 million, or 16%, from $27.8 million for the year ended December 31, 2021 to $32.1 million for the year ended December 31, 2022. The increase in general and administrative expense was primarily attributable to a $4.2 million increase in non-cash equity-based compensation expense and a $0.8 million increase in legal and patent costs, partially offset by $0.5 million and $0.2 million decreases in consulting expenses and audit and tax fees, respectively.

Interest Income, Net

Interest income increased by $4.3 million due to an increase in yields earned on cash equivalents and marketable securities and an increase in invested marketable securities during the year ended December 31, 2022 compared to the year ended December 31, 2021.

Liquidity and Capital Resources

Sources of Liquidity

From inception through December 31, 2023, we raised an aggregate of approximately $1.2 billion in gross proceeds primarily through the issuance of equity, including our convertible preferred equity securities, our initial public offering and secondary equity offerings, our private placement of common stock and pre-funded warrants, and sales of shares of our common stock under the ATM, along with payments received under our collaboration agreements.

The following table provides information regarding our total cash, cash equivalents, and marketable securities, each of which are stated at their respective fair values as of December 31, 2023 and 2022:

	December 31,	
	2023	2022
	(in thousands)	
Cash	$ 589	$ 458
Cash equivalents	57,988	58,814
Marketable securities	645,772	288,976
Total cash, cash equivalents and marketable securities	$ 704,349	$ 348,248

Cash Flows

The following table provides information regarding our cash flows for the years ended December 31, 2023, 2022 and 2021:

	Year Ended December 31,		
	2023	2022	2021
	(in thousands)		
Net cash used in operating activities	$ (112,312)	$ (100,977)	$ (83,461)
Net cash used in investing activities	(341,815)	(56,451)	(113,180)
Net cash provided by financing activities	453,432	45,266	266,313
Net (decrease) increase in cash, cash equivalents and restricted cash	$ (695)	$ (112,162)	$ 69,672

Net Cash Used in Operating Activities

The use of cash in all periods resulted primarily from our net losses adjusted for non-cash charges and changes in components of working capital. Net cash used in operating activities was $112.3 million for the year ended December 31, 2023, compared to $101.0 million in cash used in operating activities for the year ended December 31, 2022. The increase in cash used in operating activities was primarily driven by a $93.1 million increase in net loss, partially offset by a $81.2 million decrease in operating assets and liabilities, principally due to a $67.2 million decrease in deferred revenue, a $5.3 million increase in accounts payable, a $6.4 million increase in prepaid and other current assets, and a $3.7 million increase in accruals.

Net cash used in operating activities was $101.0 million for the year ended December 31, 2022, compared to $83.5 million for the year ended December 31, 2021. The increase in cash used in operating activities was primarily driven by a $61.8 million decrease in operating assets and liabilities, principally due a $52.8 million decrease in in deferred revenue, a $3.2 million increase in accounts receivable and a $2.5 million decrease in accounts payable, partially offset by a $36.5 million decrease in net loss and a $7.9 million increase in equity-based compensation.

Net Cash Used In Investing Activities

Net cash used in investing activities was $341.8 million for the year ended December 31, 2023 compared to $56.5 million used in investing activities for the year ended December 31, 2022. The change in cash used in investing activities is primarily based on the timing of purchases or maturities in marketable securities in the period, which was increased due to the proceeds received from financing activities during the year ended December 31, 2023.

During the year ended December 31, 2022, net cash used in investing activities primarily resulted from purchases of marketable securities exceeding maturities and sales of marketable securities.

During the year ended December 31, 2021, net cash used in investing activities was primarily driven by investments in marketable securities in the form of proceeds from the underwritten public offering completed in March 2021.

Net Cash Provided by Financing Activities

Net cash provided by financing activities of $453.4 million for the year ended December 31, 2023 primarily resulted from $99.8 million in net proceeds received from our private issuance of common stock and pre-funded warrants completed in February 2023, $259.1 million in net proceeds from the underwritten public offering of our common stock completed in May 2023, $84.5 million in net proceeds from the sale of common stock under the ATM and $10.0 million in proceeds received from our 2019 Employee Stock Purchase Plan, or ESPP, and stock option exercises.

Net cash provided by financing activities of $45.3 million for the year ended December 31, 2022 primarily resulted from $39.2 million in net proceeds received from sales of shares of common stock under the ATM and $6.1 million in proceeds received from issuance of common shares under the ESPP and stock option exercises.

Net cash provided by financing activities of $266.3 million for the year ended December 31, 2021 primarily resulted from the $230.0 million in net proceeds received from the underwritten public offering of our common stock completed in March 2021, $25.7 million in net proceeds received from sales of shares of common stock under the ATM, and $10.6 million in proceeds received from issuance of common shares under ESPP and stock option exercises.

Funding Requirements

We expect our expenses to increase in connection with our ongoing activities, particularly as we continue research and development, conduct clinical trials, and seek marketing approval for our current and any of our future product candidates. In addition, if we obtain marketing approval for any of our current or our future product candidates, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution, which costs we might offset through entry into collaboration agreements with third parties. Accordingly, we will need to obtain substantial additional funding in connection with our continuing operations. If we are unable to raise capital when needed on acceptable terms, or at all, including, but not limited to, as a result of macroeconomic factors related to ongoing regional conflicts around the world, inflation and market volatility, interest rate fluctuations, recent instability in the global banking sector, uncertainty with respect to the federal debt ceiling and budget and the related potential for government shutdowns, we would be forced to delay, reduce, or eliminate our research and development programs or future commercialization efforts. Based on our current operating plan, we believe that our existing cash, cash equivalents and marketable securities will enable us to fund our operating expenses and capital expenditure requirements into the second half of 2027.

We have based this estimate on assumptions that may prove to be wrong, and we may use our available capital resources sooner than we currently expect. Our future capital requirements will depend on many factors, including:

- the costs of conducting additional clinical and preclinical studies and future clinical trials;
- the costs of future manufacturing;
- the scope, progress, results and costs of discovery, preclinical development, laboratory testing, and clinical trials for other potential product candidates we may develop, if any;
- the costs, timing, and outcome of regulatory review of our product candidates;
- our ability to establish and maintain collaborations on favorable terms, if at all;
- the achievement of milestones or occurrence of other developments that trigger payments under any collaboration agreements we might have at such time;
- the costs and timing of future commercialization activities, including product sales, marketing, manufacturing and distribution, for any of our product candidates for which we receive marketing approval;
- the amount of revenue, if any, received from commercial sales of our product candidates, should any of our product candidates receive marketing approval;
- the costs of preparing, filing and prosecuting patent applications, obtaining, maintaining and enforcing our intellectual property rights, and defending intellectual property-related claims;
- our ability to file and prosecute patent applications, obtain, maintain, and enforce our intellectual property rights, and defend intellectual property-related claims in certain countries that are subject to economic sanctions and/or hostile to U.S. and international companies;
- our headcount growth and associated costs as we expand our business operations and research and development activities;
- potential delays in our preclinical studies, our development programs and our current and planned clinical trials due to geo-political actions, including war and regional conflicts around the world (such as the current armed conflicts in Ukraine and Israel), the ongoing labor shortage, global supply chain disruptions, or cybersecurity events;

- general economic conditions and trends, including inflation and market volatility, interest rate fluctuations, the ongoing labor shortage, recent instability in the global banking sector, uncertainty with respect to the federal debt ceiling and budget and the related potential for government shutdowns or the weakening of the global and U.S. economies; and
- the cost of operating as a public company.

Until such time, if ever, as we can generate substantial product revenues, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaborations, strategic alliances and licensing arrangements.

Contractual Obligations

As of December 31, 2023, our contractual obligations for our primary office and laboratory space of 32,405 square feet through May 2025 includes future rent payments of $2.5 million to be paid in 2024. See Note 6, "Leases" to the consolidated financial statements appearing elsewhere in this Annual Report on Form 10-K for additional information.

We have entered into contracts with a number of third parties, including external CROs, that require us to make upfront payments, some of which may be non-refundable. Under various licensing and related agreements with third parties, we have agreed to make milestone payments and pay royalties to third parties. Pursuant to an exclusive license agreement with Children's Medical Center Corporation or CMCC, as amended in 2018, we are required to pay $80,000 per year until the agreement is terminated. We will also be responsible for up to $1.3 million of development milestone payments through the first regulatory approval of a licensed product, tiered royalty payments of low single-digit percentages on net sales of licensed products in the event that we realize sales from products covered by the license agreement, and between 10% and 20% of non-royalty income attributable to a sublicense of the CMCC rights. Amounts paid to CMCC are recorded as research and development expense in the statements of operations.

Pursuant to a collaboration agreement with Schrödinger, we may be required to pay Schrödinger certain development milestones, not to exceed in the aggregate, on a target-by-target basis, a low six-figure payment upon initiation of lead optimization and $3.1 million on a compound-by-compound basis, as well as royalties in the low single digits on sales of products containing such compounds. In addition, we have agreed to pay Schrödinger a percentage, in the mid-single digits, of certain payments we receive from third parties in connection with the licensing or transfer of the rights to exploit such compounds to such third parties, including a one-time fee of $1.0 million paid in 2019.

We enter into agreements in the normal course of business with vendors for preclinical studies, preclinical and clinical supply and manufacturing services, professional consultants for expert advice, and other vendors for other services for operating purposes. We have not included these payments in the table of contractual obligations above since the contracts do not contain any minimum purchase commitments and are cancellable at any time by us, generally upon 30 days prior written notice, and therefore we believe that our non-cancelable obligations under these agreements are not material.

Recent Accounting Pronouncements

We have reviewed all recently issued standards and have determined that such standards will not have a material impact on our financial statements or do not otherwise apply to our operations.

Critical Accounting Policies and Significant Estimates

This management's discussion and analysis is based on our consolidated financial statements, which have been prepared in accordance with U.S. generally accepted accounting principles. The preparation of these consolidated financial statements requires us to make judgments and estimates that affect the reported amounts of assets, liabilities, revenues and expenses, and the disclosure of contingent assets and liabilities in our consolidated financial statements. We base our estimates on historical experience, known trends and events, and various other factors that we believe to be reasonable under the circumstances. Actual results may differ from these estimates under different assumptions or conditions. On an ongoing basis, we evaluate our judgments and estimates in light of changes in circumstances, facts, and experience. The effects of material revisions in estimates, if any, will be reflected in the consolidated financial statements prospectively from the date of change in estimates.

While our significant accounting policies are described in more detail in the notes to our consolidated financial statements included in this Annual Report on Form 10-K, we believe the following accounting policy used in the preparation of our consolidated financial statements requires the most significant judgments and estimates.

Accrued Research and Development Expenses

As part of the process of preparing our consolidated financial statements, we are required to estimate our accrued expenses as of each balance sheet date. This process involves reviewing open contracts and purchase orders, communicating with our personnel to identify services that have been performed on our behalf, and estimating the level of service performed and the

associated cost incurred for the service when we have not yet been invoiced or otherwise notified of the actual cost. The majority of our service providers invoice us monthly in arrears for services performed or when contractual milestones are met. We make estimates of our accrued expenses as of each balance sheet date based on facts and circumstances known to us at that time. We periodically confirm the accuracy of our estimates with the service providers and adjust, if necessary. The significant estimates in our accrued research and development expenses include the costs incurred for services performed by our vendors in connection with research and development activities for which we have not yet been invoiced. In certain instances, we prepay for services to be provided in the future. These amounts are expensed as the services are performed.

We base our expenses related to research and development activities on our estimates of the services received and efforts expended pursuant to quotes and contracts with vendors that conduct research and development on our behalf. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. There may be instances in which payments made to our vendors will exceed the level of services provided and result in a prepayment of the research and development expense. In accruing service fees, we estimate the time period over which services will be performed and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from our estimate, we adjust the accrual or prepaid balance accordingly. Non-refundable advance payments for goods and services that will be used in future research and development activities are expensed when the activity has been performed or when the goods have been received rather than when the payment is made.

Although we do not expect our estimates to be materially different from amounts incurred, if our estimates of the status and timing of services performed differ from the actual status and timing of services performed, it could result in us reporting amounts that are too high or too low in any particular period. To date, there have been no material differences between our estimates of such expenses and the amounts incurred.

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

Interest Rate Risk

Our exposure to interest rate risk is related primarily to our investment portfolio.

Our investment portfolio is primarily invested in money market funds that invest in U.S. government securities, U.S. Treasury securities, U.S. government- sponsored enterprise securities and corporate bonds. A change in prevailing interest rates may cause the fair value of our marketable securities, which had a fair value of $645.8 million at December 31, 2023, to fluctuate. For example, if we hold a debt security that was issued with a fixed interest rate at the then-prevailing rate and the prevailing rate rises, the fair value of the principal amount of our investment will probably decline.

Concentration of Credit Risk

Financial instruments that potentially expose us to concentrations of credit risk consist principally of cash, cash equivalents, restricted cash and marketable securities. We place our cash, cash equivalents and restricted cash with financial institutions with high credit quality. As of December 31, 2023 and 2022, we had $59.1 million and $59.8 million, respectively, of cash, cash equivalents and restricted cash on deposit or invested with our financial institutions.

MORPHIC HOLDING, INC.
INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

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Report of Independent Registered Public Accounting Firm

To the Shareholders and the Board of Directors of Morphic Holding, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Morphic Holding, Inc. (the Company) as of December 31, 2023 and 2022, the related consolidated statements of operations and comprehensive loss, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2023, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2023 and 2022, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2023, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2023, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework), and our report dated February 22, 2024 expressed an unqualified opinion thereon.

Basis for Opinion

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

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

Critical audit matters are matters arising from the current period audit of the financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective or complex judgments. We determined that there are no critical audit matters.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2017.
Boston, Massachusetts
February 22, 2024

MORPHIC HOLDING, INC.
CONSOLIDATED BALANCE SHEETS
(In thousands, except share and per share data)

	December 31,	
	2023	2022
Assets		
Current assets:		
Cash and cash equivalents	$ 58,577	$ 59,272
Marketable securities	645,772	288,976
Accounts receivable	—	455
Prepaid expenses and other current assets	12,579	13,479
Total current assets	716,928	362,182
Operating lease right-of-use assets	2,133	3,514
Property and equipment, net	2,767	2,119
Restricted cash	560	560
Other assets	126	214
Total assets	$ 722,514	$ 368,589
Liabilities		
Current liabilities:		
Accounts payable	$ 7,698	$ 3,475
Accrued and other current expenses	17,078	13,181
Deferred revenue, current portion	—	470
Total current liabilities	24,776	17,126
Long-term liabilities:		
Operating lease liability, net of current portion	716	2,344
Total liabilities	25,492	19,470
Commitments and contingencies (Note 11)		
Stockholders' Equity		
Preferred shares, $0.0001 par value, 10,000,000 shares authorized, no shares issued and outstanding as of December 31, 2023 and December 31, 2022	—	—
Common shares, $0.0001 par value, 400,000,000 shares authorized, 49,747,286 shares issued and outstanding as of December 31, 2023 and 38,584,678 shares issued and outstanding as of December 31, 2022	5	4
Additional paid-in capital	1,143,919	649,549
Accumulated deficit	(449,190)	(297,095)
Accumulated other comprehensive income (loss)	2,288	(3,339)
Total stockholders' equity	697,022	349,119
Total liabilities and stockholders' equity	$ 722,514	$ 368,589

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

MORPHIC HOLDING, INC.
CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS
(In thousands, except share and per share data)

	Year Ended December 31,		
	2023	2022	2021
Collaboration revenue	$ 521	$ 70,808	$ 19,794
Operating expenses:			
Research and development	140,384	102,062	87,789
General and administrative	38,823	32,142	27,811
Total operating expenses	179,207	134,204	115,600
Loss from operations	(178,686)	(63,396)	(95,806)
Other income:			
Interest income, net	26,969	4,567	272
Other income (expense), net	2	(145)	(8)
Total other income, net	26,971	4,422	264
Loss before provision for income taxes	(151,715)	(58,974)	(95,542)
Provision for income taxes	(380)	(67)	—
Net loss	$ (152,095)	$ (59,041)	$ (95,542)
Net loss per share, basic and diluted	$ (3.59)	$ (1.55)	$ (2.67)
Weighted average common shares outstanding, basic and diluted	42,390,554	38,112,498	35,797,969
Comprehensive loss:			
Net loss	$ (152,095)	$ (59,041)	$ (95,542)
Other comprehensive income (loss):			
Unrealized holding gains (losses) on marketable securities, net of tax	5,627	(2,857)	(461)
Total other comprehensive income (loss)	5,627	(2,857)	(461)
Comprehensive loss	$ (146,468)	$ (61,898)	$ (96,003)

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

MORPHIC HOLDING, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(In thousands, except share data)

	Common Shares		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Income (Loss)	Total Stockholders' Equity
	Shares	Amount				
Balance at Balance at December 31, 2020	**32,037,686**	**$ 3**	**$ 287,727**	**$ (142,512)**	**$ (21)**	**$ 145,197**
Equity-based compensation expense	—	—	21,184	—	—	21,184
Vesting of restricted shares	127,335	—	—	—	—	—
Issuance of common shares upon stock option exercises	827,830	—	9,536	—	—	9,536
Issuance of common shares under the Employee Stock Purchase Plan	35,563	—	1,095	—	—	1,095
Issuance of common shares through at-the-market offering, net of issuance costs of $1.2 million	556,983	—	25,708	—	—	25,708
Issuance of common shares in secondary offering, net of offering costs of $15.0 million	3,500,000	1	229,981	—	—	229,982
Unrealized holding losses on marketable securities, net of tax	—	—	—	—	(461)	(461)
Net loss	—	—	—	(95,542)	—	(95,542)
Balance at December 31, 2021	**37,085,397**	**$ 4**	**$ 575,231**	**$ (238,054)**	**$ (482)**	**$ 336,699**
Equity-based compensation expense	—	—	29,048	—	—	29,048
Vesting of restricted shares	9,171	—	—	—	—	—
Issuance of common shares upon stock option exercises	459,839	—	5,175	—	—	5,175
Issuance of common shares under the Employee Stock Purchase Plan	30,271	—	885	—	—	885
Issuance of common shares through at-the-market offering, net of issuance costs of $1.3 million	1,000,000	—	39,210	—	—	39,210
Unrealized holding losses on marketable securities, net of tax	—	—	—	—	(2,857)	(2,857)
Net loss	—	—	—	(59,041)	—	(59,041)
Balance at December 31, 2022	**38,584,678**	**$ 4**	**$ 649,549**	**$ (297,095)**	**$ (3,339)**	**$ 349,119**
Equity-based compensation expense	—	—	40,943	—	—	40,943
Vesting of restricted shares	62,085	—	—	—	—	—
Issuance of common shares upon stock option exercises	584,959	—	9,027	—	—	9,027
Issuance of common shares under the Employee Stock Purchase Plan	34,628	—	993	—	—	993
Issuance of common shares through at-the-market offering, net of issuance costs of $1.8 million	1,518,759	—	84,548	—	—	84,548
Issuance of common shares upon exercise of pre-funded warrants	1,980,188	—	—	—	—	—
Issuance of pre-funded warrants to purchase common shares through private placement, net of issuance costs of $0.1 million	—	—	69,859	—	—	69,859
Issuance of common shares through private placement, net of issuance costs of $0.1 million	848,655	—	29,940	—	—	29,940
Issuance of common shares through secondary offering, net of issuance costs of $16.9 million	6,133,334	1	259,060	—	—	259,061
Unrealized holding gains on marketable securities, net of tax	—	—	—	—	5,627	5,627
Net loss	—	—	—	(152,095)	—	(152,095)
Balance at December 31, 2023	**49,747,286**	**$ 5**	**$ 1,143,919**	**$ (449,190)**	**$ 2,288**	**$ 697,022**

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

MORPHIC HOLDING, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Year Ended December 31,		
	2023	**2022**	**2021**
Cash flows from operating activities:			
Net loss	$ (152,095)	$ (59,041)	$ (95,542)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	1,091	1,005	1,030
Discount accretion and premium amortization on marketable securities	(10,595)	800	1,215
Equity-based compensation	40,943	29,048	21,184
Loss on sale of marketable securities	—	154	—
Loss on disposal of equipment	—	—	4
Change in operating assets and liabilities:			
Accounts receivable	455	1,852	5,007
Prepaid expenses and other current assets	896	(5,529)	(4,035)
Other assets	88	(207)	59
Operating lease right-of-use assets	1,381	1,292	1,098
Accounts payable	3,725	(1,553)	970
Accrued expenses	3,763	60	1,467
Deferred revenue	(470)	(67,647)	(14,821)
Operating lease liabilities	(1,494)	(1,211)	(1,097)
Net cash used in operating activities	(112,312)	(100,977)	(83,461)
Cash flows from investing activities:			
Purchases of marketable securities	(764,029)	(238,274)	(244,160)
Proceeds from maturities of marketable securities	423,455	175,042	132,000
Proceeds from sale of marketable securities	—	7,146	—
Purchase of property and equipment	(1,241)	(365)	(1,020)
Net cash used in investing activities	(341,815)	(56,451)	(113,180)
Cash flows from financing activities:			
Proceeds from issuance of common shares and pre-funded warrants through the private	99,799	—	—
Proceeds from issuance of common shares under Employee Stock Purchase Plan	993	885	1,095
Proceeds from at-the-market offering, net of issuance costs	84,548	39,210	25,700
Proceeds from secondary offering, net of issuance costs	259,061	—	229,982
Proceeds from issuance of common shares upon stock option exercises	9,031	5,171	9,536
Net cash provided by financing activities	453,432	45,266	266,313
Net (decrease) increase in cash, cash equivalents and restricted cash	(695)	(112,162)	69,672
Cash, cash equivalents and restricted cash, beginning of period	59,832	171,994	102,322
Cash, cash equivalents and restricted cash, end of period	$ 59,137	$ 59,832	$ 171,994
Non-cash activities:			
Purchases of property and equipment included in accounts payable and accrued expenses	$ 674	$ 176	$ —
Amounts from exercise of stock options included in prepaid expenses and other current assets	$ —	$ 4	$ —
Right-of-use assets obtained in exchange for operating lease liabilities	$ —	$ —	$ 4,434
Supplemental cash flow information:			
Cash paid for taxes	$ 335	$ 50	$ 170

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

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Nature of the Business

Organization and Liquidity

Morphic Holding, Inc. (the "Company") was formed under the laws of the State of Delaware in August 2014. The Company is a biopharmaceutical company applying proprietary insights into integrin medicine to discover and develop potentially first-in-class oral small molecule integrin therapeutics. Integrins are a validated target class with multiple approved drugs for the treatment of serious chronic diseases. Despite significant biopharmaceutical industry investment, to the Company's knowledge no oral small molecule integrin therapies have been approved by the U.S. Food and Drug Administration or any European regulatory authority. The Company has created the Morphic integrin technology platform, or MInT Platform, by leveraging its unique understanding of integrin structure and biology, to develop a pipeline of novel product candidates designed to achieve potency, high selectivity and the pharmaceutical properties required for oral administration.

The Company is subject to risks and uncertainties common to early-stage companies in the biotechnology industry, including, but not limited to, development by competitors of new technological innovations, dependence on key personnel, protection of proprietary technology, compliance with government regulations and the ability to secure additional capital to fund operations. Product candidates currently under development will require significant additional research and development efforts, including extensive preclinical and clinical testing and regulatory approval prior to commercialization. These efforts require significant amounts of additional capital, adequate personnel and infrastructure and extensive compliance-reporting capabilities. Even if the Company's drug development efforts are successful, it is uncertain when, if ever, the Company will realize significant revenue from product sales. The Company expects to continue to incur losses from operations for the foreseeable future. The Company expects that its cash, cash equivalents and marketable securities will be sufficient to fund its operating expenses and capital expenditure requirements through at least the next 12 months from the date these financial statements were issued.

In July 2020, the Company entered into an Open Market Sale Agreement (the "Original Agreement") with Jefferies LLC ("Jefferies") with respect to an at-the-market offering program under which the Company could offer and sell, from time to time at its sole discretion, shares of its common stock, having an aggregate offering amount of up to $75.0 million, referred to as Placement Shares, through Jefferies as its sales agent. The Company paid Jefferies a commission on the gross sales proceeds of any Placement Shares sold through Jefferies under the Original Agreement, and also provided Jefferies with customary indemnification and contribution rights. On August 11, 2021, the Company entered into an Amendment No. 1 to the Original Agreement with Jefferies, establishing a new at-the-market offering ("New ATM") with an aggregate offering amount of up to $150.0 million, also subject to a commission on the gross proceeds from sales of Placement Shares, sold through Jefferies. Under the New ATM, the Company may offer and sell, from time to time at its sole discretion, Placement Shares through Jefferies as its sales agent.

During the year ended December 31, 2023, the Company issued and sold 1,518,759 shares under the New ATM for net proceeds of approximately $84.5 million after deducting offering commissions and expenses. As of December 31, 2023, the Company had approximately $10.9 million of common stock remaining available for sale under the New ATM.

In March 2021, the Company completed an underwritten follow-on public offering of 3,500,000 shares of its common stock at a price to the public of $70.00 per share. Gross proceeds from the secondary offering were approximately $245.0 million, before deducting underwriting discounts, commissions and other offering expenses of approximately $15.0 million, paid by the Company, resulting in net proceeds of approximately $230.0 million.

In February 2023, the Company entered into a securities purchase agreement with existing investors, consisting of a board member and holder of more than 5% of the Company's common stock and a holder of more than 5% of the Company's common stock, pursuant to which the Company sold to the investors, in a private placement, 848,655 shares of common stock at a price of $35.35 per share (the "PIPE Shares") and pre-funded warrants to purchase up to 1,980,198 shares of common stock at a purchase price of $35.3499 per pre-funded warrant where each pre-funded warrant has an exercise price of $0.0001 per share (the "Pre-Funded Warrants"). The Company received aggregate gross proceeds of approximately $100.0 million, before deducting costs and offering expenses payable by the Company, resulting in net proceeds of approximately $99.8 million.

In May 2023, the Company completed an underwritten public offering of 6,133,334 shares of its common stock, which includes 800,000 shares sold upon the exercise in full of the underwriters' option to purchase additional shares of common stock, at a price to the public of $45.00 per share. Gross proceeds from the secondary offering were approximately $276.0 million, before deducting underwriting discounts, commissions and other offering expenses payable by the Company of approximately $16.9 million, resulting in net proceeds of approximately $259.1 million.

2. Basis of Presentation and Significant Accounting Policies

Basis of Presentation

The consolidated financial statements include the accounts of Morphic Holding, Inc. and its wholly-owned subsidiaries, Morphic Therapeutic, Inc., Morphic Therapeutic UK Ltd and Morphic Security Corporation. All intercompany balances have been eliminated in consolidation.

These consolidated financial statements have been prepared in conformity with accounting principles generally accepted in the United States ("GAAP"). Any reference in these notes to applicable guidance is meant to refer to the authoritative United States generally accepted accounting principles as found in the Accounting Standards Codification ("ASC") and Accounting Standards Update ("ASU") of the Financial Accounting Standards Board ("FASB").

Use of Estimates and Summary of Significant Accounting Policies

The preparation of financial statements in accordance with GAAP requires management to make estimates and judgments that may affect the reported amounts of assets and liabilities and related disclosures of contingent assets and liabilities at the date of the financial statements and the related reporting of revenues and expenses during the reporting period. Significant estimates of accounting reflected in these consolidated financial statements include, but are not limited to, estimates related to revenue recognition and accrued research and development expenses. Actual results for accrued research and development expenses could differ from those estimates.

On March 2, 2022, the Company incorporated Morphic Therapeutic UK Ltd in London, U.K., to support Company functions outside of the United States. The geographic location of all long-lived assets of the Company continues to be the United States.

The functional reporting currency of Morphic Therapeutic UK Ltd is the United States Dollar. Foreign currency remeasurement is included in other income (expense) in the Company's consolidated statements of operations.

Concentration of Credit Risk and Off-Balance Sheet Risk

Financial instruments that potentially expose the Company to concentrations of credit risk consist primarily of cash and cash equivalents, marketable securities, and accounts receivable. The Company's cash and cash equivalents are held at accredited financial institutions, in amounts that exceed federally insured limits. The Company does not believe that it is subject to unusual credit risk beyond the normal credit risk associated with commercial banking relationships.

The primary objectives for the Company's investment portfolio are the preservation of capital and maintenance of liquidity. The Company's investment policy allows funds to be held outside bank accounts, but to be invested only in readily marketable fixed income instruments with readily ascertainable market values, denominated and payable in United States Dollars including obligations of the U.S. government, U.S. government-sponsored enterprises, U.S. government agencies and highly rated corporate debt obligations, including commercial paper and corporate bonds, and money market funds registered according to Rule 2a-7 of the Investment Company Act of 1940. Investments in the money market fund shall be consistent with approved instruments and assets under management must be at least $1.0 billion.

The Company has no off-balance sheet risk, such as foreign exchange contracts, option contracts, or other foreign-hedging arrangements.

Cash and Cash Equivalents and Restricted Cash

The Company considers highly liquid investments with a maturity of three months or less when purchased to be cash equivalents. At December 31, 2023, cash and cash equivalents include bank demand deposits and money market funds that invest primarily in U.S. government securities. At December 31, 2022, cash and cash equivalents include bank demand deposits, money market funds that invest primarily in U.S. government securities, and U.S. Treasury securities. Cash equivalents are stated at cost, which approximates fair value.

Restricted cash consists of cash collateralizing a letter of credit in the amount of $560,000 issued to the landlord of the Company's facility lease as of December 31, 2023 and 2022. The letter of credit and cash collateralizing it increased to $560,000 in August 2021 due to the operating lease extension. The terms of the letter of credit extend beyond one year. The following table reconciles cash, cash equivalents and restricted cash per the balance sheet to the statements of cash flows (in thousands):

	December 31,		
	2023	2022	2021
Cash and cash equivalents	$ 58,577	$ 59,272	$ 171,434
Restricted cash	560	560	560
Total cash, cash equivalents, and restricted cash	$ 59,137	$ 59,832	$ 171,994

Marketable securities

The Company invests funds in U.S. government debt securities, U.S. government-sponsored enterprise debt securities and corporate debt securities with original maturities at the date of purchase greater than three months as marketable securities. The marketable securities are classified as available-for-sale and carried at fair value. The Company considers all available-for-sale securities, including those with maturity dates beyond 12 months, as available to support current operational liquidity needs and therefore classifies all securities with maturity dates beyond three months at the date of purchase as current assets. Changes in the fair value of marketable securities are recorded in other comprehensive income (loss) as net unrealized gains (losses) on marketable securities. The Company recognized net unrealized gain of $5.6 million, and unrealized losses of $2.9 million and $0.5 million, for the years ended December 31, 2023, 2022 and 2021, respectively.

The Company assesses its available-for-sale debt securities under the available-for-sale debt security impairment model in ASC 326 as of each reporting date in order to determine if a portion of any decline in fair value below carrying value recognized on its available-for-sale debt securities is the result of a credit loss. The Company records credit losses in the consolidated statements of operations and comprehensive loss as credit loss expense within other expense, net, which is limited to the difference between the fair value and the amortized cost of the marketable security. To date, the Company has not recorded any credit losses on its available-for-sale debt securities.

Accrued interest receivable related to the Company's available-for-sale debt securities is presented within prepaid expenses and other current assets on the Company's consolidated balance sheets. The Company has elected to exclude accrued interest receivable from both the fair value and the amortized cost basis of available-for-sale debt securities for the purposes of identifying and measuring any impairment. The Company writes off accrued interest receivable once it has determined that the asset is not realizable. Any write offs of accrued interest receivable are recorded by reversing interest income, recognizing credit loss expense, or a combination of both. To date, the Company has not written off any accrued interest receivables associated with its marketable securities.

Interest income on investments

The Company recognizes interest income from investments in money market funds and available-for-sale debt securities, including accretion of discount or amortization of premium, on an accrual basis. For the years ended December 31, 2023, 2022 and 2021, the Company recognized $27.0 million, $4.6 million and $0.3 million in interest income, respectively.

Interest income, net is included within other income, net on the consolidated statements of operations and comprehensive loss.

Property and Equipment, net

Property and equipment are recorded at cost. Expenditures for major renewals or betterments that extend the useful lives of property and equipment are capitalized; expenditures for maintenance and repairs are charged to expense as incurred. Depreciation is calculated on a straight-line basis over the estimated useful lives of the related asset. Property and equipment are depreciated as follows:

	Estimated Useful Life (in Years)
Laboratory equipment	5
Computers and software	3-5
Leasehold improvements	Shorter of the useful life or the remaining term of the lease

Leases

The Company measures its lease obligations in accordance with ASC 842, Leases, ("ASC 842"), which requires lessees to recognize a right-of-use ("ROU") asset and lease liability for most lease arrangements.

At the inception of an arrangement, the Company determines whether the arrangement is or contains a lease based on the unique facts and circumstances present in the arrangement. Leases with a term greater than one year are recognized on the balance sheet as ROU assets and short-term and long-term lease liabilities, as applicable.

The Company has elected not to recognize leases with an original term of one year or less on the balance sheet. The Company typically only includes an initial lease term in its assessment of a lease arrangement. The Company considers its renewal options and extensions within the arrangements and the Company includes these options when it is reasonably certain to extend the term of the lease.

Assumptions made by the Company at the commencement date are re-evaluated upon occurrence of certain events, including a lease modification. A lease modification results in a separate contract when the modification grants the lessee an additional right of use not included in the original lease and when lease payments increase commensurate with the standalone price for the additional right of use. When a lease modification results in a separate contract, it is accounted for in the same manner as a new lease. When a lease modification does not result in a separate contract, it is accounted for as a contract modification.

A contract modification requires the Company to reassess the classification of the lease to determine if it is an operating lease or a financing lease. The Company does not have any financing leases.

Entities may elect to not separate lease and non-lease components. The Company has elected to account for lease and non-lease components together as a single lease component.

The Company recognizes an ROU asset and lease liability as of the transition date or contract modification date based on the present value of the future lease payments over the lease term. ASC 842 requires lessees to use the rate implicit in the lease unless it is not readily determinable and then it may use its incremental borrowing rate ("IBR") to discount the future minimum lease payments. The Company's lease arrangement does not provide an implicit rate; therefore, the Company uses its IBR to discount the future minimum lease payments. The Company determines its IBR based on its credit rating, current economic information available as of the transition date or modification date, as well as the identified lease term. The Company's ROU asset and related lease liability are not sensitive to changes in the Company's IBR.

Prospectively, the Company will remeasure the lease liability at the present value using the same IBR that was in effect as of the transition date or contract modification date and adjust the ROU assets for straight-line rent expense.

Impairment of Long-Lived Assets

Long-lived assets consist primarily of property and equipment. Long-lived assets to be held and used are tested for recoverability whenever events or changes in business circumstances indicate that the carrying amount of the assets may not be fully recoverable. Factors that the Company considers in deciding when to perform an impairment review include significant underperformance of the business in relation to expectations, significant negative industry or economic trends, and significant changes or planned changes in the use of the assets. If an impairment review is performed to evaluate a long-lived asset for recoverability, the Company compares forecasts of undiscounted cash flows expected to result from the use and eventual disposition of the long-lived asset to its carrying value. An impairment loss would be recognized when estimated undiscounted future cash flows expected to result from the use of an asset are less than its carrying amount. The impairment loss would be based on the excess of the carrying value of the impaired asset over its fair value, determined based on discounted cash flows. To date, the Company has not recorded any impairment losses on long-lived assets.

Fair Value Measurements

ASC Topic 820, Fair Value Measurement ("ASC 820"), establishes a fair value hierarchy for instruments measured at fair value that distinguishes between assumptions based on market data (observable inputs) and the Company's own assumptions (unobservable inputs). Observable inputs are inputs that market participants would use in pricing the asset or liability based on market data obtained from sources independent of the Company. Unobservable inputs are inputs that reflect the Company's assumptions about the inputs that market participants would use in pricing the asset or liability and are developed based on the best information available in the circumstances. ASC 820 identifies fair value as the exchange price, or 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 a basis for considering market participant assumptions in fair value measurements, ASC 820 establishes a three-tier fair value hierarchy that distinguishes between the following:

Level 1 — Quoted market prices in active markets for identical assets or liabilities.

Level 2 — Inputs other than Level 1 inputs that are either directly or indirectly observable, such as quoted market prices, interest rates and yield curves.

Level 3 — Unobservable inputs developed using estimates of assumptions developed by the Company, which reflect those that a market participant would use.

At December 31, 2023, investments include U.S. Treasury securities, U.S. government-sponsored enterprise securities, and corporate bonds, which are valued either based on recent trades of securities in inactive markets or based on quoted market prices of similar instruments and other significant inputs derived from or corroborated by observable market data.

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

The Company believes that the carrying amounts of the Company's consolidated financial instruments, including prepaid expenses and other current assets, accounts receivable, accounts payable, and accrued expenses approximate fair value due to the short-term nature of those instruments.

Segment Information

Operating segments are defined as components of an entity about which separate discrete information is available for evaluation by the chief operating decision maker, or decision-making group, in deciding how to allocate resources and in assessing performance. The Company's Chief Executive Officer is its chief operating decision-maker and views operations and manages the Company's business in one operating segment operating in the United States and the U.K.

Revenue Recognition

To date all revenue has been generated from the Company's agreements with AbbVie Biotechnology Ltd ("AbbVie"), executed in October 2018 and terminated as of December 2022, and Janssen Pharmaceuticals, Inc. ("Janssen"), executed in February 2019, amended in December 2020 and terminated as of March 2023. Please refer to Note 12 below for details of ASC 606 application to the Company's agreements with AbbVie and Janssen.

The Company first evaluates collaboration arrangements to determine whether the arrangement (or part of the arrangement) represents a collaborative arrangement pursuant to ASC Topic 808, Collaborative Arrangements, based on the risks and rewards and activities of the parties pursuant to the contractual arrangement. The Company accounts for any collaborative arrangement or elements within the contract that are deemed to be a collaborative arrangement, and not a customer relationship, in accordance with ASC 808. To date, the Company has not recognized any amounts for collaborative arrangements in accordance with ASC 808.

Under ASC 606, an entity recognizes revenue when its customer obtains control of promised goods or services, in an amount that reflects the consideration which the entity expects to receive in exchange for those goods or services. To determine the appropriate amount of revenue to be recognized for arrangements determined to be within the scope of ASC 606, the Company performs the following five steps: (i) identification of the contract(s) with the customer, (ii) identification of the promised goods or services in the contract and determination of whether the promised goods or services are performance obligations, (iii) measurement of the transaction price, (iv) allocation of the transaction price to the performance obligations, and (v) recognition of revenue when (or as) the Company satisfies each performance obligation. The Company only applies the five-step model to contracts when it is probable that the entity will collect consideration it is entitled to in exchange for the goods or services it transfers to the customer.

The Company accounts for a contract with a customer that is within the scope of ASC 606 when all of the following criteria are met: (i) the arrangement has been approved by the parties and the parties are committed to perform their respective obligations, (ii) each party's rights regarding the goods or services to be transferred can be identified, (iii) the payment terms for the goods or services to be transferred can be identified, (iv) the arrangement has commercial substance and (v) collection of substantially all of the consideration to which the Company will be entitled in exchange for the goods or services that will be transferred to the customer is probable.

Performance obligations are promised goods or services in a contract to transfer a distinct good or service to the customer. Promised goods or services are considered distinct when: (i) the customer can benefit from the good or service on its own or together with other readily available resources and (ii) the promised good or service is separately identifiable from other promises in the contract. Options to purchase additional goods or services are considered to be marketing offers and are to be accounted for as separate contracts when the customer elects such options, unless the Company determines the option provides a material right which would not be provided without entering into the contract. If, however, an option is determined to provide a material right that would not be provided without entering into a contract, a portion of the transaction price is allocated to such option.

The Company estimates the transaction price based on the amount of consideration the Company expects to receive for transferring the promised goods or services in the contract. The consideration may include both fixed consideration and variable consideration. At the inception of each arrangement that includes variable consideration, the Company evaluates the amount of the potential payments and the likelihood that the payments will be received. The Company utilizes either the most likely amount method or expected value method to estimate the transaction price based on which method better predicts the amount of consideration expected to be received. If it is probable that a significant revenue reversal would not occur, the variable consideration is included in the transaction price.

The Company also evaluates whether instances in which the timing of payments by customers do not match the timing of performance obligation satisfaction contain an element of financing and adjusts the transaction price for the effect of the financing component, if any.

The Company's transactions with customers may include development and regulatory milestone payments. The Company evaluates whether the milestones are considered probable of being reached and estimates the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within the Company's control or the customer's control, such as regulatory approvals, are not considered probable of being achieved until those approvals are received. At the end of each reporting period, the Company re-evaluates the probability of achievement of such milestones and any related constraint, and, if necessary, adjusts the estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect collaboration revenue and net income (loss) in the period of adjustment.

For sales-based royalties, including milestone payments based on the level of sales, the Company determines whether the sole or predominant item to which the royalties relate is a license. When the license is the sole or predominant item to which the sales-based royalty relates, the Company recognizes revenue at the later of: (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied).

The Company allocates the transaction price based on the estimated standalone selling price of the identified performance obligations. The Company must develop assumptions that require judgment to determine the standalone selling price for each performance obligation identified in the contract. The Company utilizes key assumptions to determine the standalone selling price, which may include other comparable transactions, pricing considered in negotiating the transaction, and the estimated costs. Certain variable consideration is allocated specifically to one or more performance obligations in a contract when the terms of the variable consideration relate to the satisfaction of the performance obligation and the resulting amounts allocated to each performance obligation are consistent with the amounts the Company would expect to receive for each performance obligation.

The Company recognizes as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) each performance obligation is satisfied, either at a point in time or over time.

When the Company receives payments from customers based on billing schedules established in each contract, up-front payments and fees will be recorded as deferred revenue upon receipt or when due until the Company performs its obligations under these arrangements. Amounts will be recorded as accounts receivable when the Company's right to consideration is unconditional.

Research and Development Expenses

Research and development expenses are expensed as incurred and consist of costs incurred in performing research and development activities, including compensation related expenses for research and development personnel, preclinical and clinical activities including cost of supply and contract research organizations, overhead expenses including facilities expenses, materials and supplies, amounts paid to consultants and outside service providers, costs related to compliance and license costs, and depreciation of equipment. Upfront license payments related to acquired technologies which have not yet reached technological feasibility and have no alternative future use are also included in research and development expense.

Research Contract and Development Costs and Accruals

The Company has entered into various research development service arrangements under which vendors perform various services on behalf of the Company. The Company records accrued expenses for estimated costs incurred under the arrangements. When evaluating the adequacy of the accrued expenses, the Company analyzes the progress of the studies, trials or other services performed, including invoices received and contracted costs. Judgments and estimates are made in determining the accrued expense balances at the end of each reporting period.

Equity-Based Compensation

The Company issues stock options, restricted common stock, and restricted stock units to certain employees and non-employees, including directors. The Company accounts for restricted common stock and restricted stock unit expense based on the grant date fair value, which is generally the market price of the Company's common stock on the date of grant, which is recognized over the requisite service period of the award, which is generally the vesting period, on a straight-line basis. The Company accounts for stock option compensation expense based on the grant date fair value of the respective award, determined using the Black-Scholes option-pricing model, which is recognized over the requisite service period of the award, which is generally the vesting period, on a straight-line basis. The Company classifies equity-based compensation expense in its consolidated statements of operations and comprehensive loss in the same way the award recipient's salary and related costs are classified or in which the award recipient's service payments are classified. The Company recognizes forfeitures as they occur.

Please refer to Note 9 for additional information.

Comprehensive Loss

Comprehensive loss is the change in equity of a business enterprise during a period from transactions and other events and circumstances from non-owner sources. Comprehensive loss includes net loss and the change in accumulated other comprehensive loss for the period. The Company recognized net unrealized gains of $5.6 million and unrealized losses of $2.9 million and $0.5 million for the years ended December 31, 2023, 2022 and 2021, respectively.

Income Taxes

Since inception, the Company recorded income taxes in accordance with FASB ASC Topic 740, Income Taxes ("ASC 740"), which provides for deferred taxes using an asset and liability approach. Under this method, deferred tax assets and liabilities are determined based on temporary differences between the financial statement basis and tax basis of assets and liabilities and net operating loss and credit carryforwards using enacted tax rates in effect for the year in which the differences are expected to reverse. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date. Valuation allowances are established when it is more likely than not that some portion of the deferred tax assets will not be realized.

The Company accounts for uncertainty in income taxes recognized in the financial statements by applying a two-step process to determine the amount of tax benefit to be recognized. First, the tax position must be evaluated to determine the likelihood that it will be sustained upon external examination by the taxing authorities. If the tax position is deemed more-likely-than-not to be sustained, the tax position is then assessed to determine the amount of benefit to recognize in the financial statements. The amount of the benefit that may be recognized is the largest amount that has a greater than 50% likelihood of being realized upon ultimate settlement. At December 31, 2023 and 2022, the Company had not identified any significant uncertain tax positions.

Common stock warrants

The Company's common stock warrants are evaluated pursuant to ASC 480, Distinguishing Liabilities from Equity ("ASC 480"), and ASC 815, Derivatives and Hedging ("ASC 815"). The Company classifies its freestanding warrants as (i) liabilities, if the warrant terms allow settlement of the warrant exercise in cash, or (ii) equity, if the warrant terms only allow settlement in shares of common stock. Please refer to Note 8 below for the application to the Company's pre-funded warrants.

3. Fair Value of Financial Assets and Liabilities

The tables below present information about the Company's financial assets that are measured at fair value on a recurring basis as of December 31, 2023 and 2022 (in thousands) and indicate the level within the fair value hierarchy where each measurement is classified.

	Fair Value Measurements at December 31, 2023			
	Total	Level 1	Level 2	Level 3
Assets:				
Cash equivalents	$ 57,988	$ 57,988	$ —	$ —
Marketable securities:				
U.S. Treasury securities	573,394	—	573,394	—
U.S. government-sponsored enterprise securities	54,906	—	54,906	—
Corporate bonds	17,472	—	17,472	—
Total assets	$ 703,760	$ 57,988	$ 645,772	$ —

	Fair Value Measurements at December 31, 2022			
	Total	Level 1	Level 2	Level 3
Assets:				
Cash equivalents	$ 58,814	$ 38,942	$ 19,872	$ —
Marketable securities:				
U.S. Treasury securities	177,932	—	177,932	—
U.S. government-sponsored enterprise securities	12,396	—	12,396	—
Commercial paper	9,860	—	9,860	—
Corporate bonds	88,788	—	88,788	—
Total assets	$ 347,790	$ 38,942	$ 308,848	$ —

Cash equivalents consist of money market funds as of December 31, 2023 and money market funds and U.S. Treasury securities as of December 31, 2022. The money market funds included in the tables above invest in U.S. government securities that are valued using quoted market prices. Accordingly, money market funds are categorized as Level 1 as of December 31, 2023 and 2022. Marketable securities included in the tables above consist of U.S. Treasury securities, U.S. government-sponsored enterprise securities and corporate bonds as of December 31, 2023 and U.S. Treasury securities, U.S. government-sponsored enterprise securities, corporate bonds and commercial paper as of December 31, 2022, and these securities are categorized as Level 2 as of December 31, 2023 and 2022. During the years ended December 31, 2023 and 2022, no assets were transferred between the fair value hierarchy categories. The Company had no liabilities measured at fair value on a recurring basis at December 31, 2023 and 2022.

4. Marketable securities

The following tables summarize the Company's investments in marketable securities classified as available-for-sale (in thousands):

	As of December 31, 2023				
	Maturity	Amortized cost	Gross unrealized holding gains	Gross unrealized holding losses	Aggregate estimated fair value
Marketable securities:					
U.S. Treasury securities	within 3 years	$ 570,964	$ 2,499	$ (69)	$ 573,394
U.S. government-sponsored enterprise securities	less than 1 year	54,997	—	(91)	54,906
Corporate bonds	less than 1 year	17,498	—	(26)	17,472
Total marketable securities		$ 643,459	$ 2,499	$ (186)	$ 645,772

	As of December 31, 2022				
	Maturity	Amortized cost	Gross unrealized holding gains	Gross unrealized holding losses	Aggregate estimated fair value
Marketable securities:					
U.S. Treasury securities	less than 1 year	$ 179,854	$ —	$ (1,922)	$ 177,932
U.S. government-sponsored	within 2 years	12,500	—	(104)	12,396
Commercial paper	less than 1 year	9,860	—	—	9,860
Corporate bonds	within 2 years	90,076	—	(1,288)	88,788
Total marketable securities		$ 292,290	$ —	$ (3,314)	$ 288,976

The Company determined that there was no material change in the credit risk of the above marketable securities during the years ended December 31, 2023 and 2022. As such, an allowance for credit losses was not recognized. As of December 31, 2023, the Company does not intend to sell such securities and it is not more likely than not that the Company will be required to sell the securities before recovery of its amortized cost basis.

Accrued interest receivable on the Company's available-for-sale securities totaled $4.4 million and $1.4 million as of December 31, 2023 and 2022, respectively.

5. Property and Equipment, Net

At December 31, 2023 and 2022, property and equipment, net consists of the following (in thousands):

	December 31,	
	2023	2022
Laboratory equipment	$ 7,068	$ 6,094
Computers and software	709	596
Leasehold improvements	611	611
Construction in progress	652	—
	9,040	7,301
Less: Accumulated depreciation and amortization	(6,273)	(5,182)
	$ 2,767	$ 2,119

Depreciation and amortization expense was $1.1 million, $1.0 million and $1.0 million for the years ended December 31, 2023, 2022 and 2021, respectively.

6. Leases

The Company entered into a lease arrangement for its corporate headquarters in Waltham, Massachusetts. In August 2021, the Company exercised its one-time extension right for its existing lease for 32,405 square feet of office and laboratory space through May 2025, as provided for under the terms of the lease. Since the exercise of the one-time extension right for its existing lease did not qualify to be accounted for as a separate lease, the Company accounted for the exercise of the one-time extension right as a contract modification.

The Company reassessed the lease classification for the Company's corporate headquarters as of the effective date of the modification using the modified terms and conditions and the facts and circumstances as of that date. This included using the remaining economic life of the underlying asset on that date, the discount rate for the lease on that date and a remeasurement and reallocation of the remaining consideration in the contract on that date. The Company concluded that the lease continues to be classified as an operating lease, reassessed the IBR as of the effective date of the modification, and remeasured the lease liability and ROU asset.

Supplemental balance sheet information

Supplemental operating lease balance sheet information is summarized as follows (in thousands):

	December 31, 2023
Operating lease right-of-use assets	$ 2,133
Accrued expenses[(1)]	$ 1,628
Operating lease liabilities	716
Total operating lease liabilities	$ 2,344

[(1)] The short-term portion of operating lease liabilities is included within accrued expenses on the consolidated balance sheet.

Other supplemental information

Other supplemental operating lease information is summarized as follows (in thousands, except for years and discount rate):

	Year Ended December 31, 2023
Cash paid for amounts included in the measurement of operating lease liabilities	$ 1,700
Weighted average remaining lease term	1.4 years
Weighted average discount rate	6.5 %

Maturities of lease commitments

Maturities of operating lease commitments as of December 31, 2023 were as follows (in thousands):

Year ending December 31,	Totals
2024	1,732
2025	728
Total lease payments	$ 2,460
Less: imputed interest	116
Present value of operating lease liabilities	$ 2,344

During the years ended December 31, 2023, 2022 and 2021 the Company recognized operating lease expense of $1.6 million, $1.6 million and $1.3 million, respectively.

7. Accrued Expenses

At December 31, 2023 and 2022 accrued expenses consist of the following (in thousands):

	December 31,	
	2023	2022
Payroll and related expenses	$ 8,528	$ 6,569
Research and development activities	5,818	4,265
Current portion of operating lease liability	1,628	1,494
Other expenses	1,104	853
	$ 17,078	$ 13,181

8. Stockholders' Equity

Common Stock

The common stock have the following characteristics:

Voting

The holders of common stock are entitled to one vote for each share of common stock held.

Dividends

The holders of shares of common stock are entitled to receive dividends, if and when declared by the Company's board of directors. Cash dividends may not be declared or paid to holders of shares of common stock until all unpaid dividends on any preferred shares outstanding have been paid in accordance with their terms. As of December 31, 2023 and 2022, no preferred shares were outstanding. No dividends have been declared or paid by the Company to the holders of common stock since the issuance of the common stock.

Liquidation

Holders of the common stock are entitled to receive distributions of cash, including in the event of a liquidation or dissolution of the Company, which preference is junior to the liquidation preference of any preferred stockholders. After any preferred stockholders have received their respective preferred distributions, any assets remaining for distribution shall be distributed to the holders of preferred or common shares determined on an as-converted basis.

Sale of PIPE Shares and Pre-Funded Warrants

In February 2023, the Company entered into a securities purchase agreement with existing investors, pursuant to which it sold, in a private placement, the PIPE Shares and the Pre-Funded Warrants. The Pre-Funded Warrants were immediately exercisable upon issuance at an exercise price of $0.0001 per share and had no expiry date. The Company received aggregate net proceeds of approximately $99.8 million after deducting offering expenses.

The Pre-Funded Warrants generally could not be exercised if the holder's aggregate beneficial ownership would be more than 9.99% of the total issued and outstanding shares of the Company's common stock following such exercise. The exercise price and number of shares of common stock issuable upon the exercise of the Pre-Funded Warrants were subject to adjustment in the event of any stock dividends and splits, reverse stock split, recapitalization, reorganization or similar transaction, as described in the Pre-Funded Warrants. In connection with the issuance and sale of the PIPE Shares and the Pre-Funded Warrants, the Company granted the investors certain registration rights with respect to the PIPE Shares and the shares issuable upon exercise of the Pre-Funded Warrants.

The Pre-Funded Warrants were evaluated pursuant to ASC 480 and ASC 815. The Company classified the Pre-Funded Warrants as a component of permanent stockholders' equity within additional paid-in capital and were recorded at the issuance date using a relative fair value allocation method. The Pre-Funded Warrants were equity classified because they were freestanding financial instruments that are legally detachable and separately exercisable, were immediately exercisable, did not embody an obligation for the Company to repurchase its common shares, permitted the holders to receive a fixed number of common shares upon exercise, were indexed to the Company's common shares and met the equity classification criteria. The Company valued the Pre-Funded Warrants at issuance, concluding their sales price approximated their fair value, and allocated net proceeds from the sale proportionately to the PIPE Shares and Pre-Funded Warrants, of which $29.9 million and $69.9 million, respectively, net of issuance costs, was recorded as a component of additional paid-in capital.

Common Stock Warrants

During the year ended December 31, 2023, 1,980,188 shares of common stock were issued upon the net exercise of 1,980,198 Pre-Funded Warrants.

As of December 31, 2023, there were no Pre-Funded Warrants to purchase shares of the Company's common stock outstanding.

9. Equity-Based Compensation

In connection with the Company's initial public offering in July 2019, the Company adopted the 2019 Equity Incentive Plan (the "Original 2019 Plan") in June 2019, which replaced the 2018 Stock Incentive Plan. The board of directors adopted the Amended and Restated 2019 Equity Incentive Plan (the "A&R 2019 Plan") on April 27, 2022, which was subsequently approved by the Company's stockholders on June 8, 2022, to revise the total annual compensation that may be awarded to the Company's non-employee directors thereunder. The A&R 2019 Plan provides for the grant of stock options, restricted stock awards, stock bonus awards, cash awards, stock appreciation right, restricted stock units, and performance awards to directors, officers and employees of the Company, as well as consultants and advisors of the Company. As a result of the automatic increase provision of the A&R 2019 Plan, the number of shares of common stock available for issuance thereunder increased by 1.5 million shares in January 2023. As of December 31, 2023, there were a total of 1.2 million shares available for future award grants under the A&R 2019 Plan.

The Company recognized equity-based compensation expense in the consolidated statements of operations and comprehensive loss, by award type, as follows (in thousands):

	Year Ended December 31,		
	2023	2022	2021
Stock options	$ 30,684	$ 25,828	$ 19,894
Restricted stock units	9,849	2,764	403
Employee Stock Purchase Plan	410	450	604
Restricted common stock	—	6	283
Total	$ 40,943	$ 29,048	$ 21,184

The following table summarizes the allocation of equity-based compensation expense in the consolidated statements of operations and comprehensive loss, by expense category (in thousands):

	Year Ended December 31,		
	2023	2022	2021
Research and development expense	$ 19,629	$ 13,518	$ 9,866
General and administrative expense	21,314	15,530	11,318
Total	$ 40,943	$ 29,048	$ 21,184

Restricted Stock Units

The following table summarizes the restricted stock units activity during the year ended December 31, 2023:

	Number of Shares	Weighted Average Fair Value per Share at Issuance
Unvested restricted stock units as of December 31, 2022	249,090	$ 43.85
Granted	929,080	31.85
Vested	(62,085)	43.92
Forfeited	(5,790)	33.41
Unvested restricted stock units as of December 31, 2023	1,110,295	$ 33.86

As of December 31, 2023, the Company had unrecognized equity-based compensation expense of $27.9 million related to the restricted stock units, which is expected to be recognized over a weighted average period of 2.87 years. The total fair value of restricted stock units vested during the years ended December 31, 2023, 2022 and 2021 was approximately $2.0 million, $0.2 million and $2.1 million, respectively.

Stock Options

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

	Number of Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term	Aggregate Intrinsic Value
			(in years)	(in thousands)
Outstanding as of December 31, 2022	5,263,553	$ 24.94		
Granted	1,239,304	35.77		
Exercised	(584,959)	15.43		
Forfeited or expired	(30,641)	48.68		
Outstanding as of December 31, 2023	5,887,257	$ 28.04	7.26	$ 36,563
Options exercisable as of December 31, 2023	3,798,171	$ 23.20	6.62	$ 34,841

The following table provides certain information related to the stock options granted, vested, and exercised during the years ended December 31, 2023, 2022 and 2021, in thousands, except for per option values:

	Year Ended December 31,		
	2023	2022	2021
Weighted-average fair value of options granted, per option	$ 26.11	$ 28.88	$ 26.16
Total cash received from exercises of stock options	$ 9,027	$ 5,175	$ 9,536
Total intrinsic value of stock options exercised	$ 20,487	$ 8,507	$ 39,335

The following table summarizes the assumptions used in determining the fair value of the options granted during the years ended December 31, 2023, 2022 and 2021:

	Year Ended December 31,		
	2023	2022	2021
Risk-free interest rate range	3.58% to 4.73%	1.64% to 4.20%	1.04% to 1.35%
Weighted-average expected term	6.0 years	6.0 years	6.0 years
Expected volatility range	82.28% to 85.26%	85.16% to 87.03%	86.22% to 87.55%
Weighted-average expected volatility	84.95%	86.81%	87.09%

The expected term of options granted has been determined based upon the simplified method, because the Company does not have sufficient historical information regarding its options to derive the expected term. Under this approach, the expected term for employee and director stock options is the mid-point between the weighted average of vesting period and the contractual term. The Company determines the volatility for options granted based on the historical volatility of the Company's own historical volatility in addition to a representative group of publicly traded companies for which historical information is available. The historical volatility is generally calculated based on a period of time commensurate with the expected term assumption. The risk-free interest rate is based on a zero-coupon U.S. Treasury instrument with terms consistent with the term of the stock options. The Company has not paid and does not anticipate paying cash dividends on shares of common stock; therefore, the expected dividend yield is assumed to be zero.

As of December 31, 2023, the Company had unrecognized equity-based compensation expense of $51.5 million related to stock options issued to employees and non-employees, which is expected to be recognized over a weighted average period of 2.19 years.

Restricted Common Stock

As of and for the year-ended December 31, 2023, the Company had no recognized or unrecognized equity-based compensation expense or outstanding awards related to the restricted common stock. The total fair value of restricted common stock awards vested during the years ended December 31, 2022 and 2021 was approximately $0.1 million, and $5.0 million, respectively.

Employee Stock Purchase Plan

In 2019, the Company adopted the 2019 Employee Stock Purchase Plan ("ESPP"), which became effective on June 26, 2019. The Company initially reserved 300,000 shares of common stock for sale under the ESPP. As a result of the automatic increase provision of the ESPP, the number of shares of common stock available for issuance under the ESPP increased by 0.4 million shares on January 1, 2023. The ESPP is a qualified, compensatory plan under Section 423 of the Internal Revenue Code and offers substantially all employees opportunity to purchase up to $25,000 of common stock per year at 15% discount to the lower of the beginning of the offering period price or the end of the offering period price.

Compensation expense for discounted purchases under the ESPP is measured using the Black-Scholes model to compute the fair value of the lookback provision plus the purchase discount and is recognized as compensation expense over the course of the offering period.

10. Income Taxes

The components of loss before income taxes for the years ended December 31, 2023, 2022 and 2021 (in thousands) were:

	Year Ended December 31,		
	2023	2022	2021
U.S.	$ (151,993)	$ (59,036)	$ (95,542)
Foreign	278	62	—
Total	$ (151,715)	$ (58,974)	$ (95,542)

The components of the income tax expense for the years ended December 31, 2023, 2022 and 2021 (in thousands) were:

	Year Ended December 31,		
	2023	2022	2021
Current:			
Federal	$ —	$ —	$ —
State	342	55	—
Foreign	38	12	—
Total current tax provision	380	67	—
Deferred:			
Federal	—	—	—
State	—	—	—
Foreign	—	—	—
Total deferred tax provision	—	—	—
Total income tax provision	$ 380	$ 67	$ —

The effective income tax rate differed from the amount computed by applying the federal statutory rate to the Company's loss before income taxes as follows:

	Year Ended December 31,		
	2023	2022	2021
Tax effected at statutory rate	21.00 %	21.00 %	21.00 %
State taxes	7.42	7.84	9.31
Equity-based compensation	0.74	(1.02)	5.33
Non-deductible expenses	(2.92)	(3.87)	(0.01)
Federal research and development credits	3.11	6.83	3.34
Change in valuation allowance	(29.60)	(30.89)	(38.97)
	(0.25)%	(0.11)%	— %

Deferred tax assets and liabilities consist of the following at December 31, 2023 and 2022 (in thousands):

	December 31,	
	2023	2022
Deferred tax assets:		
Net operating loss carryforwards	$ 57,348	$ 49,969
Capitalized research and experimental expenditures	48,984	22,147
Research and development credit carryforwards	23,212	17,101
Equity-based compensation	9,740	5,649
Fixed and intangible assets	3,175	3,332
Reserves and accruals	2,467	1,764
Lease liabilities	640	1,049
Deferred revenue	—	128
Total deferred tax assets	145,566	101,139
Valuation allowance	(144,328)	(99,417)
Subtotal	1,238	1,722
Right-of-use assets	(583)	(960)
Fixed assets	(434)	(472)
Prepaid expense	(221)	(290)
Total net deferred tax assets	$ —	$ —

As required by ASC 740, the Company has evaluated the positive and negative evidence bearing upon the realizability of its deferred tax assets, which are composed principally of collaboration revenue that has been recognized as taxable but remains deferred for book reporting as of year end and net operating loss carryfowards. The Company has determined that it is more likely than not that the Company will not realize the benefits of its federal and state deferred tax assets, and, as a result, a valuation allowance of $144.3 million and $99.4 million has been established at each of December 31, 2023 and 2022. The change in the valuation allowance was $44.9 million and $16.7 million for the years ended December 31, 2023 and 2022.

Beginning in 2022, Tax Cuts and Jobs Act ("Tax Act") amended Section 174 and now requires U.S.-based and non-U.S.-based research and experimental ("R&E") expenditures to be capitalized and amortized over a period of five or 15 years, respectively, for amounts paid in tax years starting after December 31, 2021. Prior to the Tax Act amendment, Section 174 allowed taxpayers to immediately deduct R&E expenditures in the year paid or incurred. The Company has applied this required change in accounting method beginning in 2023 and the computation may be adjusted pending future IRS guidance.

The Company has incurred net operating losses ("NOLs") from inception. At December 31, 2023, the Company has federal and state NOL carryforwards of approximately $201.6 million and $237.4 million, respectively, available to reduce future taxable income, with $197.7 million of the federal NOLs having an unlimited carryover life and the remaining federal and the state NOLs beginning to expire in 2037. As of December 31, 2023, the Company also has federal and state research and development tax credit carryforwards of approximately $17.3 million and $7.4 million, respectively, to offset future income taxes, which will begin to expire beginning in December 2032. The Company's NOL carryforwards are subject to review and possible adjustment by the appropriate taxing authorities. The Company continues to review its historic ownership changes to determine if there are any IRC 382 limitations which may limit the annual utilization of the NOLs.

The Company follows the provisions of ASC 740-10, "Accounting for Uncertainty in Income Taxes," which specifies how tax benefits for uncertain tax positions are to be recognized, measured, and recorded in financial statements; requires certain disclosures of uncertain tax matters; specifies how reserves for uncertain tax positions should be classified on the balance sheet; and provides transition and interim period guidance, among other provisions. As of December 31, 2023 and 2022, the Company had no unrecognized tax benefits. The Company has not identified any uncertain positions with respect to the credit computations. The Company's policy is to recognize interest and penalties accrued on any uncertain tax positions as a component of income tax expense, if any, in its statements of operations.

For the years ended December 31, 2023 and 2022, no estimated interest or penalties were recognized on uncertain tax positions. The Company does not expect any significant change in its uncertain tax positions in the next 12 months.

The Company files U.S. federal and state income tax returns and is generally subject to income tax examinations by these authorities for all tax years after December 31, 2020. Currently, no federal or state income tax returns are under examination by the respective income tax authorities.

Provision for Income Taxes

The Company recorded income tax expense of $0.4 million for the year ended December 31, 2023, income tax expense of $0.1 million for the year ended December 31, 2022 and $0.0 million for the year ended December 31, 2021.

Despite the collaboration revenue, the Company continues to maintain a valuation allowance against all deferred tax assets. The Company believes that it is more likely than not that the Company will not realize a future tax benefit of these attributes, as the Company's research programs continue to require significant investment and future revenue is subject to uncertainties. Ultimate realization of any deferred tax asset is dependent on the Company's ability to generate sufficient future taxable income in the appropriate tax jurisdiction before the expiration of carryforward periods, if any.

11. Commitments and Contingencies

Guarantees and Indemnifications

The Company entered, and intends to continue to enter, into separate indemnification agreements with directors, officers, and certain other key employees, in addition to the indemnification provided for in the restated certificate of incorporation and amended and restated bylaws, as amended. These agreements, among other things, require the Company to indemnify directors, officers, and certain other key employees for certain expenses, including attorneys' fees, judgments, penalties, fines, and settlement amounts actually incurred by these individuals in any action or proceeding arising out of their service to the Company or any of its subsidiaries or any other company or enterprise to which these individuals provide services at the Company's request. Subject to certain limitations, the indemnification agreements also require the Company to advance expenses incurred by directors, officers, and key employees for the defense of any action for which indemnification is required or permitted.

The Company has standard indemnification arrangements in its leases for laboratory and office space that require it to indemnify the landlord against any liability for injury, loss, accident, or damage from any claims, actions, proceedings, or costs resulting from certain acts, breaches, violations, or non-performance under the Company's lease.

Through December 31, 2023, the Company had not experienced any losses related to these indemnification obligations, and no material claims were outstanding. The Company does not expect significant claims related to these indemnification obligations and, consequently, concluded that the fair value of these obligations is negligible, and no related reserves were established.

Legal Proceedings

The Company is not currently a party to any material legal proceedings.

12. Option and License Agreements

AbbVie Agreement Overview

In October 2018, the Company entered into a 5-year collaboration and option agreement with AbbVie (the "AbbVie Agreement"), a research-based global biopharmaceutical company that held Series A and Series B Convertible Preferred Shares of the Company at the time the AbbVie Agreement was executed. Pursuant to this agreement, AbbVie paid the Company an upfront, non-refundable amount of $100.0 million. In exchange, the Company: (i) assumed the obligation to perform research and development activities to identify and develop compounds directed at multiple fibrosis indications (grouped into four research programs) through completion of Investigational New Drug (IND)-enabling studies, and (ii) granted AbbVie options to license the results of research and development in exchange for separate upfront option-exercise fees. In June 2022, AbbVie informed the Company that it had decided to exercise its right to terminate the AbbVie Agreement for convenience and the AbbVie Agreement terminated in December 2022.

Prior to the AbbVie Agreement termination, AbbVie held the right to exercise its license options for molecules with the selected pharmacological profiles by providing written notice to the Company and paying an option exercise fee of $20.0 million per option exercised (up to three in total). Effective upon the termination of the AbbVie Agreement, all rights and licenses granted thereunder immediately terminated and were returned to the Company.

AbbVie Agreement Accounting Analysis

The Company concluded that the performance obligations in the agreement had included the research services for the four research programs. The Company has concluded that the unexercised license options were marketing offers as the options did not provide any discounts or other rights that would be considered a material right in the arrangement. All other performance obligations were determined to be immaterial in the context of the contract.

The Company estimated the standalone selling price of each research program based on internal and external costs to perform the research plus a reasonable profit margin of 10%. The total estimated cost of the research and development services reflected the nature of the services to be performed and the Company's best estimate of the length of time required to perform the services. The Company recognized revenue as research and development services were provided based on the costs incurred to date, as such costs have a direct relationship between the Company's effort and the progress made towards satisfying its performance obligations to AbbVie. Changes to the estimated cost of internal and external development services were recognized in the period of change as a cumulative catch-up adjustment. These research and development performance obligations were recognized as revenue and completed through the effective date of the termination in December 2022.

The Company determined that the transaction price included only the non-refundable up-front payment of $100.0 million and recorded this amount as deferred revenue as of December 31, 2018. The option exercise payments were not included in the transaction price, as the Company determined that the agreed upon fees represent fair value of such options. The milestone payments were fully constrained, as a result of the uncertainty regarding whether AbbVie would exercise any of the options and whether any of the associated milestones would be achieved. There were no changes to the transaction price prior to the AbbVie Agreement termination.

The Company also considered the existence of any significant financing component within the AbbVie Agreement given its upfront payment structure. Based upon this assessment, the Company concluded that the up-front payment was provided for valid business reasons and not for the purpose of providing financing. Accordingly, the Company has concluded that the upfront payment structure of the AbbVie Agreement did not result in the existence of a significant financing component.

On August 25, 2020, AbbVie exercised its option to license and control further development and commercialization of Morphic's αvβ6–specific integrin inhibitors for the treatment of fibrotic diseases including idiopathic pulmonary fibrosis (IPF) and additional indications. In connection with the exercise of the option, AbbVie paid the Company $20.0 million. Upon option exercise, the Company evaluated whether the change to the contract should be treated as the continuation of the current arrangement or as a separate agreement. As the additional performance obligations were deemed to be distinct and priced consistent with the standalone selling price of such obligations, the Company concluded that the license and any additional performance obligations should be accounted for as a separate contract. The potential performance obligations included in the arrangement were (1) the license to research, develop and commercialize αvβ6–specific integrin inhibitors, and (2) options to purchase materials that were manufactured prior to option exercise (the "Material Options"). The Company concluded that the Material Options were not material rights as the price to purchase the materials approximated the standalone selling price. Based on this conclusion, the full transaction price of $20.0 million was allocated to the license and recognized upon delivery in 2020. The Company will not receive any additional payments for this program from AbbVie as the license terminated upon termination of the AbbVie Agreement.

Upon receipt of notification of the exercise of the right to terminate the AbbVie Agreement, the Company concluded that there was a contract modification to an existing contract under ASC 606 because the notification of termination of the AbbVie Agreement resulted in a reduction in scope of the Company's responsibilities for the three remaining research programs thereunder. The terms of the AbbVie Agreement termination notification did not include any additional promised goods or services. As a result of the notification from AbbVie, the Company recognized revenue of $57.7 million on a cumulative catch-up basis using an updated measure of progress towards satisfying the research and development services performance obligations thereunder.

Effective upon the termination of the AbbVie Agreement, all rights and licenses granted thereunder immediately terminated and were returned to the Company and no research and development costs were incurred or revenue was recognized in connection with the AbbVie Agreement after the termination.

The following table summarizes research and development costs incurred and revenue recognized in connection with Company's performance under the AbbVie Agreement during the years ended December 31, 2022 and 2021 (in thousands):

	Year Ended December 31,	
	2022	2021
Revenue recognized	$ 60,500	$ 11,197
Costs incurred	$ 631	$ 5,376

Janssen Agreement Overview

In February 2019, the Company entered into a research collaboration and option agreement with Janssen ("Janssen Agreement"), a subsidiary of Johnson & Johnson, to discover and develop novel integrin therapeutics for patients with conditions not adequately addressed by current therapies. The Janssen Agreement focused on three integrin targets, each target the subject of a research program, with a limited ability to substitute integrin targets for others, not explored by the Company, if research results were not favorable. Under the terms of the agreement, Janssen paid the Company an upfront fee of $10.0 million for the first two research programs in 2019 and in December 2020 the Company reached an agreement with Janssen to commence work on the third research program and Janssen agreed to pay $5.0 million for the third research program commencement fee. In addition, Janssen reimbursed the Company for all internal and external costs and expenses incurred during the term of the agreement at agreed-upon contractual rates.

In December 2021, Janssen informed the Company that they had decided not to exercise its options on the first two integrin targets, thus also discontinuing those two research programs. The Company focused its remaining efforts on the third integrin research program which included the potential development of integrin antibody activators.

In January 2023, Janssen informed the Company that it had decided to exercise its right to terminate the Janssen Agreement for convenience and the effective date of the termination of Janssen Agreement was in March 2023.

Janssen Agreement Accounting Analysis

The Company has concluded that the performance obligations in the agreement include the research services for the three research programs and three options to license the outcomes of those research programs, which were determined to provide Janssen with material rights. All other performance obligations were determined to be immaterial in the context of the contract.

The Company estimated the standalone selling price of each research program based on internal and external costs to perform the research plus a reasonable profit margin. The total estimated cost of the research and development services reflect the nature of the services to be performed and the Company's best estimate of the length of time required to perform the services. The Company estimated the standalone selling price of each material right by determining the discount provided to the estimated standalone selling price of comparable options and applying appropriate likelihood of exercise, which includes the appropriate probability of successfully completing the research efforts. Based on the standalone selling prices determined, the Company allocates the total transaction price among the programs and material rights.

The Company recognized revenue as research services were provided based on the costs incurred to date, as such costs had a direct relationship between the Company's effort and the progress made towards satisfying its performance obligations to Janssen. Transaction price allocated to the material rights was deferred and recognized as revenue when Janssen terminated the agreement and the option period expired. Changes in estimates of total internal and external costs expected to be incurred were recognized in the period of change as a cumulative catch-up adjustment.

The Company determined that the transaction price included: the non-refundable up-front payment of $10.0 million for the first two programs, $5.0 million non-refundable up-front payment for the third program, and the estimated reimbursement payments at agreed upon contractual rates that were received from Janssen for the Company's on-going research services. The option exercise payments were not included in the transaction price. The milestone payments were fully constrained, as a result of the uncertainty regarding whether Janssen would exercise any of the options and whether any of the associated milestones would be achieved.

The Company also considered the existence of any significant financing component within the Janssen Agreement given its upfront payment structure. Based upon this assessment, the Company concluded that the up-front payment was provided for valid business reasons and not for the purpose of providing financing. Accordingly, the Company has concluded that the upfront payment structure of the Janssen Agreement does not result in the existence of a significant financing component.

Upon notification of discontinuation of the two research programs and related options, the Company concluded that there was a contract modification to an existing contract under ASC 606 because the December 2021 notification resulted in a reduction in scope of the Company's responsibilities under the Janssen Agreement. The December 2021 notification did not include any additional promised goods and services. Subsequent to the modification, there were two remaining performance obligations pursuant to the Janssen Agreement, research services for the remaining research program and a material right for Janssen's remaining license option. The Company concluded that the remaining research services to be provided to satisfy the third research program were not distinct from its existing research services, and as a result treated the modification as part of the original contract (as opposed to a separate contract). Therefore, the Company updated the transaction price, which included the remaining deferred revenue and estimated variable consideration for research services and allocated the updated transaction price to the remaining performance obligations based on the estimated standalone selling prices at the date of the contract modification.

For the research services, the effect that the contract modification had on the transaction price and the measure of progress towards satisfying the performance obligation of $1.9 million has been recognized on a cumulative catch-up basis. The transaction price allocated to the remaining material right of $0.5 million was deferred and was recognized upon expiration of the option period. The accounting for any previously satisfied performance obligations as of the contract modification date are not affected by the modification.

Upon notification of termination for convenience of the Janssen Agreement in January 2023, certain remaining research and development performance obligations under the Janssen Agreement were completed, including the termination of the third integrin research program thereunder, through the effective date of the termination in March 2023. In March 2023, the Company recognized the remaining deferred revenue allocated to the material right upon expiration of the Janssen license option.

The following table summarizes research and development costs incurred and revenue recognized in connection with the Company's performance under the Janssen Agreement during the years ended December 31, 2023, 2022 and 2021 (in thousands):

	Year Ended December 31,		
	2023	2022	2021
Reimbursement revenue	$ 51	$ 3,159	$ 4,944
Upfront payment revenue	470	7,149	3,653
Total revenue recognized	$ 521	$ 10,308	$ 8,597
Costs incurred	$ 51	$ 2,637	$ 4,426

In Q4 2022, the Company recognized additional revenue of $3.0 million on a cumulative catch-up basis as a result of changes to the estimated costs associated with the remaining effort required to complete the research services for the third research program. The amount of future expected cost estimates had decreased based on a change in expected effort and based on the timing of the research services.

As of December 31, 2022, the Company had $0.5 million due from Janssen recorded in accounts receivable. As of December 31, 2022, $0.5 million of deferred revenue was classified as current in the accompanying consolidated balance sheets based on the period over which the revenue was expected to be recognized.

As of December 31, 2023 the Company had no remaining deferred revenue related to the Janssen Agreement, as all of the performance obligations thereunder were satisfied as of the effective date of the termination.

13. Net Loss per Share

Basic net loss per share is calculated by dividing net loss allocable to common stockholders by the weighted-average common shares outstanding during the period, without consideration of common stock equivalents.

For periods with net income, diluted net income per share is calculated by adjusting the weighted-average shares outstanding for the dilutive effect of common share equivalents, including stock options, restricted stock units, and restricted common stock outstanding for the period as determined using the treasury stock method.

For purposes of the diluted net loss per share calculation, common share equivalents are excluded from the calculation if their effect would be anti-dilutive. As such, basic and diluted net loss per share applicable to common stockholders are the same for periods with a net loss.

The following tables illustrate the determination of basic and diluted net loss per share for each period presented (in thousands, except share and per share data):

	Year Ended December 31,		
	2023	2022	2021
Net loss	$ (152,095)	$ (59,041)	$ (95,542)
Weighted average common shares outstanding, basic and diluted	42,390,554	38,112,498	35,797,969
Net loss per share, basic and diluted	$ (3.59)	$ (1.55)	$ (2.67)

In February 2023, the Company sold and issued the Pre-Funded Warrants (see Note 8). The shares of common stock into which the Pre-Funded Warrants may be exercised are considered outstanding from the date of issuance of the Pre-Funded Warrants for the purposes of computing basic loss per share because the shares may be issued for little or no consideration and because the Pre-Funded Warrants were fully vested and immediately exercisable upon issuance.

The following table sets forth the outstanding common stock equivalents, presented based on amounts outstanding at each period end, that have been excluded from the calculation of diluted net loss per share for the periods indicated because their inclusion would have been anti-dilutive (in common stock equivalent shares, as applicable):

	Year Ended December 31,		
	2023	2022	2021
Restricted stock units	1,110,295	249,090	7,000
Stock options	5,887,257	5,263,553	4,781,565
Restricted common stock	—	—	2,171
	6,997,552	5,512,643	4,790,736

In addition to the securities listed in the table above, as of December 31, 2023 the Company had reserved 1,493,422 shares of common stock for sale under the ESPP, which, if issued, would be anti-dilutive if included in calculation of diluted net loss per share for the year ended December 31, 2023.

14. Employee Benefit Plan

In 2016, the Company adopted a qualified retirement plan, the Morphic Therapeutic, Inc. 401(k) Plan to provide retirement income for eligible employees through employee contributions and employer matching contributions. Matching contributions totaled $1.2 million, $0.6 million and $0.6 million for the years ended December 31, 2023, 2022 and 2021, respectively.

Item 9. ***Changes In And Disagreements With Accountants on Accounting and Financial Disclosure***

Item 9A. ***Controls and Procedures***

(a) Effectiveness of Disclosure Controls and Procedures

We conducted an evaluation as of December 31, 2023 under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer (our principal executive officer and principal financial officer, respectively), and concluded that our disclosure controls and procedures (as defined in Rule 13a-15(e) or Rule 15d-15(e) under the Securities Exchange Act of 1934, as amended, the "Exchange Act") were effective as of December 31, 2023 and designed to ensure that the information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms and that it is accumulated and communicated to our management, including our principal executive officer and principal financial officer, to allow timely decisions regarding required disclosure.

(b) Inherent Limitations on Effectiveness of Controls

Our management, including the principal executive officer and principal financial officer, does not expect that our internal control over financial reporting or our internal controls will prevent or detect all errors and all fraud. A control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. The design of any system of controls is based in part on certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions.

(c) Management's Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting. Under the supervision of the principal executive officer and principal financial officer, management conducted an assessment of the effectiveness of our internal control over financial reporting as of December 31, 2023 based on the framework in Internal Control - Integrated Framework (2013) published by the Committee of Sponsoring Organizations of the Treadway Commission. As a result of this assessment, management concluded that our internal control over financial reporting was effective as of December 31, 2023. The effectiveness of our internal control over financial reporting as of December 31, 2023 has been audited by Ernst & Young LLP, an independent registered public accounting firm, as stated in its report.

(d) Changes in Internal Control Over Financial Reporting

There have been no changes in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the quarter ended December 31, 2023 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Report of Independent Registered Public Accounting Firm

To the Shareholders and the Board of Directors of Morphic Holding, Inc.

Opinion on Internal Control Over Financial Reporting

We have audited Morphic Holding, Inc.'s internal control over financial reporting as of December 31, 2023, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). In our opinion, Morphic Holding, Inc. (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2023, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2023 and 2022, the related consolidated statements of operations and comprehensive loss, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2023, and the related notes and our report dated February 22, 2024 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Annual Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the 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 audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Ernst & Young LLP

Boston, Massachusetts
February 22, 2024

Item 9B. ***Other Information***

During the fourth quarter of the year ended December 31, 2023, except as noted below none the Company's directors or executive officers adopted a Rule 10b5-1 trading plan, terminated a Rule 10b5-1 trading plan or adopted or terminated a non-Rule 10b5-1 trading arrangement (as defined in Item 408(c) of Regulation S-K).

On December 27, 2023, Praveen P. Tipirneni, M.D., the Chief Executive Officer and a Director of the Company, adopted a trading arrangement for the sale of shares of the Company's common stock that is intended to satisfy the affirmative defense conditions of Securities Exchange Act Rule 10b5-1(c) (the "Tipirneni Plan"). The Tipirneni Plan, which is scheduled to expire on April 28, 2025, provides for the sale of up to 149,492 shares of common stock pursuant to the terms thereof.

On December 28, 2023, William D. DeVaul, Esq., the General Counsel and Secretary of the Company, terminated an existing trading arrangement for the sale of securities of the Company's common stock that he had previously adopted (the "Terminated DeVaul Plan") and adopted a trading arrangement for the sale of shares of the Company's common stock that is intended to satisfy the affirmative defense conditions of Securities Exchange Act Rule 10b5-1(c) (the "New DeVaul Plan"). The Terminated DeVaul Plan was adopted on September 30, 2022, was set to expire on March 29, 2024 and provided for the sale of up to 234,132 shares of common stock pursuant to the terms thereof. As of the date of termination of the Terminated DeVaul Plan, Mr. DeVaul had sold 11,658 shares of common stock thereunder. The New DeVaul Plan, which is scheduled to expire on March 28, 2025, provides for the sale of up to 200,950 shares of common stock pursuant to the terms thereof.

On February 17, 2024, the Company adopted the Morphic Holding, Inc. 2024 Equity Inducement Plan (the "Inducement Plan"), pursuant to which the Company reserved 500,000 shares of its common stock to be used exclusively for grants of awards to individuals who were not previously employees or directors of the Company, as an inducement material to the individual's entry into employment with the Company within the meaning of Rule 5635(c)(4) of the Nasdaq Listing Rules. The Inducement Plan was approved by the Company's Board of Directors without stockholder approval in accordance with such rule.

The foregoing description of the Inducement Plan is not complete and is qualified in its entirety by reference to the full text of the Inducement Plan, a copy of which is attached hereto as Exhibit 10.18 and is incorporated herein by reference.

Item 9C. ***Disclosures Regarding Foreign Jurisdictions That Prevent Inspections***

Not applicable.

PART III

Item 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE.

The information required by Item 10 will be included in our definitive proxy statement relating to our 2024 Annual Meeting of Stockholders, to be filed no later than 120 days after December 31, 2023, and is incorporated herein by reference.

Item 11. EXECUTIVE COMPENSATION.

The information required by Item 11 will be included in our definitive proxy statement relating to our 2024 Annual Meeting of Stockholders, to be filed no later than 120 days after December 31, 2023, and is incorporated herein by reference.

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

The information required by Item 12 will be included in our definitive proxy statement relating to our 2024 Annual Meeting of Stockholders, to be filed no later than 120 days after December 31, 2023, and is incorporated herein by reference.

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

The information required by Item 13 will be included in our definitive proxy statement relating to our 2024 Annual Meeting of Stockholders, to be filed no later than 120 days after December 31, 2023, and is incorporated herein by reference.

Item 14. PRINCIPAL ACCOUNTING FEES AND SERVICES.

The information required by Item 14 will be included in our definitive proxy statement relating to our 2024 Annual Meeting of Stockholders, to be filed no later than 120 days after December 31, 2023, and is incorporated herein by reference.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(1) Financial Statements:

Our consolidated financial statements are set forth in Part II, Item 8 of this Annual Report on Form 10-K and are incorporated herein by reference.

(2) Financial Statement Schedules:

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

(3) Exhibits

The exhibits filed as part of this Annual Report on Form 10-K are listed below.

Furnish the exhibits required by Item 601 of Regulation S-K (§ 229.601 of this chapter).

Exhibit Number	Description	Form	File No.	Exhibit	Exhibit Filing Date	Filed/Furnished Herewith
3.1	Restated Certificate of Incorporation, as amended	10-Q	001-38940	3.1	August 3, 2023	
3.2	Amended and Restated Bylaws	8-K	001-38940	3.1	February 13, 2023	
4.1	Form of Common Stock Certificate	S-1/A	333-231837	4.1	June 14, 2020	
4.2	Investors' Rights Agreement, dated December 5, 2018, by and among the Registrant and certain of its stockholders.	S-1/A	333-231837	4.2	June 14, 2020	
4.3	Description of Registrant's Securities Registered under Section 12 of the Securities Exchange Act of 1934, as amended	10-K	001-38940	4.3	March 1, 2021	
4.4	Form of Debt Security	S-3	333-258435	4.3	August 4, 2021	
4.5	Form of Indenture	S-3	333-258435	4.4	August 4, 2021	
4.6	Form of Pre-Funded Warrant	8-K	001-38940	4.1	February 13, 2023	
10.1*	Form of Indemnity Agreement.	S-1/A	333-231837	10.1	June 14, 2020	
10.2*	2018 Stock Incentive Plan and forms of award agreements	S-1/A	333-231837	10.2	June 14, 2020	
10.3*	Amended and Restated 2019 Equity Incentive Plan	10-Q	001-38940	10.1	August 3, 2022	
10.4*	Form of Stock Option Award Agreement (Included in the 2019 Equity Incentive Plan)	S-1/A	333-231837	10.3	June 14, 2020	
10.5*	Form of Restricted Stock Award Agreement (Included in the 2019 Equity Incentive Plan)	S-1/A	333-231837	10.3	June 14, 2020	
10.6*	2019 Employee Stock Purchase Plan and forms of award agreements	S-1/A	333-231837	10.4	June 14, 2020	
10.7*	Offer Letter, dated June 10, 2019, by and between the Registrant and Praveen P. Tipirneni, MD	S-1/A	333-231837	10.5	June 14, 2020	
10.8*	Offer Letter, dated June 10, 2019, by and between the Registrant and Bruce N. Rogers, Ph.D.	S-1/A	333-231837	10.6	June 14, 2020	

10.9*	Offer Letter, dated June 10, 2019, by and between the Registrant and William DeVaul	10-K	001-38940	10.7	February 27, 2021	
10.10	Lease, dated August 5, 2015, by and between the Registrant and AstraZeneca Pharmaceuticals Limited Partnership, as amended.	S-1/A	333-231837	10.9	June 14, 2020	
10.11†	Collaboration Agreement, dated June 10, 2015, by and between Morphic Rock Therapeutic, Inc. and Schrödinger, LLC, as amended.	S-1/A	333-231837	10.12	June 14, 2020	
10.12†	Exclusive License Agreement, dated October 7, 2015, by and between Children's Medical Center Corporation and the Registrant, as amended.	S-1/A	333-231837	10.13	June 14, 2020	
10.13	Form of Stock Restriction Agreement	S-1/A	333-231837	10.17	June 14, 2020	
10.14*	Offer Letter, dated February 3, 2020, by and between Marc Schegerin, and Morphic Holding, Inc.	10-Q	001-38940	10.1	August 10, 2020	
10.15	Fifth Amendment of Lease, dated August 17, 2021, by and between the Registrant and AstraZeneca Pharmaceuticals Limited Partnership	10-Q	001-38940	10.1	November 4, 2021	
10.16	Form of Change in Control and Severance Agreement	10-K	001-38940	10.19	February 24, 2022	
10.17	Registration Rights Agreement, dated February 13, 2023, by and among Morphic Holding, Inc. and the investors listed on the signature pages thereto	8-K	001-38940	10.2	February 13, 2023	
10.18	2024 Equity Inducement Plan					X
10.19	2024 Equity Inducement Plan Form of Stock Option Award Agreement					X
10.20	2024 Equity Inducement Plan Form of Restricted Stock Award Agreement					X
21.1	Subsidiaries of the Registrant.					X
23.1	Consent of Independent Registered Public Accounting Firm.					X
24.1	Powers of Attorney. Reference is made to the signature page hereto.					X
31.1	Certification of Principal Executive Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.					X
31.2	Certification of Principal Financial Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.					X
32.1**	Certification of Principal Executive Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.					X
32.2**	Certification of Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002					X
97.1	Compensation Recovery Policy					X
101.INS	Inline XBRL Instance Document					X

101.SCH	Inline XBRL Taxonomy Extension Schema Document	X
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document	X
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document	X
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document	X
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document	X
104	Cover Page Interactive Data File (embedded within the Inline XBRL)	X

*Executive compensation plan or agreement.
**The certifications furnished in Exhibits 32.1 and 32.2 hereto are deemed to accompany this Form 10-K and are not deemed "filed" for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section, nor shall they be deemed incorporated by reference into any filing under the Securities Act or the Exchange Act.
†Registrant has omitted portions of the exhibit as permitted under Item 601(b)(10) of Regulation S-K.

Item 16. Form 10-K Summary

None.

SIGNATURES

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

MORPHIC HOLDING, INC.

February 22, 2024

By: /s/ Praveen P. Tipirneni

Praveen P. Tipirneni, M.D.

Chief Executive Officer and Director
(Principal Executive Officer)

February 22, 2024

By: /s/ Marc Schegerin

Marc Schegerin, M.D.

Chief Financial Officer and Chief Operating Officer
(Principal Financial Officer)

February 22, 2024

By: /s/ Robert E. Farrell, Jr.

Robert E. Farrell, Jr. CPA

Chief Accounting Officer and Assistant Treasurer
(Principal Accounting Officer)

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below hereby constitutes and appoints Praveen P. Tipirneni and William D. DeVaul, and each of them, with full power of substitution and resubstitution and full power to act without the other, as his or her true and lawful attorney-in-fact and agent to act in his or her name, place and stead and to execute in the name and on behalf of each person, individually and in each capacity stated below, and to file any and all amendments to this Annual Report on Form 10-K and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing, ratifying and confirming all that said attorneys-in-fact and agents or any of them or their or his substitute or substitutes may lawfully do or cause to be done by virtue thereof.

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

Signature	Title	Date
/s/ Praveen P. Tipirneni Praveen P. Tipirneni, M.D.	Chief Executive Officer and Director (Principal Executive Officer)	February 22, 2024
/s/ Marc Schegerin Marc Schegerin, M.D.	Chief Financial Officer and Chief Operating Officer (Principal Financial Officer)	February 22, 2024
/s/ Robert E. Farrell, Jr. Robert E. Farrell, Jr., CPA	Chief Accounting Officer and Assistant Treasurer (Principal Accounting Officer)	February 22, 2024
/s/ Norbert Bischofberger Norbert Bischofberger, Ph.D.	Director	February 22, 2024
/s/ Gustav Christensen Gustav Christensen	Director	February 22, 2024
/s/ Martin Edwards Martin Edwards	Director	February 22, 2024
/s/ Susannah Gray Susannah Gray	Director	February 22, 2024
/s/ Nisha Nanda Nisha Nanda, Ph.D.	Director	February 22, 2024
/s/ Amir Nashat Amir Nashat	Director	February 22, 2024
/s/ Joseph P. Slattery Joseph P. Slattery, CPA	Director	February 22, 2024
/s/ Timothy A. Springer Timothy A. Springer, Ph.D.	Director	February 22, 2024