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Registration No. 333-275997

PROSPECTUS

2,743,530 Shares of Common Stock

This prospectus relates to the resale by the selling stockholders (the "Selling Stockholders") identified in this prospectus under the section "*The Selling Stockholders*," of up to 2,743,530 shares of our common stock, par value $0.0001 per share ("Common Stock"), issuable upon the exercise of certain warrants held by the Selling Stockholders (including shares that may be issued to the holder in lieu of fractional shares). We are registering the offer and sale of Common Stock on behalf of the Selling Stockholders to satisfy certain registration rights that we have granted to the Selling Stockholders.

The Selling Stockholders may resell or dispose of the Common Stock, or interests therein, at fixed prices, at prevailing market prices at the time of sale or at prices negotiated with purchasers, to or through underwriters, broker-dealers, agents, or through any other means described in the section of this prospectus titled "*Plan of Distribution*." The Selling Stockholders will bear commissions and discounts, if any, attributable to the sale or disposition of the Common Stock, or interests therein, held by the Selling Stockholders. We will bear all costs, expenses and fees in connection with the registration of the offer and sale of the Common Stock under the Securities Act of 1933, as amended (the "Securities Act"). We will not receive any of the proceeds from the sale of the Common Stock by the Selling Stockholders.

Our Common Stock is listed on the Nasdaq Capital Market under the symbol "MBIO." On April 26, 2024, the last reported sale price of our Common Stock was $0.32 per share. You are urged to obtain current market quotations for our Common Stock.

Investing in our securities involves risks. You should review carefully the risks and uncertainties described under the heading "*Risk Factors*" contained in this prospectus and under similar headings in the other documents that are incorporated by reference into this prospectus, as described on page 9 of this prospectus.

Neither the Securities and Exchange Commission (the "SEC") nor any state securities commission has approved or disapproved of these securities or passed upon the accuracy or adequacy of this prospectus. Any representation to the contrary is a criminal offense.

The date of this prospectus is April 29, 2024.

TABLE OF CONTENTS

	Page
ABOUT THIS PROSPECTUS	1
PROSPECTUS SUMMARY	1
THE OFFERING	14
CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS	15
RISK FACTORS	16
DIVIDEND POLICY	17
USE OF PROCEEDS	17
DETERMINATION OF OFFERING PRICE	17
THE SELLING STOCKHOLDERS	18
PLAN OF DISTRIBUTION	20
DESCRIPTION OF CAPITAL STOCK	21
LEGAL MATTERS	23
EXPERTS	23
WHERE YOU CAN FIND MORE INFORMATION	24
INCORPORATION OF CERTAIN INFORMATION BY REFERENCE	24

ABOUT THIS PROSPECTUS

This prospectus provides you with a general description of the Common Stock that may be resold by the Selling Stockholders. In certain circumstances, we may provide a prospectus supplement that will contain specific information about the terms of a particular offering by the Selling Stockholders. We also may provide a prospectus supplement to add information to, or update or change information contained in, this prospectus. To the extent there is a conflict between the information contained in this prospectus and any prospectus supplement, you should rely on the information in the prospectus supplement, provided that if any statement in one of these documents is inconsistent with a statement in another document having a later date — for example, a document incorporated by reference in this prospectus or any prospectus supplement — the statement in the later-dated document modifies or supersedes the earlier statement.

This prospectus and the documents incorporated by reference into this prospectus include important information about us, the securities being offered and other information you should know before investing in our securities. You should not assume that the information contained in this prospectus is accurate on any date subsequent to the date set forth on the front cover of this prospectus or that any information we have incorporated by reference is correct on any date subsequent to the date of the document incorporated by reference, even though this prospectus is delivered or securities are sold or otherwise disposed of on a later date. It is important for you to read and consider all information contained in this prospectus, including the documents incorporated by reference therein, in making your investment decision. You should also read and consider the information in the documents to which we have referred you under "*Where You Can Find More Information*" and "*Incorporation of Certain Information by Reference*" in this prospectus.

We have not authorized anyone to give any information or to make any representation to you other than those contained or incorporated by reference in this

prospectus. We take no responsibility for, and can provide no assurances as the reliability of, any other information that others may give to you. This prospectus does not constitute an offer to sell or the solicitation of an offer to buy securities in any jurisdiction to any person to whom it is unlawful to make such offer or solicitation in such jurisdiction.

For investors outside the United States: we have not done anything that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons outside the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of our securities and the distribution of this prospectus outside the United States.

This prospectus contains summaries of certain provisions contained in some of the documents described herein, but reference is made to the actual documents for complete information. All of the summaries are qualified in their entirety by the actual documents. Copies of the documents referred to herein have been filed, will be filed or will be incorporated by reference as exhibits to the registration statement of which this prospectus is a part, and you may obtain copies of those documents as described in this prospectus under "*Where You Can Find More Information*."

PROSPECTUS SUMMARY

This summary highlights selected information from this prospectus and does not contain all of the information that may be important to you in making an investment decision. This summary is qualified in its entirety by the more detailed information included elsewhere in this prospectus and/or incorporated by reference herein. Before making your investment decision with respect to our securities, you should carefully read this entire prospectus, including the information in our filings with the SEC incorporated by reference into this prospectus.

References in this prospectus to the "Company," "we," "us," "our" and similar words refer to Mustang Bio, Inc.

Our Business

Overview and Product Candidate Development

We are a clinical-stage biopharmaceutical company focused on translating today's medical breakthroughs in cell and gene therapies into potential cures for hematologic cancers, solid tumors and rare genetic diseases. We aim to acquire rights to these technologies by licensing or otherwise acquiring an ownership interest in the technologies, funding their research and development and eventually either out-licensing or bringing the technologies to market.

Our pipeline is currently focused in two core areas: CAR T therapies for hematologic malignancies and CAR T therapies for solid tumors. For these therapies we have partnered with world class research institutions, including the City of Hope National Medical Center ("COH" or "City of Hope"), Fred Hutchinson Cancer Center ("Fred Hutch"), Nationwide Children's Hospital ("Nationwide") and the Mayo Foundation for Medical Education and Research ("Mayo Clinic").

CAR T Therapies

Our pipeline of CAR T therapies is being developed under exclusive licenses from several world class research institutions. Our strategy is to license these technologies, support preclinical and clinical research activities by our partners and transfer the underlying technology to our or our contract manufacturer's cell processing facility in order to conduct our own clinical trials.

We are developing CAR T therapy for hematologic malignancies in partnership with Fred Hutch targeting CD20 (MB-106). In May 2021, we announced that the U.S. Food and Drug Administration ("FDA") accepted our Investigational New Drug ("IND") Application for MB-106. As of December 2023, approximately 40 patients have been treated in an ongoing phase 1 clinical trial sponsored by Fred Hutch (ClinicalTrials.gov Identifier: NCT03277729), and approximately 20 patients have been treated in an ongoing phase 1 clinical trial sponsored by us (ClinicalTrials.gov Identifier: NCT05360238). In 2023, we received Safety Review Committee approval to continue dose escalation in all three active arms of the ongoing Mustang-sponsored phase 1 trial. We presented the latest results, demonstrating a favorable safety profile, complete response rate, and durability, from the ongoing Mustang-sponsored phase 1 trial at the 2023 American Society of Hematology ("ASH") Annual Meeting. As of December 31, 2023, the MB-106 Mustang-sponsored phase 1 trial is pending one patient to complete the final dose level required to advance to phase 2 pivotal studies for treatment of patients with relapsed or refractory indolent B-cell non-Hodgkin lymphoma.

We are also developing CAR T therapy for solid tumors in partnership with COH targeting IL13Rα2 (MB-101). In addition, we have partnered with Nationwide for a herpes simplex virus type 1 ("HSV-1") oncolytic virus (MB-108) in order to enhance the activity of MB-101 for the treatment of patients with high-grade malignant brain tumors. The Phase 1 clinical trial sponsored by COH for MB-101 (ClinicalTrials.gov Identifier: NCT02208362) has completed the treatment phase and patients continue to be assessed for long-term safety. A Phase 1 clinical trial sponsored by the University of Alabama at Birmingham ("UAB") for MB-108 (ClinicalTrials.gov Identifier: NCT03657576) began during the third quarter of 2019. In October 2023, we announced that the FDA accepted our IND application for the combination of MB-101 and MB-108 – which is referred to as MB-109 – for the treatment of patients with *IL13Rα2*+relapsed or refractory glioblastoma ("GBM") and high-grade astrocytoma.

Finally, we are collaborating with the Mayo Clinic to develop a novel technology that may be able to transform the administration of CAR T therapies and potentially be used as an off-the-shelf therapy. We are evaluating plans to file an IND application for a multicenter Phase 1 clinical trial once a lead construct has been identified, subject to allocation of resources.

On May 18, 2023, we announced a series of changes resulting from a review of our portfolio of product candidates to determine the future strategy of our programs and the proper allocation of our resources. Following this review, we determined to discontinue development of our MB-102 (CD123), MB-103 (HER2), MB-104 (CS1) and MB-105 (PSCA) programs, all of which were CAR T therapies being developed in partnership with City of Hope.

Terminated Gene Therapy Product Candidates

We formerly developed several gene therapy product candidates, which included MB-117 and MB-217 (based on technologies licensed from St. Jude Children's Research Hospital ("St. Jude")) and MB-110 (based on technologies licensed from Leiden University Medical Centre ("LUMC")). In April 2024, we entered into a termination and release agreement with St. Jude, pursuant to which we agreed to terminate the license agreement underpinning the MB-117 and MB-217 product candidates in exchange for a mutual release of liability and forgiveness by St. Jude of all amounts previously owing to them. Also in April 2024, we delivered a termination notice to LUMC pursuant to which we terminated the license agreement underpinning the MB-110 product candidate; we are currently in discussions with LUMC regarding the terms that will govern such termination.

To date, we have not received approval for the sale of any of our product candidates in any market and, therefore, have not generated any product sales from our product candidates. In addition, we have incurred substantial operating losses since our inception, and expect to continue to incur significant operating losses for the foreseeable future and may never become profitable. As of December 31, 2023, we have an accumulated deficit of $381.0 million.

Therapeutic Pipeline

Therapies for Oncology and Hematologic Malignancies

MB - 106 (CD20 CAR T for B cell non-Hodgkin lymphoma (NHL) and chronic lymphocytic leukemia (CLL))

We believe CD20 is a promising target for immunotherapy of B-cell malignancies. CD20 is a B-cell lineage-specific phosphoprotein that is expressed in high, homogeneous density on the surface of more than 95% of B-cell NHL and CLL. CD20 is stable on the cell surface with minimal shedding, internalization, or modulation upon antibody binding and is present at only nanomolar levels as a soluble antigen. It is well established as an effective immunotherapy target, with extensive studies demonstrating improved tumor responses and survival of B-NHL patients treated with rituximab and other anti-CD20 antibodies. Importantly, CD20 continues to be expressed on the lymphoma cells of most patients with relapsed B-NHL despite repetitive rituximab treatments, and loss of CD20 expression is not a major contributor to treatment resistance. Thus, there is strong rationale for testing CD20 CAR T cells as an immunotherapy for NHL.

More than 80,000 new cases of NHL are diagnosed each year in the United States, and over 20,000 patients die of this group of diseases annually. Most forms of NHL, including follicular lymphoma, mantle cell lymphoma, marginal zone lymphoma, lymphoplasmacytic lymphoma, and small lymphocytic lymphoma ("SLL"), which account collectively for approximately 45% of all cases of NHL, are incurable with available therapies, except for allogenic stem cell transplant ("allo-SCT"). However, many NHL patients are not suitable candidates for allo-SCT, and this treatment is also limited by significant rates of morbidity and mortality due to graft-versus-host disease. Aggressive B-cell lymphomas such as diffuse large B-cell lymphoma, the most common subtype of lymphoma, account for an additional 30-35% of NHL. The majority of patients with aggressive B-NHL are successfully treated with combination chemotherapy, but a significant proportion relapse or have refractory disease, and the outcome of these patients is poor. Innovative new treatments are therefore urgently needed.

Chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL) is a mature B cell neoplasm characterized by a progressive accumulation of monoclonal B lymphocytes. CLL is considered to be identical (i.e., one disease with different manifestations) to the NHL SLL. The malignant cells seen in CLL and SLL have identical pathologic and immunophenotypic features. The term CLL is used when the disease manifests primarily in the blood, whereas the term SLL is used when involvement is primarily nodal.

CLL is the most common leukemia in adults in Western countries, accounting for approximately 25 to 35 percent of all leukemias in the United States. An estimated 20,700 new cases of CLL will be diagnosed in the United States in 2024. CLL is considered to be mainly a disease afflicting older adults, with a median age at diagnosis of approximately 70 years; however, it is not unusual to make this diagnosis in younger individuals (e.g., from approximately 30 to 39 years of age). The incidence increases rapidly with increasing age. The natural history of CLL is extremely variable, with survival times from initial diagnosis that range from approximately 2 to 20 years, and a median survival of approximately 10 years.

Most patients will have a complete or partial response to initial therapy. However, conventional therapy for CLL is not curative and most patients experience relapse. In addition, many patients will require a change in therapy due to intolerance. Since patients with CLL are generally elderly with a median age older than 70 years, and due to the relatively benign course of the disease in the majority of patients, only selected patients are candidates for intensive treatments such as allo-SCT. Innovative new treatments with a favorable safety profile are therefore urgently needed for patients with relapsed and refractory disease.

Under their IND, Fred Hutch is currently conducting a Phase 1/2 clinical study to evaluate the anti-tumor activity and safety of administering CD20-directed third-generation CAR T cells incorporating both 4-1BB and CD28 co-stimulatory signaling domains (MB-106) to patients with relapsed or refractory B-cell NHL or CLL (ClinicalTrials.gov Identifier: NCT03277729). Secondary endpoints of this study include safety and toxicity, preliminary antitumor activity as measured by overall response rate and complete remission rate, progression-free survival, and overall survival. The study is also assessing CAR T cell persistence and the potential immunogenicity of the cells. Finally, this study was designed so that, together with Fred Hutch, we could determine a recommended Phase 2 dose. Fred Hutch intends to enroll approximately 50 subjects in this study, which is being led by the Principal Investigator Mazyar Shadman, M.D., M.P.H., Associate Professor of Fred Hutch's Clinical Research Division.

The Fred Hutch IND was amended in 2019 to incorporate an optimized manufacturing process that had been developed in collaboration with us.

In May 2021, we announced that the FDA issued a safe to proceed letter for our IND application allowing for initiation of a multi-center Phase 1/2 clinical study of MB-106 in patients with relapsed or refractory B cell NHL or CLL (Clinicaltrials.gov Identifier: NCT05360238). In August 2022, the first patient was treated in our study.

In November 2021, Mustang was awarded a grant of approximately $2.0 million from NCI of the National Institutes of Health. This two-year award partially funded the Mustang-sponsored multicenter trial to assess the safety, tolerability and efficacy of MB-106. In August 2023, we fully utilized the grant.

In June 2022, MB-106 received Orphan Drug Designation for the treatment of Waldenstrom macroglobulinemia ("WM").

In December 2023, we presented preliminary clinical data for the indolent lymphoma patients treated in the ongoing Phase 1/2 clinical study at the American Society of Hematology (ASH) annual meeting. All 9 patients responded clinically to treatment; the observed overall response rate was 100%. All 5 follicular lymphoma patients achieved a complete response. Among the WM patients 1 patient attained a very good partial response, and 2 patients attained a partial response. The single patient with a hairy cell leukemia variant experienced stable disease. The safety profile demonstrated that MB-106 was well tolerated with no occurrences of cytokine release syndrome ("CRS") above grade 1, and no immune effector cell-associated neurotoxicity syndrome ("ICANS") of any grade was reported. Cell expansion and persistence were also demonstrated.

In the first quarter of 2024, we completed a successful End-of-Phase 1 meeting with the FDA regarding a potential pivotal Phase 2 single-arm clinical trial for the treatment of WM. Per the discussions, the FDA agreed with the proposed overall design of the pivotal trial for WM at the recommended dose of 1 x 107 CAR-T cells/kg and requested only minimal modifications to the study protocol. No additional nonclinical studies are expected prior to Phase 2 or a Biologics License Application ("BLA") filing. Due to limited resources, and as a result of the reduction in force described below, we do not expect to initiate our pivotal Phase 2 single-arm clinical trial of MB-106 for the treatment of WM trial in 2024. Subject to available funds, we intend to rely on third party service providers to conduct study and manufacturing services to advance our priority potential product candidates.

Also in the first quarter of 2024, we completed enrollment of the indolent lymphoma arm in our multicenter Phase 1 trial. The tenth and final patient enrolled was a patient with follicular lymphoma (FL) who achieved a complete response following treatment with 1×10^7 CAR-T cells/kg. As a result, the overall complete response rate for FL in the Phase 1 portion of this trial was sustained at 100% (N=6), with no occurrence of CRS above grade 1 and no ICANS of any grade, despite not using prophylactic tocilizumab or dexamethasone.

In March 2024, we announced plans to collaborate with Fred Hutch for a proof-of-concept Phase 1 investigator-sponsored clinical trial evaluating MB-106 in autoimmune diseases.

In March 2024, we were granted the Regenerative Medicine Advanced Therapy ("RMAT") designation by the FDA for the treatment of relapsed or refractory CD20 positive WM and FL, based on potential improvement in response as seen in clinical data-to-date. Drugs eligible for RMAT designation are those intended to treat, modify, reverse or cure a serious or life-threatening disease or condition, and that present preliminary clinical evidence indicating the drug has the potential to address unmet medical needs for such disease or condition. RMAT designation provides regenerative medicine advanced therapy products with the same benefits to expedite the development and review of a marketing application that are available to drugs that receive Breakthrough Therapy Designation. These advantages include timely advice and interactive communications with FDA, as well as proactive and collaborative involvement by senior FDA managers and experienced review and regulatory health project management staff. A product designated as an RMAT also may be eligible for other FDA-expedited programs, such as Priority Review. The FDA also may conduct a rolling review of products in its expedited programs, reviewing portions of a marketing application before the complete application is submitted.

MB-109: Combination MB-101(IL13Rα2 CAR T Cell Program for Glioblastoma) and MB-108 (HSV-1 oncolytic virus C134) as a Potential Treatment for IL13Rα2+ Relapsed or Refractory Glioblastoma (GBM) and High-Grade Astrocytoma

An attractive novel approach to control glioblastoma is adoptive cellular immunotherapy utilizing CAR T cells. CAR T cells can be engineered to recognize very specific antigenically distinct tumor populations and to migrate through the brain parenchyma to kill malignant cells. In addition, oncolytic viruses ("OVs") have been developed to effectively infect and kill cancer cells in the tumor, as well as modify the microenvironment to increase tumor immunogenicity and immune cell trafficking within the tumor. Due to these properties, OVs have been studied in combination with other treatments to enhance the effectiveness of immunotherapies.

Preliminary anti-tumor activity has been observed in clinical studies administering the OV (MB-108) and CAR T cell therapy (MB-101) as single agents; however, the combination has not yet been explored. To determine if the combination of both therapies will result in a synergistic effect, investigators from COH developed preclinical studies in orthotopic GBM models in nude mice. Dr. Christine Brown from City of Hope presented these preclinical studies at the American Association for Cancer Research 2022 Annual Meeting. It was observed that co-treatment with HSV-1 OV and IL13Rα2-directed CAR-T cells resulted in no additional adverse events beyond those seen with the individual therapies, and, more notably, that pre-treatment with HSV-1 OV re-shaped the tumor microenvironment by increasing immune cell infiltrates and enhanced the efficacy of sub-therapeutic doses of IL13Rα2-directed CAR-T cell therapy delivered either intraventricularly or intratumorally. These preclinical studies aimed to provide a deeper understanding of this combination

approach to support the potential benefit of a combination study that will evaluate HSV-1 OV (MB-108) and IL13Rα2-directed CAR-T cells (MB-101).

In October 2023, we received a safe-to-proceed "approval" from the FDA for our MB-109 IND application allowing us to initiate a Phase 1, open-label, non-randomized, multicenter study of MB-109 in patients with IL13Ra2+ recurrent GBM and high-grade astrocytoma. In this Phase 1 clinical study, we intend to evaluate the combination of CAR-T cells (MB-101) and the herpes simplex virus type 1 oncolytic virus (MB-108) in patients with IL13Ra2+ high-grade gliomas. The design of this study involves first a lead in cohort, wherein patients are treated with MB-101 alone without prior MB-108 administration. After successful confirmation of the safety profile of MB-101 alone, the study will then investigate increasing doses of intratumorally administered MB-108 followed by dual intratumoral (ICT) and intraventricular (ICV) administration of MB-101. Due to limited resources, we do not currently expect to initiate this study until such time, if any, that additional resources become available to us.

MB-101 (IL13Rα2 CAR T Cell Program for Glioblastoma)

GBM is the most common brain and central nervous system ("CNS") cancer, accounting for approximately 49.1% of malignant primary brain and CNS tumors, approximately 54% of all gliomas, and approximately 16% of all primary brain and CNS tumors. More than 14,490 new GBM cases were predicted to be diagnosed in the U.S. for 2023. Malignant brain tumors are the second leading cause of cancer-related deaths in adolescents and young adults aged 15-39 and the most common cancer occurring among 15-19-year-olds in the U.S. While GBM is a rare disease 2-3 cases per 100,000 persons per year in the U.S. and European Union ("EU"), it is quite lethal, with five-year survival rate historically under 10%, which has been virtually unchanged for decades. Standard of care therapy consists of maximal surgical resection, radiation, and chemotherapy with temozolomide, which, while rarely curative, is shown to extend median overall survival from 4.5 to 15 months. GBM remains difficult to treat due to the inherent resistance of the tumor to conventional therapies.

Immunotherapy approaches targeting brain tumors offer promise over conventional treatments. IL13Rα2 is an attractive target for CAR T therapy, as it has limited expression in normal tissue but is overexpressed on the surface of greater than 50% of GBM tumors. CAR-T cells are designed to express membrane-tethered IL-13 receptor ligand ("IL-13") mutated at a single site (glutamic acid at position 13 to a tyrosine; E13Y) with high affinity for IL13Rα2 and reduced binding to IL13Rα1 in order to reduce healthy tissue targeting (Kahlon KS *et al. Cancer Research.* 2004;64:9160-9166).

We are developing an optimized CAR-T product incorporating enhancements in CAR-T design and T cell engineering to improve antitumor potency and T cell persistence. These include a second-generation hinge-optimized CAR containing mutations in the IgG4 linker to reduce off-target Fc interactions (Jonnalagadda M *et al. Molecular Therapy.* 2015;23(4):757-768.), a 4-1BB (CD137) co-stimulatory signaling domain for improved survival and maintenance of CAR T cells, and the extracellular domain of CD19 as a selection/tracking marker. In order to further improve persistence, either central memory T-cells (T_{CM}) or enriched CD62L+ naïve and memory T cells ($T_{N/MEM}$) are isolated and enriched. Our manufacturing process limits *ex vivo* expansion, which is designed to reduce T cell exhaustion and maintain a T_{CM} or $T_{N/MEM}$ phenotype. Based on experiments with CAR-Ts in mouse xenograft models of GBM, these CAR-modified T_{CM} and $T_{N/MEM}$ cells have been shown to be more potent and persistent than earlier generations of CAR-T cells.

Our academic partners at COH have recently completed the treatment phase of their Phase 1 study, which was designed to assess the feasibility and safety of using T_{CM} or $T_{N/MEM}$ enriched IL13Rα2-specific CAR-engineered T cells for clinical study participants with IL13Rα2 recurrent/refractory malignant glioma (ClinicalTrials.gov Identifier: NCT02208362). In this study, COH enrolled and treated 65 patients, with 58 patients receiving 3 cycles of CAR T cells per the study protocol. MB-109: Combination MB-101(IL13Rα2 CAR T Cell Program for Glioblastoma) and MB-108 (HSV-1 oncolytic virus C134) as a Potential Treatment for IL13Rα2+ Relapsed or Refractory Glioblastoma (GBM) and High-Grade Astrocytoma. Preliminary data indicated that the CAR-T cells were well tolerated, and no dose-limiting toxicities were observed in any of the study arms nor where there any occurrences of CRS or treatment-related deaths. Of the 58 patients evaluable for disease response, 50% achieved stable disease (SD) or better; 22%, including 8 patients with grade 4 gliomas, achieved SD or better for at least 90 days. Two patients achieved partial response, and one patient achieved complete response on the study. In 2016 COH reported that a patient had achieved a complete response to treatment based on the imaging and clinical features set forth by the Response Assessment in Neuro-Oncology Criteria ("RANO"). This result was published as a case report in the *New England Journal of Medicine* (Brown CE et a1. *NEJM*. 2016;375:2561-9). As described in the paper, this patient diagnosed with recurrent multifocal glioblastoma received multiple infusions of IL13Rα2-specific CAR-T cells over 220 days through two intracranial delivery routes – infusions into the resected tumor cavity followed by infusions into the ventricular system. Intracranial infusions of IL13Rα2-targeted CAR-T cells were not associated with any toxic effects of grade 3 or higher. After CAR-T cell treatment, regression of all intracranial and spinal tumors was observed, along with corresponding increases in levels of cytokines and immune cells in the cerebrospinal fluid. This clinical response was sustained for 7.5 months after the initiation of CAR T-cell therapy; however, the patient's disease eventually recurred at four new locations that were distinct and non-adjacent to the original tumors, and biopsy of one of these lesions showed decreased expression of IL13Rα2.

Results from this COH study have laid the foundation for potentially three new MB-101 studies listed below. Due to limited resources, we do not expect to initiate these studies until such time, if any, that additional resources become available to us.

1. MB-101 with or without nivolumab and ipilimumab in treating patients with recurrent or refractory glioblastoma (currently enrolling patients; ClinicalTrials.gov Identifier: NCT04003649) sponsored by COH;

2. MB-101 in treating patients with recurrent or refractory glioblastoma with a substantial component of leptomeningeal disease (currently enrolling patients; ClinicalTrials.gov Identifier: NCT04661384) sponsored by COH;

3. MB-101 in combination with the herpes simplex virus type 1 oncolytic virus (MB-108) in treating patients with recurrent or refractory glioblastoma or high-grade astrocytoma, as described above. This combination therapy, to be administered in a phase 1 two-center trial under our IND, will be referred to as MB-109.

MB - 108 (HSV 1 oncolytic virus C134)

MB-108 is a next-generation oncolytic herpes simplex virus ("oHSV") that is conditionally replication competent; that is, it can replicate in tumor cells, but not in normal cells, thus killing the tumor cells directly through this process. Replication of C134 in the tumor itself not only kills the infected tumor cells but causes the tumor cell to act as a factory to produce new virus. These virus particles are released as the tumor cell dies and can then proceed to infect other tumor cells in the vicinity and continue the process of tumor kill. In addition to this direct oncolytic activity, the virus promotes an immune response against surviving tumor cells, which increases the antitumor effect of the therapy. The virus expresses a gene from another virus from the same overall virus family, human cytomegalovirus, which allows it to replicate better in the tumor cells than its first-generation predecessors. However, the virus has also been

genetically engineered to minimize the production of any toxic effects for the patient receiving the therapy.

To improve this virus over its first-generation predecessors, modifications have focused on improving viral replication and spread within the tumor bed and on enhancing bystander damage to uninfected tumor cells. These effects cumulatively should result in converting an immunologically cold tumor to an immunologically hot tumor, which we anticipate will increase the efficacy of our IL13Rα2 directed CAR T for the treatment of GBM and high-grade astrocytoma.

The O'Neal Comprehensive Cancer Center at the UAB is the single clinical trial site for the Phase 1 trial of MB - 108, and this site has initiated a Phase 1 trial that began enrolling patients in 2019 (ClinicalTrials.gov Identifier: NCT03657576). The primary objective of this study is to determine the safety and tolerability of a single dose of MB-108 administered via a stereotactic intracerebral injection and to determine the maximally tolerated dose ("MTD") of the oncolytic virus. Secondary objectives are to obtain preliminary information about the potential benefit of MB - 108 in the treatment of patients with recurrent malignant gliomas, including relevant data on markers of efficacy, including time to tumor progression and patient survival. As of April 2023, 9 patients had been enrolled in this study.

In Vivo CAR T Platform Technology

We are collaborating with the Mayo Clinic to develop a novel technology that may be able to transform the administration of CAR T therapies and potentially be used as an off-the-shelf therapy. The technology, developed by Larry R. Pease, Ph.D., principal investigator and former director of the Center for Immunology and Immune Therapies at Mayo Clinic, is a new platform to administer CAR T therapy using a two-step approach. First, a peptide is administered to the patient to drive the proliferation of the patient's resident T cells. This is followed by the administration of a viral CAR construct directly into the lymph nodes of the patient. In turn, the viral construct infects the activated T cells and effectively forms CAR T cells in vivo in the patient. Successful implementation may lead to an off-the-shelf product with no need to isolate and expand patient T cells ex vivo in a cell processing facility.

Preclinical proof-of-concept has been established, and the ongoing development of this technology will take place at Mayo Clinic. We are evaluating plans to file an IND application for a multicenter Phase 1 clinical trial once a lead construct has been identified, subject to allocation of resources.

Recent Developments

Sale of Manufacturing Facility – Overview of Transaction

On May 18, 2023, we entered into an Asset Purchase Agreement (the "Original Asset Purchase Agreement") with uBriGene (Boston) Biosciences, Inc., a Delaware corporation ("uBriGene"), pursuant to which we agreed to sell our leasehold interest in our cell processing facility located in Worcester, Massachusetts (the "Facility"), and associated assets relating to the manufacturing and production of cell and gene therapies at the Facility to uBriGene (the "Transaction"). We and uBriGene subsequently entered into Amendment No. 1, dated as of June 29, 2023, and Amendment No. 2, dated as of July 28, 2023, to the Original Asset Purchase Agreement (the Original Asset Purchase Agreement, as so amended, the "Asset Purchase Agreement").

On July 28, 2023 (the "Closing Date"), pursuant to the Asset Purchase Agreement, we completed the sale of all of our assets that primarily relate to the manufacturing and production of cell and gene therapies at the Facility (such operations, the "Transferred Operations" and such assets, the "Transferred Assets") to uBriGene for upfront consideration of $6 million cash (the "Base Amount"). The Transferred Assets that were transferred to uBriGene on the Closing Date include, but are not limited to: (i) our leases of equipment and other personal property and all other property, equipment, machinery, tools, supplies, inventory, fixtures and all other personal property primarily related to the Transferred Operations, (ii) the data, information, methods, quality management systems, and intellectual property primarily used for the purposes of the Transferred Operations, (iii) the records and filings, including customer and vendor lists, production data, standard operating procedures and business records relating to, used in or arising under the Transferred Operations and (iv) all transferrable business license, permits and approvals necessary to operate the Transferred Operations. As described in greater detail below, certain Transferred Assets, including our lease of the Facility and contracts that are primarily used in the Transferred Operations (the "Transferred Contracts") did not transfer to uBriGene on the Closing Date.

Under the terms of the Asset Purchase Agreement, in addition to the Base Amount, uBriGene will be obligated to pay us a contingent amount (the "Contingent Amount") if we, within two years from the Closing Date: (i) complete an issuance of equity securities in an aggregate amount equal to or greater

than $10.0 million after the closing (the "Contingent Capital Raise") and (ii) obtain the consent of the landlord of the Facility to transfer the lease of the Facility to uBriGene. As of December 31, 2023, we had completed issuances of equity securities for proceeds totaling approximately $4.6 million following the Closing Date. If we are unable to close the full amount of the Contingent Capital Raise and/or do not receive the Landlord's consent to the transfer the lease of the Facility to uBriGene within two years from the Closing Date, uBriGene will not be obligated to pay the Contingent Amount to us. The Contingent Amount to be paid to us upon the satisfaction of the conditions listed above will be an amount equal to $5.0 million less (i) any severance payments or other monetary obligations to our employees who support the Transferred Operations and who have accepted offers of employment with uBriGene that arise between the Closing Date and the date the lease transfers to uBriGene and (ii) any payments payable by us under Transferred Contracts in connection with the consummation of the Transaction, including any payments necessary to obtain third party consents.

Voluntary Notice to U.S. Committee on Foreign Investment in the United States

uBriGene is an indirect, wholly owned subsidiary of UBrigene (Jiangsu) Biosciences Co., Ltd., a Chinese contract development and manufacturing organization. Under the Asset Purchase Agreement, we and uBriGene agreed to use our reasonable best efforts to obtain clearance for the Transaction from the U.S. Committee on Foreign Investment in the United States ("CFIUS"), although obtaining such clearance was not a condition to closing the Transaction. In accordance with the Asset Purchase Agreement, we and uBriGene previously submitted a voluntary notice to CFIUS on August 10, 2023.

Following an initial 45-day review period and subsequent 45-day investigation period, on November 13, 2023, CFIUS requested that we and uBriGene withdraw and re-file our joint voluntary notice to allow more time for review and discussion regarding the nature and extent of national security risk posed by the Transaction. Upon CFIUS's request, we and uBriGene submitted a request to withdraw and re-file our joint voluntary notice to CFIUS, and on November 13, 2023, CFIUS granted this request, accepted the joint voluntary notice and commenced a new 45-day review period on November 14, 2023. CFIUS's 45-day review ended on December 28, 2023. Since CFIUS had not concluded its review by December 28, 2023, the proceeding transitioned to a subsequent 45-day investigation period, which ended on February 12, 2024.

Following the 45-day review period and subsequent 45-day investigation period described above, on February 12, 2024, we and uBriGene requested permission to withdraw and re-file our joint voluntary notice to allow more time for review and discussion regarding the nature and extent of national security risk posed by the Transaction. Upon our joint request to withdraw and re-file their joint voluntary notice to CFIUS, on February 12, 2024, CFIUS granted this request, accepted the joint voluntary notice and commenced a new 45-day review period on February 13, 2024. CFIUS's new 45-day review ended on March 28, 2024. Because CFIUS had not yet concluded its action, the proceeding transitioned to a second 45-day phase as CFIUS further investigates the Transaction. On March 28, 2024, CFIUS advised us that its investigation will be completed no later than May 13, 2024.

At the completion of its review and investigation, if CFIUS determines there are no unresolved national security concerns, CFIUS will apprise the parties of its determination and conclude all action on the matter. Alternatively, CFIUS may identify and impose mitigation measures. Depending on the nature and severity of perceived national security risks identified, CFIUS may, among other mitigation measures, require suspension of the Transaction, require uBriGene to divest the Facility or other assets relating thereto, forfeit contracts that CFIUS deems to be sensitive, or require appointment of special compliance personnel or a proxy board consisting of U.S. persons. If CFIUS determines to require mitigating measures with respect to the Transaction, then uBriGene must comply with such measures although the Closing Date has already occurred.

We and uBriGene have been and will continue to be actively engaged with CFIUS, and they remain fully committed to obtaining clearance from CFIUS and completing the full transfer of the Facility to uBriGene. There can be no assurance, however, that CFIUS will ultimately provide clearance with respect to the Transaction, or what mitigating measures may be required in order to obtain such clearance.

Notification of Non-Compliance with Nasdaq Continued Listing Requirements

On March 13, 2024, we received a deficiency letter (the "Letter") from the Listing Qualifications Department (the "Staff") of Nasdaq notifying us that we were not in compliance with the minimum stockholders' equity requirement for continued listing on the Nasdaq Capital Market under Nasdaq Listing Rule 5550(b)(1). Nasdaq Listing Rule 5550(b)(1) requires companies listed on The Nasdaq Capital Market to maintain stockholders' equity of at least $2,500,000 (the "Stockholders' Equity Requirement"). Our Annual Report on Form 10-K for the fiscal year ended December 31, 2023, reported stockholders' equity of $123,000. The Letter further noted that as of its date, we did not have a market value of listed securities of $35 million, or net income from continued operations of $500,000 in the most recently completed fiscal year or in two of the last three most recently completed fiscal years, the alternative quantitative standards for continued listing on the Nasdaq Capital Market.

The Letter has no immediate effect on our continued listing on the Nasdaq Capital Market, subject to our compliance with the other continued listing requirements. In accordance with Nasdaq rules, we have been provided 45 calendar days, or until April 29, 2024, to submit a plan to regain compliance (the "Compliance Plan"). If the Compliance Plan is acceptable to the Staff, it may grant an extension of 180 calendar days from the date of the Letter. If the Staff does not accept the Compliance Plan, the Staff will provide written notification to us that the Compliance Plan has been rejected. At that time, we may appeal the Staff's determination to a Nasdaq Hearings Panel.

We intend to submit a Compliance Plan on or before April 29, 2024. Further, we intend to take all reasonable measures available to regain compliance under the Nasdaq Listing Rules and remain listed on the Nasdaq Capital Market. However, there can be no assurance that Nasdaq will approve the Compliance Plan or that we will ultimately regain compliance with all applicable requirements for continued listing.

April 2024 Reduction in Work Force

On April 10, 2024, our board of directors approved a reduction of our workforce by approximately 81% of our employee base in order to reduce costs and preserve capital due to the fundraising environment and continued uncertainty regarding the CFIUS review of the sale of the Facility and the Transaction with uBriGene. The workforce reduction will take place primarily in April 2024 and is expected to be substantially completed in the second quarter of 2024. As a result of these actions, we expect to incur personnel-related restructuring charges of approximately $0.2 million in connection with one-time employee termination cash expenditures, which are expected to be incurred in the second quarter of 2024. We may also incur other charges or cash expenditures not currently contemplated due to events that may occur as a result of, or associated with, the workforce reduction or retention efforts. The estimates of the costs expected to be incurred, and the timing thereof, are subject to various assumptions and actual costs may differ. We and our board of directors continue to evaluate all strategic and other alternatives related to the business.

Due to limited resources, and as a result of the reduction in work force described above, we do not expect to initiate our pivotal Phase 2 single-arm clinical trial of MB-106 for the treatment of WM trial in 2024. Subject to available funds, we intend rely on third party service providers to conduct study and manufacturing services to advance our priority potential product candidates.

Preliminary First Quarter Results

Based on information currently available, we estimate that as of March 31, 2024, cash and cash equivalents were approximately $1.3 million and cash used in operating activities for the first quarter of 2024 was $5.3 million.

Our estimate of our cash and cash equivalents as of March 31, 2024 and cash used in operating activities for the first quarter of 2024 are preliminary and actual results may differ from these estimates due to the completion of our closing procedures with respect to the three months ended March 31, 2024, final adjustments and other developments that may arise between now and the time the financial results for the three months ended March 31, 2024 are finalized. As such, these estimates should not be viewed as a substitute for our unaudited financial statements for the three months ended March 31, 2024 prepared in accordance with U.S. generally accepted accounting principles. Our expected results could change materially and are not necessarily indicative of the results to be achieved for three months ended March 31, 2024 or any future period. As a result of the foregoing considerations and the other limitations described herein, investors are cautioned not to place undue reliance on this preliminary financial information. We do not undertake any obligation to publicly update or revise these estimates, except as required by law.

Private Placement of Warrants

On October 26, 2023, the Company entered into a Securities Purchase Agreement (the "Purchase Agreement") with Armistice Capital Master Fund Ltd. ("Armistice"), an institutional accredited investor, pursuant to which the Company agreed to issue and sell, in a registered direct offering priced at-the-market under the rules of The Nasdaq Stock Market (the "Registered Offering"), (i) 920,000 shares of Common Stock, at a price per Share of $1.70 and (ii) pre-funded warrants (the "Pre-Funded Warrants") to purchase up to 1,668,236 shares of its Common Stock, at a price per Pre-Funded Warrant equal to $1.699, the price per Share, less $0.001.

The Pre-Funded Warrants were sold, in lieu of shares of Common Stock,to Armistice whose purchase of shares of Common Stock in the Registered Offering would otherwise result in Armistice, together with its affiliates and certain related parties, beneficially owning more than 4.99% (or, at Armistice's option upon issuance, 9.99%) of the Company's outstanding Common Stock immediately following the consumption of the Registered Offering. The Pre-Funded Warrants have an exercise price of $0.001 per share, became exercisable upon issuance and remain exercisable until exercised in full.

The Registered Offering closed on October 30, 2023. The Company intends to use the net proceeds from the Registered Offering for general corporate purposes and working capital requirements, which may include, among other things, the advancement of its product candidates to obtain regulatory approval from the FDA.

In a concurrent private placement, pursuant to the terms of the Purchase Agreement, the Company also agreed to issue and sell to Armistice unregistered warrants (the "Private Placement Warrants") to purchase up to 2,588,236 shares of Common Stock, at an offering price of $0.125 per Private Placement Warrant to purchase one share of common stock (the "Private Placement" and, together with the Registered Offering, the "Offerings") (which offering price is included in the purchase price per Share or Pre-Funded Warrant). The Private Placement Warrants have an exercise price of $1.58 per share (subject to customary adjustments as set forth in the Private Placement Warrants), are exercisable upon issuance and will expire five and one-half years from the date of issuance. The Private Placement Warrants contain customary anti-dilution adjustments to the exercise price, including for share splits, share dividends, rights offering and pro rata distributions.

H.C. Wainwright & Co., LLC ("Wainwright" and together with Armistice, the "Selling Stockholders") acted as the exclusive placement agent in connection with the Offerings under an Engagement Letter, dated as of October 9, 2023, between the Company and Wainwright (the "Engagement Letter"). Pursuant to the Engagement Letter, Wainwright was paid a cash fee equal to 7.0% of the gross proceeds received by the Company in the Offerings, a management fee equal to 1.0% of the gross proceeds of the Offering, $75,000 for non-accountable expenses and a clearing fee of $15,950. In addition, under the terms of the Engagement Letter, the Company issued to Wainwright (or its designees) warrants to purchase up to 155,294 shares of Common Stock (the "Wainwright Warrants" and together with the Private Placement Warrants, the "2023 Warrants"). The Wainwright Warrants have substantially the same terms as the Private Placement Warrants, except that the Wainwright Warrants will expire five years from the commencement of the sales of the Offerings and have an exercise price of $2.125 per share (subject to customary adjustment as set forth in the Wainwright Warrants), representing 125% of the purchase price per Share in the Registered Offering.

Pursuant to the Purchase Agreement, the Company is required to file, by December 11, 2023, a registration statement on Form S-1 with the SEC providing for the resale by the Selling Stockholders of the shares of Common Stock issuable upon exercise of the 2023 Warrants to register the resale of the shares issuable upon exercise of the 2023 Warrants.

Summary Risk Factors

Our business is subject to risks of which you should be aware before making an investment decision. You should carefully consider the risk factors described under the heading "*Risk Factors*," and in the other reports and documents that we have filed with the SEC.

Corporate Information

We are a majority-controlled subsidiary of Fortress Biotech, Inc. We were incorporated under the laws of the State of Delaware on March 13, 2015. Our principal executive offices are located at 377 Plantation Street, Worcester, Massachusetts 01605, and our telephone number is 781-652-4500. We maintain a website on the Internet at www.mustangbio.com and our e-mail address is info@mustangbio.com. Information on our website, or any other website, is not incorporated by reference in this prospectus. We have included our website address in this prospectus solely as an inactive textual reference.

Implications of Being a Smaller Reporting Company

We are a smaller reporting company as defined in the Securities Exchange Act of 1934, as amended (the "Exchange Act"). We may take advantage of certain of the scaled disclosures available to smaller reporting companies and will be able to take advantage of these scaled disclosures for so long as (i) the market value of our voting and non-voting common stock held by non-affiliates is less than $250 million measured on the last business day of our second fiscal quarter or (ii) our annual revenue is less than $100 million during the most recently completed fiscal year and the market value of our voting and non-voting common stock held by non-affiliates is less than $700 million measured on the last business day of our second fiscal quarter. Specifically, as a smaller reporting company, we may choose to present only the two most recent fiscal years of audited financial statements in our Annual Reports on Form 10-K and have reduced disclosure obligations regarding executive compensation, and if we are a smaller reporting company with less than $100 million in annual revenue, we would not be required to obtain an attestation report on internal control over financial reporting issued by our independent registered public accounting firm.

THE OFFERING

The Selling Stockholders identified in this prospectus are offering on a resale basis a total of 2,743,530 shares of Common Stock underlying the 2023 Warrants, as more fully described below.

Common Stock to be Offered by Selling Stockholders:	Up to 2,743,530 shares of the Company's Common Stock
Shares of Common Stock Outstanding Prior to this Offering:	10,509,505 shares as of April 25, 2024
Shares of Common Stock Outstanding Assuming Exercise of All 2023 Warrants[(1)]:	13,253,035
Plan of Distribution:	The Selling Stockholders will determine when and how they will sell the Common Stock offered in this prospectus, as described in the section of this prospectus titled "*Plan of Distribution*."
Use of Proceeds:	We will not receive any proceeds from the sale of the Common Stock by the Selling Stockholders in this offering. See "*Use of Proceeds.*"
Risk Factors:	An investment in our securities involves a high degree of risk and could result in a loss of your entire investment. Prior to making an investment decision, you should carefully consider all of the information in this prospectus and, in particular, you should evaluate the risk factors set forth under the caption "Risk Factors."
Nasdaq Capital Market Symbol:	MBIO

(1) The number of shares of Common Stock to be outstanding after this offering is based on 10,509,505 shares of our Common Stock outstanding as of April 25, 2024, and excludes:

- 2,813,632 shares of Common Stock issuable upon exercise of outstanding warrants having a weighted-average exercise price of $2.14 per share;
- 23,501 shares of Common Stock issuable upon the vesting and settlement of outstanding restricted stock units;
- 76,112 shares of Common Stock issuable upon the vesting and exercise of outstanding stock options;
- 56,359 shares of our common stock issuable upon conversion of the Class A Common Stock, at the holders' election;
- 16,666 shares of our common stock issuable upon conversion of the Class A Preferred Stock, at the holders' election;
- 393,167 shares of Common Stock reserved for issuance and available for future grant under our 2016 Incentive Plan; and
- 338,315 shares of our common stock reserved for future issuance under the Mustang Bio, Inc. 2019 Employee Stock Purchase Plan, as amended (the "ESPP"), plus any future increases, including annual automatic evergreen increases, in the number of shares of common stock reserved for issuance thereunder

CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus and the documents incorporated herein by reference contain predictive or "forward-looking statements" within the meaning of the Securities Act and the Exchange Act and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from the future results, performance or achievements expressed or implied by such forward-looking statements. The words "anticipate," "believe," "estimate," "may," "expect" and similar expressions are generally intended to identify forward-looking statements. Such forward-looking statements include, but are not limited to, statements about our:

- expectations for increases or decreases in expenses;
- expectations for the clinical and pre-clinical development, manufacturing, regulatory approval, and commercialization of our pharmaceutical product candidates or any other products we may acquire or in-license;
- use of clinical research centers and other contractors;
- expectations for incurring capital expenditures to expand our research and development and manufacturing capabilities;
- expectations for generating revenue or becoming profitable on a sustained basis;
- expectations or ability to enter into marketing and other partnership agreements;
- expectations or ability to enter into product acquisition and in-licensing transactions;
- expectations or ability to build our own commercial infrastructure to manufacture, market and sell our product candidates, if approved;
- expectations for the acceptance of our product candidates, if approved, by doctors, patients or payors;
- ability to compete against other companies and research institutions;
- our ability to attract, hire and retain qualified personnel, including the impact of our recently announced reduction in work force;
- ability to secure adequate protection for our intellectual property;
- ability to attract and retain key personnel;
- ability to obtain reimbursement for our products, if approved;
- estimates of the sufficiency of our existing cash and cash equivalents and investments to finance our operating requirements, including expectations regarding the value and liquidity of our investments;
- stock price and the volatility of the equity markets;
- expected losses; and
- expectations for future capital requirements.

We have based these forward-looking statements largely on our current expectations, estimates, forecasts, and projections about future events and financial trends that we believe may affect our financial condition, results of operations, business strategy, and financial needs. In light of the significant uncertainties in these forward-looking statements, you should not rely upon forward-looking statements as predictions of future events. Although we believe that we have a reasonable basis for each forward-looking statement contained in this prospectus, we cannot guarantee that the future results, levels of activity, performance, or events and circumstances reflected in the forward-looking statements will be achieved or occur at all. You should refer to the section entitled "*Risk Factors*" in this prospectus and the risk factors set forth in the documents incorporated by reference in this prospectus for a discussion of important factors that may cause our actual results to differ materially from those expressed or implied by our forward-looking statements. Furthermore, if our forward-looking statements prove to be inaccurate, the inaccuracy may be material. Except as required by law, we undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise.

You should read this prospectus and the documents incorporated by reference in this prospectus completely and with the understanding that our actual future results may be materially different from what we expect. We qualify all of the forward-looking statements in this prospectus by these cautionary statements.

RISK FACTORS

Investing in our Common Stock involves a high degree of risk. Our business is influenced by many factors that are difficult to predict, involve uncertainties that may materially affect actual results and are often beyond our control. We have identified some of these factors below and under the heading "Risk Factors" in our Annual Report on Form 10-K for the year ended December 31, 2023, which is incorporated by reference in this prospectus, as well as in other information included or incorporated by reference in this prospectus and any prospectus supplement. You should consider carefully these risks and uncertainties before deciding to invest in our Common Stock. If any of the risks identified herein or the risks identified as risk factors in the incorporated documents were to materialize, our business, financial condition, results of operations, and future growth prospects could be materially and adversely affected. In that event, the market price of our Common Stock could decline, and you could lose part of or all of your investment in our Common Stock. See the section of this prospectus titled "Where You Can Find More Information."

Risks Related to the Company and this Offering

There is substantial doubt regarding our ability to continue as a going concern. We will need to raise additional funding, (which may not be available on acceptable terms

to us, or at all) and/or delay, limit or terminate our product development efforts or other operations.

We are currently advancing our programs in hematologic cancers, solid tumors and rare genetic diseases through clinical development. Developing and commercializing CAR T and gene therapy products is expensive, and we do not expect to generate meaningful product revenues in the foreseeable future until we obtain marketing approval for products in the United States and following any potential commercial launch.

As of December 31, 2023, our cash and cash equivalents were $6.2 million. Based on our current business plan, there is substantial doubt regarding our ability to continue as a going concern for a period of one year after the date that our financial statements for the year ended December 31, 2023 were issued. Our fundraising efforts to raise additional funding may divert our management from their day-to-day activities, which may adversely affect our ability to develop and commercialize our potential products following marketing approval if and when obtained. In addition, we cannot guarantee that financing will be available in sufficient amounts or on terms acceptable to us, if at all. Moreover, the terms of any financing may adversely affect the holdings or the rights of our stockholders and the issuance of additional securities, whether equity or debt, by us, or the possibility of such issuance, may cause the market price of our shares to decline. The sale of additional equity or convertible securities would dilute all of our stockholders. Potential indebtedness, if incurred, would result in increased fixed payment obligations, and we may be required to agree to certain restrictive covenants, such as limitations on our ability to incur additional debt, limitations on our ability to acquire, sell or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. We could also be required to seek funds through arrangements with collaborative partners or otherwise at an earlier stage than otherwise would be desirable and we may be required to relinquish rights to some of our technologies or product candidates or otherwise agree to terms unfavorable to us, any of which may have a material adverse effect on our business, operating results and prospects.

In addition, in order to address our current funding constraints, we may be required to further revise our business plan and strategy, which may result in us (i) further curtailing, delaying or discontinuing one or more of our research or development programs or the commercialization of any product candidates, (ii) selling certain of our assets and/or (iii) may result in our being unable to expand our operations or otherwise capitalize on our business opportunities. Such actions may become necessary whether or not we are able to raise additional capital. As a result, our business, financial condition, and results of operations could be materially affected.

We contract with third parties for the manufacture of our product candidates for preclinical and clinical testing and may also do so for commercialization, if and when our product candidates are approved. This reliance on third parties increases the risk that we will not have sufficient quantities of our product candidates or any future product candidate or such quantities at an acceptable cost, which could delay, prevent or impair our development or commercialization efforts.

Due to limited resources, and in light of our reduction in work force in April 2024, we may increase our reliance on third-party manufacturers or third-party collaborators for the manufacture of commercial supply of one or more product candidates for which our collaborators or we obtain marketing approval. We may be unable to establish any agreements with third-party manufacturers or to do so on acceptable terms. Even if we are able to establish agreements with third-party manufacturers, reliance on third-party manufacturers entails additional risks, including, but not necessarily limited to:

- reliance on the third party for regulatory compliance and quality assurance, while still being required by law to establish adequate oversight and control over products furnished by that third party;
- the possible breach of the manufacturing agreement by the third party;
- manufacturing delays if our third-party manufacturers are unable to obtain raw materials due to supply chain disruptions, give greater priority to the supply of other products over our product candidates or otherwise do not satisfactorily perform according to the terms of the agreement between us;
- the possible misappropriation of our proprietary information, including our trade secrets and know-how; and
- the possible termination or nonrenewal of the agreement by the third party at a time that is costly or inconvenient for us.

We rely on our third-party manufacturers to produce or purchase from third-party suppliers the materials and equipment necessary to produce our product candidates for our preclinical and clinical trials. Forces beyond our control could disrupt the global supply chain and impact our or our third-party manufacturers' ability to obtain raw materials or other products necessary to manufacture our product candidates. There are a limited number of suppliers for raw materials and equipment that we use (or that are used on our behalf) to manufacture our product candidates, and there may be a need to assess alternate suppliers to prevent a possible disruption of the manufacture of the materials and equipment necessary to produce our product candidates for our preclinical and clinical trials, and if approved, ultimately for commercial sale. We do not have any control over the process or timing of the acquisition of these raw materials or equipment by our third-party manufacturers. Any significant delay in the supply of a product candidate, or the raw material components thereof, for an ongoing preclinical or clinical trial due to the need to replace a third-party manufacturer could considerably delay completion of our preclinical or clinical trials, product testing and potential regulatory approval of our product candidates. If our manufacturers or we are unable to purchase these raw materials or equipment after regulatory approval has been obtained for our product candidates, the commercial launch of our product candidates would be delayed or there would be a shortage in supply, which would impair our ability to generate revenues from the sale of our product candidates.

The facilities used by contract manufacturers to potentially manufacture our product candidates must be approved by the FDA pursuant to inspections that will be conducted after we submit an New Drug Application (NDA) or BLA to the FDA. We are required by law to establish adequate oversight and control over raw materials, components and finished products furnished by our contract manufacturers, but we do not control the day-to-day manufacturing operations of, and are dependent on, the contract manufacturers for compliance with current Good Manufacturing Practices ("cGMP") regulations for manufacture of our product candidates. Third-party manufacturers may not be able to comply with the cGMP regulations or similar regulatory requirements outside the United States. Our failure, or the failure of our third-party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us, including clinical holds, fines, injunctions, restrictions on imports and exports, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of product candidates or products, operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supplies of our products.

One or more of the product candidates that we may develop may compete with other product candidates and products for access to manufacturing facilities. There are a limited number of manufacturers that operate under cGMP regulations and that might be capable of manufacturing for us. Any performance failure on the part of our existing or future manufacturers could delay clinical development or marketing approval. We do not currently have arrangements in place for redundant supply. If our current contract manufacturers cannot perform as agreed, we may be required to replace such manufacturers. We may incur added costs and delays in identifying and qualifying any replacement manufacturers.

Future dependence upon others for the manufacture of our product candidates or products may adversely affect our future profit margins and our ability to commercialize any products that may receive marketing approval on a timely and competitive basis. We also expect to rely on third parties to distribute drug supplies for our clinical trials. Any performance failure on the part of our distributors could delay clinical development or marketing approval of our product candidates or commercialization of our products, if approved, producing additional losses and depriving us of potential product revenue.

The trading price of the shares of our Common Stock has been and is likely to continue to be highly volatile, and purchasers of our Common Stock could incur substantial losses.

Our stock price has been and will likely continue to be volatile for the foreseeable future. The stock market in general and the market for biotechnology companies in particular have experienced extreme volatility that has often been unrelated to the operating performance of particular companies. As a result of this volatility, investors may not be able to sell their Common Stock at or above the price they paid.

In addition, in the past, stockholders have initiated class action lawsuits against biotechnology and pharmaceutical companies following periods of volatility in the market prices of these companies' securities. Such litigation and any litigation that may be instituted against us, our officers and/or our directors in the future, could cause us to incur substantial costs and divert management's attention and resources, which could have a material adverse effect on our business, financial condition and results of

operations.

A substantial number of shares of our Common Stock could be sold into the public market in the near future, which could depress our stock price.

Sales of substantial amounts of Common Stock in the public market could reduce the prevailing market prices for our Common Stock. Substantially all of our outstanding Common Stock is eligible for sale as are shares of Common Stock issuable under vested and exercisable stock options. If our existing stockholders sell a large number of shares of our Common Stock, or the public market perceives that existing stockholders might sell shares of Common Stock, the market price of our Common Stock could decline significantly. These sales might also make it more difficult for us to sell equity securities at a time and price that we deem appropriate.

DIVIDEND POLICY

We have never declared or paid any cash dividends on our Common Stock and do not anticipate paying any cash dividends in the foreseeable future. Any future determination to pay dividends will be at the discretion of our board of directors and will depend on our financial condition, results of operations, capital requirements and other factors our board of directors deems relevant.

USE OF PROCEEDS

We will not receive any proceeds from the sale of the Common Stock covered by this prospectus and any accompanying prospectus supplement. All proceeds from the sale of the Common Stock will be for the respective accounts of the Selling Stockholders named herein.

We will bear all other costs, fees and expenses incurred in effecting the registration of the offering and sale of the Common Stock covered by this prospectus and any accompanying prospectus supplement, including, without limitation, all registration and filing fees, Nasdaq listing fees and fees and expenses of our counsel and our accountants, in accordance with the terms of the Purchase Agreement. The Selling Stockholders will pay any discounts, commissions, and fees of underwriters, selling brokers, dealer managers or similar securities industry professionals incurred by the Selling Stockholders in disposing of the Common Stock covered by this prospectus.

DETERMINATION OF OFFERING PRICE

The prices at which the shares of Common Stock covered by this prospectus may actually be sold will be determined by the prevailing public market price for shares of our Common Stock or be negotiations between the Selling Stockholders and buyers of our Common Stock in private transactions or as otherwise described in "*Plan of Distribution*."

THE SELLING STOCKHOLDERS

The shares of Common Stock being offered by the Selling Stockholders are those issuable to the Selling Stockholders upon exercise of the 2023 Warrants. For additional information regarding the issuances of those shares of Common Stock and 2023 Warrants, see "*Prospectus Summary – Private Placement of Warrants*" above. We are registering the resale of the shares of Common Stock in order to permit the Selling Stockholders to offer the shares for resale from time to time. Except for the ownership of the shares of Common Stock and the 2023 Warrants as well as their purchase of other securities from us in the past, the Selling Stockholders have not had any material relationship with us within the past three years.

The table below lists the Selling Stockholders and other information regarding the beneficial ownership of the shares of Common Stock by the Selling Stockholders. The second column lists the number of shares of Common Stock beneficially owned by the Selling Stockholders, based on its ownership of the shares of Common Stock and 2023 Warrants, as well as any other securities of ours owned by the Selling Stockholders, as of April 25, 2024, assuming exercise of the 2023 Warrants held by the Selling Stockholders on that date, without regard to any limitations on exercises.

The third column lists the shares of Common Stock being offered by this prospectus by the Selling Stockholders.

In accordance with the terms of the Purchase Agreement, this prospectus covers the resale of the maximum number of shares of Common Stock issuable upon exercise of the 2023 Warrants, determined as if the outstanding 2023 Warrants were exercised in full as of the trading day immediately preceding the date this registration statement was initially filed with the SEC, each as of the trading day immediately preceding the applicable date of determination and all subject to adjustment as provided in the Purchase Agreement, without regard to any limitations on the exercise of the 2023 Warrants. The third and fourth column assumes the sale of all of the shares offered by the Selling Stockholders pursuant to this prospectus.

We cannot advise you as to whether the Selling Stockholders will in fact sell any or all of such Common Stock. In addition, the Selling Stockholders may sell, transfer or otherwise dispose of, at any time and from time to time, the Common Stock and 2023 Warrants in transactions exempt from the registration requirements of the Securities Act after the date of this prospectus. For purposes of this table, we have assumed that the Selling Stockholders will have sold all of the securities covered by this prospectus upon the completion of the offering.

Under the terms of the 2023 Warrants, a selling stockholder may not exercise the 2023 Warrants to the extent such exercise would cause such selling stockholder, together with its affiliates and attribution parties, to beneficially own a number of shares of Common Stock which would exceed 4.99% or 9.99%, as applicable, of our then-outstanding Common Stock following such exercise, excluding for purposes of such determination shares of Common Stock issuable upon exercise of the 2023 Warrants that have not been exercised. The number of shares in the second and fourth columns do not reflect this limitation. The Selling Stockholders may sell all, some or none of its shares in this offering. See "*Plan of Distribution*."

Name of Selling Stockholder	Number of Shares of Common Stock Beneficially Owned Immediately Prior to the Offering		Maximum Number of Shares of Common Stock Being Offered for Resale Under this Prospectus	Number of Shares of Common Stock Beneficially Owned After the Maximum Offered Shares are Sold [1]	Percentage of Outstanding Shares of Common Stock Beneficially Owned Immediately Following the Sale of Shares[1][2]
Armistice Capital, LLC[3]	2,588,236	[4]	2,588,236	-	-
John Chambers[5]	14,753		14,753	-	-
Noam Rubenstein[5]	34,165		34,165	-	-
Craig Schwabe[5]	5,241		5,241	-	-
Michael Vasinkevich[5]	99,582		99,582	-	-
Charles Worthman[5]	1,553		1,553	-	-

* Less than 1%

(1) Assumes the Selling Stockholders sell all of the shares of Common Stock being offered by this prospectus.

(2) Percentage calculated based upon the assumption that the Selling Stockholders sell all of the shares of Common Stock offered by this prospectus.

(3) The securities reported herein are held by Armistice Capital Master Fund Ltd., a Cayman Islands exempted company (the "Master Fund"), and may be deemed to be indirectly beneficially owned by: (i) Armistice Capital, LLC ("Armistice Capital"), as the investment manager of the Master Fund; and (ii) Steven Boyd, as the Managing Member of Armistice Capital. Armistice Capital and Steven Boyd disclaim beneficial ownership of the securities except to the extent of their respective pecuniary interests therein. The address of the Master Fund is c/o Armistice Capital, LLC, 510 Madison Ave, 7th Floor, New York, NY 10022.

(4) Consists of shares issuable upon exercise of Private Placement Warrants to purchase up to 2,588,236 shares of Common Stock with an exercise price of $1.58 per share. The Private Placement Warrants are subject to a beneficial ownership of 4.99%, which limitation precludes the Master Fund from exercising any portion of such warrants to the extent that, following such exercise, the Master Fund's ownership of our Common Stock would exceed the beneficial ownership limitation.

(5) Each of the selling stockholders is affiliated with H.C. Wainwright & Co., LLC, a registered broker dealer with a registered address of H.C. Wainwright & Co., LLC, 430 Park Ave, 3rd Floor, New York, NY 10022, and has sole voting and dispositive power over the securities held. The number of shares beneficially owned prior to this offering consist of shares of Common Stock issuable upon exercise of placement agent warrants, which were received as compensation. The selling stockholder acquired the placement agent warrants in the ordinary course of business and, at the time the placement agent warrants were acquired, the selling stockholder had no agreement or understanding, directly or indirectly, with any person to distribute such securities.

PLAN OF DISTRIBUTION

The Selling Stockholders of the securities and any of their pledgees, assignees and successors-in-interest may, from time to time, sell any or all of its securities covered hereby on the principal trading market or any other stock exchange, market or trading facility on which the securities are traded or in private transactions. These sales may be at fixed or negotiated prices. The Selling Stockholders may use any one or more of the following methods when selling securities:

- ordinary brokerage transactions and transactions in which the broker-dealer solicits purchasers;
- block trades in which the broker-dealer will attempt to sell the securities as agent but may position and resell a portion of the block as principal to facilitate the transaction;
- purchases by a broker-dealer as principal and resale by the broker-dealer for its account;
- an exchange distribution in accordance with the rules of the applicable exchange;
- privately negotiated transactions;
- settlement of short sales;
- in transactions through broker-dealers that agree with the Selling Stockholders to sell a specified number of such securities at a stipulated price per security;
- through the writing or settlement of options or other hedging transactions, whether through an options exchange or otherwise;
- a combination of any such methods of sale; or
- any other method permitted pursuant to applicable law.

The Selling Stockholders may also sell securities under Rule 144 or any other exemption from registration under the Securities Act, if available, rather than under this prospectus. Broker-dealers engaged by the Selling Stockholders may arrange for other brokers-dealers to participate in sales. Broker-dealers may receive commissions or discounts from the Selling Stockholders (or, if any broker-dealer acts as agent for the purchaser of securities, from the purchaser) in amounts to be negotiated, but, except as set forth in a supplement to this prospectus, in the case of an agency transaction not in excess of a customary brokerage commission in compliance with FINRA Rule 2121; and in the case of a principal transaction a markup or markdown in compliance with FINRA Rule 2121.

In connection with the sale of the securities or interests therein, theSelling Stockholders may enter into hedging transactions with broker-dealers or other financial institutions, which may in turn engage in short sales of the securities in the course of hedging the positions they assume. The Selling Stockholders may also sell securities short and deliver these securities to close out their short positions, or loan or pledge the securities to broker-dealers that in turn may sell these securities. The Selling Stockholders may also enter into option or other transactions with broker-dealers or other financial institutions or create one or more derivative securities which require the delivery to such broker-dealer or other financial institution of securities offered by this prospectus, which securities such broker-dealer or other financial institution may resell pursuant to this prospectus (as supplemented or amended to reflect such transaction).

The Selling Stockholders and any broker-dealers or agents that are involved in selling the securities may be deemed to be "underwriters" within the meaning of the Securities Act in connection with such sales. In such event, any commissions received by such broker-dealers or agents and any profit on the resale of the securities purchased by them may be deemed to be underwriting commissions or discounts under the Securities Act. Each of the Selling Stockholders have informed us that it does not have any written or oral agreement or understanding, directly or indirectly, with any person to distribute the securities.

We are required to pay certain fees and expenses incurred by us incident to the registration of the securities. We have agreed to indemnify the Selling Stockholders against certain losses, claims, damages and liabilities, including liabilities under the Securities Act.

We agreed to keep this prospectus effective until the earlier of (i) the date on which the securities may be resold by theSelling Stockholders without registration and

without regard to any volume or manner-of-sale limitations by reason of Rule 144, without the requirement for us to be in compliance with the current public information under Rule 144 under the Securities Act or any other rule of similar effect or (ii) all of the securities have been sold pursuant to this prospectus or Rule 144 under the Securities Act or any other rule of similar effect. The resale securities will be sold only through registered or licensed brokers or dealers if required under applicable state securities laws. In addition, in certain states, the resale securities covered hereby may not be sold unless they have been registered or qualified for sale in the applicable state or an exemption from the registration or qualification requirement is available and is complied with.

Under applicable rules and regulations under the Exchange Act, any person engaged in the distribution of the resale securities may not simultaneously engage in market making activities with respect to the Common Stock for the applicable restricted period, as defined in Regulation M, prior to the commencement of the distribution. In addition, the Selling Stockholders will be subject to applicable provisions of the Exchange Act and the rules and regulations thereunder, including Regulation M, which may limit the timing of purchases and sales of the Common Stock by the Selling Stockholders or any other person. We will make copies of this prospectus available to the Selling Stockholders and have informed them of the need to deliver a copy of this prospectus to each purchaser at or prior to the time of the sale (including by compliance with Rule 172 under the Securities Act).

DESCRIPTION OF CAPITAL STOCK

When used herein, the terms "Company," "we," "our," and "us" refer to Mustang Bio, Inc.

Capital Stock

We are authorized to issue 200,000,000 shares of common stock, par value of $0.0001 per share, of which 1,000,000 shares are designated as Class A common stock, and 2,000,000 of preferred stock, $0.0001 par value per share, of which 250,000 are designated as Class A Preferred Stock.

Common Stock

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

As of April 25, 2024, there were 10,509,505 shares of our common stock outstanding held by 71 stockholders of record.

The undesignated preferred stock may be issued from time to time in one or more series. Our board of directors is authorized to determine or alter the dividend rights, dividend rate, conversion rights, voting rights, rights and terms of redemption (including sinking fund provisions, if any), the redemption price or prices, the liquidation preferences and other designations, powers, preferences and relative, participating, optional or other special rights, if any, and the qualifications, limitations and restrictions granted to or imposed upon any wholly unissued series of preferred stock, and to fix the number of shares of any series of preferred stock (but not below the number of shares of any such series then outstanding).

Class A Common Stock

The holders of Class A common stock are entitled to the number of votes equal to the number of whole shares of common stock into which the shares of Class A Common Shares held by such holder are convertible. For a period of ten years from issuance, the holders of the Class A common stock have the right to appoint one member of the Board of Directors of Mustang. To date, the holders of Class A common stock have not yet appointed such director.

Class A Preferred Stock

The Class A Preferred Stock is identical to undesignated common stock other than as to voting rights, conversion rights, and the PIK dividend right.

The holders of the outstanding shares of Class A Preferred Stock receive on each January 1 (each a "PIK Dividend Payment Date") after the original issuance date of the Class A Preferred Stock until the date all outstanding Class A Preferred Stock is converted into common stock or redeemed (and the purchase price is paid in full), pro rata per share dividends paid in additional fully paid and non-assessable shares of common stock such that the aggregate number of shares of common stock issued pursuant to such PIK dividend is equal to 2.5% of the Corporation's fully-diluted outstanding capitalization on the date that is one business day prior to any PIK Dividend Payment Date ("PIK Record Date"). In the event the Class A Preferred Stock converts into common stock, the holders shall receive all PIK dividends accrued through the date of such conversion. No dividend or other distribution shall be paid, or declared and set apart for payment (other than dividends payable solely in capital stock on the capital stock) on the shares of common stock until all PIK dividends on the Class A Preferred Stock shall have been paid or declared and set apart for payment. All dividends are non-cumulative.

On any matter presented to the stockholders for their action or consideration at any meeting of stockholders (or by written consent of stockholders in lieu of meeting), each holder of outstanding shares of Class A Preferred Stock shall be entitled to cast for each share of Class A Preferred Stock held by such holder as of the record date for determining stockholders entitled to vote on such matter, the number of votes that is equal to one and one-tenth (1.1) times a fraction, the numerator of which is the sum of (A) the number of shares of outstanding common stock and (B) the whole shares of common stock in to which the shares of outstanding Class A common stock and the Class A Preferred Stock are convertible, and the denominator of which is number of shares of outstanding Class A Preferred Stock. Thus, the Class A Preferred Stock will at all times constitute a voting majority.

Each share of Class A Preferred Stock is convertible, at the option of the holder, into one fully paid and nonassessable share of common stock, subject to certain adjustments. If the Company, at any time effects a subdivision or combination of the outstanding common stock (by any stock split, stock dividend, recapitalization, reverse stock split or otherwise), the applicable conversion ratio in effect immediately before that subdivision is proportionately decreased or increased, as applicable, so that the number of shares of common stock issuable on conversion of each share of Class A Preferred Stock shall be increased or decreased, as applicable, in proportion to such increase or decrease in the aggregate number of shares of common stock outstanding. Additionally, if any reorganization, recapitalization, reclassification, consolidation or merger involving the Company occurs in which the common stock (but not the Class A Preferred Stock) is converted into or exchanged for securities, cash or other property, then each share of Class A Preferred Stock becomes convertible into the kind and amount of securities, cash or other property which a holder of the number of shares of common stock of the Company issuable upon conversion of one share of the Class A Preferred Stock immediately prior to such reorganization, recapitalization, reclassification, consolidation or merger would have been entitled to receive pursuant to such transaction.

Additional Features

Other features of our capital stock include:

- *Dividend Rights*. The holders of outstanding shares of our common stock, including Class A common stock, are entitled to receive dividends out of funds legally available at the times and in the amounts that our Board of Directors may determine. All dividends are non-cumulative.

- *Voting Rights*. The holders of our common stock are entitled to one vote for each share of common stock held on all matters submitted to a vote of the stockholders, including the election of directors. Our certificate of incorporation and bylaws do not provide for cumulative voting rights.

- *No Preemptive or Similar Rights*. The holders of our common stock have no preemptive, conversion, or subscription rights, and there are no redemption or sinking fund provisions applicable to our common stock.

- *Right to Receive Liquidation Distributions.* Upon our liquidation, dissolution, or winding-up, the assets legally available for distribution to our stockholders would be distributable ratably among the holders of our common stock, including Class A common stock, outstanding at that time after payment of other claims of creditors, if any.

- *Fully Paid and Non-Assessable.* All of the outstanding shares of our common stock, including Class A common stock, and the Class A Preferred Stock are duly issued, fully paid and non-assessable.

LEGAL MATTERS

McGuireWoods LLP, Charlotte, North Carolina, has passed upon the validity of the securities being offered by this prospectus. Additional legal matters may be passed upon for us or any underwriters, dealers or agents, by counsel that we will name in the applicable prospectus supplement.

EXPERTS

The financial statements of Mustang Bio, Inc. as of December 31, 2023 and 2022, and for each of the years in the two-year period ended December 31, 2023, have been incorporated by reference herein in reliance upon the reports of KPMG LLP, independent registered public accounting firm, incorporated by reference herein, and upon the authority of said firm as experts in accounting and auditing. The audit report covering the December 31, 2023 financial statements contains an explanatory paragraph that states the Company's expectation to generate operating losses and negative operating cash flows in the future, and the need for additional funding to support its planned operations raise substantial doubt about its ability to continue as a going concern. The financial statements do not include any adjustments that might result from the outcome of that uncertainty.

WHERE YOU CAN FIND MORE INFORMATION

We file reports and proxy statements with the SEC. These filings include our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and proxy statements on Schedule 14A, as well as any amendments to those reports and proxy statements, which are available free of charge through our website as soon as reasonably practicable after we file them with, or furnish them to, the SEC. Our Internet website address is www.mustangbio.com. Our website and the information contained on, or that can be accessed through, the website will not be deemed to be incorporated by reference in, and are not considered part of, this prospectus. You should not rely on any such information in making your decision whether to purchase our securities. The SEC also maintains a website at www.sec.gov that contains reports, proxy and information statements and other information regarding us and other issuers that file electronically with the SEC.

We have filed with the SEC a registration statement on Form S-1 under the Securities Act relating to the securities being offered by this prospectus. This prospectus, which constitutes part of that registration statement, does not contain all of the information set forth in the registration statement or the exhibits and schedules which are part of the registration statement. For further information about us and the securities offered, see the registration statement and the exhibits and schedules thereto. Statements contained in this prospectus regarding the contents of any contract or any other document to which reference is made are not necessarily complete, and, in each instance where a copy of a contract or other document has been filed as an exhibit to the registration statement, reference is made to the copy so filed, each of those statements being qualified in all respects by the reference.

INCORPORATION OF CERTAIN INFORMATION BY REFERENCE

The SEC allows us to "incorporate by reference" information from other documents that we file with it, which means that we can disclose important information to you by referring you to those documents. The information incorporated by reference is considered to be part of this prospectus. Information in this prospectus supersedes information incorporated by reference that we filed with the SEC prior to the date of this prospectus. We incorporate by reference into this prospectus and the registration statement of which this prospectus is a part the information or documents listed below that we filed with the SEC (File No. 001-38191):

- our Annual Report on Form 10-K for the year ended December 31, 2023, filed with the SEC on March 11, 2024;

- our Current Reports on Form 8-K filed with the SEC on January 4, 2024; January 25, 2024; February 14, 2024; March 15, 2024; March 29, 2024; and April 12, 2024; and

- the description of our common stock contained in our registration statement on Form 8-A filed with the SEC on August 21, 2017, including any amendments or reports filed for the purposes of updating this description.

Notwithstanding the statements in the preceding paragraphs, no document, report or exhibit (or portion of any of the foregoing) or any other information that we have "furnished" to the SEC pursuant to the Exchange Act shall be incorporated by reference into this prospectus.

We also incorporate by reference into this prospectus all documents (other than current reports furnished under Item 2.02 or Item 7.01 of Form 8-K and exhibits filed on such form that are related to such items) that are filed by us with the SEC pursuant to Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act (i) after the date of the initial filing of the registration statement of which this prospectus forms a part and prior to effectiveness of the registration statement, or (ii) after the date of this prospectus but prior to the termination of the offering. These documents include periodic reports, such as Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q and Current Reports on Form 8-K, as well as proxy statements on Schedule 14A.

We will provide to each person, including any beneficial owner, to whom a prospectus is delivered, without charge upon written or oral request, a copy of any or all of the documents that are incorporated by reference into this prospectus but not delivered with the prospectus, including exhibits that are specifically incorporated by reference into such documents. You should direct any requests for documents to Mustang Bio, Inc., 377 Plantation Street, Worcester, Massachusetts 01605, Attn: General Counsel, or by

calling (781) 652-4500.

You also may access these filings on our website at *www.mustangbio.com*. We do not incorporate the information on our website into this prospectus or any supplement to this prospectus and you should not consider any information on, or that can be accessed through, our website as part of this prospectus or any supplement to this prospectus (other than those filings with the SEC that we specifically incorporate by reference into this prospectus or any supplement to this prospectus). You may also access these filings at the SEC's website at *www.sec.gov*.

Any statement contained in a document incorporated or deemed to be incorporated by reference in this prospectus will be deemed modified, superseded or replaced for purposes of this prospectus to the extent that a statement contained in this prospectus modifies, supersedes or replaces such statement.

2,743,530 Shares of Common Stock

PROSPECTUS

April 29, 2024