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PROSPECTUS SUPPLEMENT
(To Prospectus Dated May 19, 2023)

iTeos Therapeutics, Inc.
1,142,857 Shares of Common Stock
Pre-Funded Warrant to Purchase up to 5,714,285 Shares of Common Stock

We are offering directly to Boxer Capital, LLC ("Boxer Capital") 1,142,857 shares of our common stock, par value $0.001 per share (the "Common Stock"), and to RA Capital Healthcare Fund, L.P. ("RA Capital Management" and together with Boxer Capital, the "Investors") a pre-funded warrant to purchase up to 5,714,285 shares of Common Stock. This prospectus supplement also relates to the offering of the shares of Common Stock issuable upon exercise of the pre-funded warrant. The pre-funded warrant will have an exercise price of $0.001 per share of our Common Stock. The aggregate consideration for the Common Stock is $19,999,997.50, or $17.50 per share of Common Stock and the aggregate consideration for the pre-funded warrant is $99,994,273.22, or $17.499 per share of Common Stock underlying the pre-funded warrant, which, together with the per share exercise price, is equal to $17.50 per share of Common Stock. The pre-funded warrant will be exercisable on or after the date of issuance and will not expire. For a more detailed description of the pre-funded warrant, see the section entitled "Description of the Securities We Are Offering – Pre-Funded Warrant" beginning on page S-9 of this prospectus supplement.

Our Common Stock is listed on The Nasdaq Global Market ("Nasdaq") under the symbol "ITOS". On May 9, 2024, the closing price of our Common Stock as reported on Nasdaq was $12.19 per share. There is no established public trading market for the pre-funded warrant, and we do not expect a market to develop. In addition, we do not intend to apply for listing of the pre-funded warrant on any national securities exchange or other nationally recognized trading system.

Investing in our securities involves a high degree of risk. See the information contained under "Risk Factors" beginning on page S-5 of this prospectus supplement and the documents incorporated by reference herein.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus supplement or the accompanying prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The date of this Prospectus Supplement is May 10, 2024

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PROSPECTUS SUPPLEMENT

PROSPECTUS

ABOUT THIS PROSPECTUS SUPPLEMENT

This prospectus supplement and the accompanying prospectus relates to part of a "shelf" registration statement that was initially filed with the Securities and Exchange Commission (the "SEC") on May 10, 2023 and declared effective on May 19, 2023. This prospectus supplement and the accompanying prospectus include or incorporate by reference important information about us, our pre-funded warrant, our Common Stock and other matters you should know before investing. You should read both this prospectus supplement and the accompanying prospectus as well as additional information described under "Where You Can Find More Information" in this prospectus supplement before making an investment decision.

You should rely only on the information contained in or incorporated or deemed to be incorporated by reference into this prospectus supplement, the accompanying prospectus and any free writing prospectuses we provide you. We have not authorized anyone to provide you with information that is in addition to, or different from, that contained or incorporated by reference in this prospectus supplement, the accompanying prospectus or in any free writing prospectuses we have provided you. If anyone provides you with different or inconsistent information, you should not rely on it. We are not offering to sell securities in any jurisdiction where such offer or sale is not permitted. You should not assume that the information contained or incorporated by reference in this prospectus supplement or the accompanying prospectus is accurate as of any date other than as of the date of the applicable document. Our business, financial condition, liquidity, results of operations, and prospects may have changed since those dates.

This prospectus supplement may add to, update or change the information in the accompanying prospectus or the documents incorporated by reference herein. If information in this prospectus supplement is inconsistent with information in the accompanying prospectus or the documents incorporated by reference herein, this prospectus supplement will apply and will supersede that information in the accompanying prospectus or the documents incorporated by reference herein. We use various trademarks and trade names in our business, including without limitation our corporate name and logo. All other trademarks or trade names referred to in this prospectus supplement or the accompanying prospectus are the property of their respective owners. Solely for convenience, the trademarks and trade names in this prospectus may be referred to without the ® and ™ symbols, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto. We are offering to sell, and seeking offers to buy, shares of our Common Stock only in jurisdictions where such offers and sales are permitted. The distribution of this prospectus supplement and the offering of our Common Stock in certain jurisdictions may be restricted by law.

Unless the context suggests otherwise, all references in this prospectus supplement to "us," "our," "iTeos," "we," the "Company" and similar designations refer to iTeos Therapeutics, Inc. and, where appropriate, our subsidiary.

PROSPECTUS SUPPLEMENT SUMMARY

This summary highlights certain information about us, this offering and selected information contained in or incorporated by reference into this prospectus supplement and the accompanying prospectus from our annual report on Form 10-K for the year ended December 31, 2023, and other filings with the SEC listed below under the heading "Incorporation of Certain Information by Reference." This summary is not complete and does not contain all of the information that you should consider before deciding whether to invest in our securities. For a more complete understanding of our company and this offering, we encourage you to read and consider carefully the matters discussed in the section titled "Risk Factors" in this prospectus supplement and the accompanying prospectus, and in other periodic reports incorporated by reference herein, and the section titled "Management's Discussion and Analysis of Financial Condition and Results of Operation" and the financial statements and the notes to those financial statements each incorporated by reference in this prospectus supplement or the accompanying prospectus.

Overview

We are a clinical-stage biopharmaceutical company pioneering the discovery and development of a new generation of immuno-oncology therapeutics for people living with cancer. By leveraging our deep understanding of tumor immunology and immunosuppressive pathways, we design novel product candidates with optimized pharmacologic properties to improve clinical outcomes by restoring the immune response against cancer.

Our innovative pipeline includes three clinical-stage programs targeting novel, validated immuno-oncology pathways. Our lead antibody product candidate, belrestotug, is an antagonist of TIGIT, or T-cell immunoreceptor with lg and ITIM domains, an immune checkpoint with multiple mechanisms of action. Belrestotug was selected for its affinity for TIGIT, its potency and its potential to engage the FcgR to activate dendritic cells, natural killer cells and macrophages and to promote cytokine release, activation of antigen presenting cells and ADCC activity. In 2020, we initiated an open-label Phase 1/2a clinical trial of belrestotug in adult cancer patients with advanced solid tumors. In April 2021, we reported preliminary safety, pharmacokinetic, engagement and pharmacodynamic data, indicating target engagement and early evidence of clinical activity as a single agent.

On June 11, 2021, our wholly owned subsidiary, iTeos Belgium S.A., and GlaxoSmithKline Intellectual Property (No. 4) Limited ("GSK") executed a Collaboration and License Agreement (the "GSK Collaboration Agreement"), which became effective on July 26, 2021. Pursuant to the GSK Collaboration Agreement, we granted GSK a license under certain of our intellectual property rights to develop, manufacture, and commercialize products comprised of or containing belrestotug, which license is exclusive in all countries outside of the United States and co-exclusive, with iTeos, in the United States. GSK and iTeos intend to develop belrestotug in combination with other oncology assets of GSK, and iTeos and GSK will jointly own the intellectual property created under the GSK Collaboration Agreement that covers such combinations.

In partnership with GSK, we are enrolling patients with first line non-small cell lung cancer ("NSCLC") in a randomized Phase 2 platform study assessing the doublet of GSK's anti-PD-1 (Jemperli (dostarlimab-gxly)) with belrestotug and in combination with GSK'608, GSK's investigational anti-CD96 antibody, nelistotug. Interim assessment of this study exceeded pre-defined efficacy criteria for clinically relevant activity with clinically meaningful tumor reduction and showed an acceptable safety profile in line with the TIGIT:PD-1 class. In addition, we are enrolling patients in a randomized Phase 2 platform study assessing dostarlimab with belrestotug and other novel IO combinations, including nelistotug. In the TIG-006 trial assessing the doublet of dostarlimab with belrestotug in patients with first-line head and neck squamous cell carcinoma (Cohorts 2C and 2D), we completed enrollment in the first portion of the Phase 2 expansion part of the trial. We and GSK agreed to not

continue beyond stage 1 recruitment in these open-label cohorts in order to focus on the randomized, controlled GALAXIES H&N-202 platform study. We and GSK continue to explore two novel triplets in selected advanced solid tumors both in Phase 1b trials: belrestotug with dostarlimab and GSK's investigational anti-CD96 antibody, and belrestotug with dostarlimab and GSK'562, GSK's anti-PVRIG.

We are also advancing inupadenant, a next-generation adenosine A2A receptor antagonist tailored to overcome the specific adenosine-mediated immunosuppression found in the tumor microenvironment, into proof-of concept trials in several indications following encouraging single-agent activity in Phase 1. We investigated inupadenant in an open-label multi-arm Phase 1/2a clinical trial in adult cancer patients with advanced solid tumors. The single-agent dose-escalation and expansion portions of our Phase 1/2a clinical trial of inupadenant have demonstrated durable monotherapy antitumor activity in some patients with advanced solid tumors and safety consistent with previously reported results. We also completed enrollment of patients in the dose escalation portion (Part 1) of an ongoing two-part Phase 2 trial in post-IO metastatic NSCLC to evaluate the combination of inupadenant with platinum-doublet chemotherapy compared to standard platinum-doublet chemotherapy.

Our most recent program to initiate clinical trials is EOS-984, a potentially first-in-class small molecule focused on a new mechanism in the adenosine pathway by targeting equilibrative nucleoside transporter 1, or ENT1, a dominant transporter of adenosine on lymphocytes involved in T cell metabolism, expansion, effector function, and survival. EOS-984 has the potential to fully reverse adenosine immune suppression, as a monotherapy and in combination with inupadenant and other standards of care. We are enrolling patients in the dose escalation of the Phase 1 trial in advanced malignancies.

Corporate Information

We were incorporated in October 2019 under the laws of the State of Delaware. Our principal executive offices are located at 321 Arsenal Street, Watertown, Massachusetts 02472, and our telephone number is (339) 217-0162. Our Belgian subsidiary, iTeos Belgium SA, was incorporated in August 2011 under the laws of Belgium. Our website address is www.iteostherapeutics.com. No portion of our website is incorporated by reference into this prospectus supplement or the accompanying prospectus, and you should not consider any information on, or that can be accessed through, our website as part of this prospectus supplement or the accompanying prospectus. Our Common Stock trades on The Nasdaq Global Market under the symbol "ITOS."

THE OFFERING

Common Stock to be outstanding after this offering	42,700,898 shares if the pre-funded warrant offered hereby is exercised in full.
Common Stock offered by us	1,142,857 shares. For additional information regarding our Common Stock, see "Description of Capital Stock" in the accompanying prospectus.
Pre-funded warrant offered by us	We are offering directly to RA Capital Management a pre-funded warrant to purchase up to 5,714,285 shares of Common Stock, which will be exercisable beginning on the date of issuance and will not expire, subject to an ownership limitation, at an exercise price per share equal to equal to $0.001. For additional information regarding the pre-funded warrant, see "Description of the Securities We Are Offering – Pre-Funded Warrant." This prospectus supplement also relates to the offering of the shares of Common Stock issuable upon exercise of the pre-funded warrant.
Listing	Our Common Stock is listed on the Nasdaq Global Market under the symbol "ITOS." There is no established public trading market for the pre-funded warrant and we do not expect a market to develop. In addition, we do not intend to apply for listing of the pre-funded warrant on any national securities exchange or other nationally recognized trading system.
Use of proceeds	We intend to use the net proceeds from this offering to advance our clinical programs and preclinical pipelines, and for working capital and other general corporate purposes. See "Use of Proceeds."
Risk factors	Investing in our securities involves risks. See "Risk Factors" beginning on page S-5 of this prospectus supplement and under similar headings in the documents incorporated by reference herein for a discussion of the factors you should carefully consider before deciding to invest in our securities.
Nasdaq Global Market symbol:	ITOS

All information in this prospectus supplement related to the number of shares of our Common Stock to be outstanding immediately after this offering is based on 35,843,756 shares of our Common Stock outstanding as of March 31, 2024. It does not include:

- shares of Common Stock issuable upon the exercise of stock options outstanding under our 2019 Stock Option and Grant Plan and our Amended and Restated 2020 Stock Option and Incentive Plan (the "Amended 2020 Plan"), as of March 31, 2024;
- shares of Common Stock issuable upon the vesting of restricted stock units under our 2019 Stock Option and Grant Plan and our Amended 2020 Plan as of May 3, 2024;
- 10,907,819 shares of Common Stock reserved and available for issuance under our Amended 2020 Plan as of March 31, 2024; and
- 612,642 shares of Common Stock reserved for future issuance under our 2020 Employee Stock Purchase Plan as of March 31, 2024.

RISK FACTORS

Investing in our securities involves a high degree of risk. Before making an investment decision, you should carefully consider the risks and uncertainties described below and set forth in our filings with the SEC that are incorporated by reference herein, including the risk factors in our most recent Annual Report on Form 10-K, which is incorporated by reference in this prospectus supplement and the accompanying prospectus, and all of the other information in this prospectus supplement and the accompanying prospectus, including our financial statements and related notes incorporated by reference herein and therein. See "Where You Can Find More Information." If any of these risks is realized, our business, financial condition, results of operations and prospects could be materially and adversely affected. In that event, the trading price of our common stock could decline and you could lose part or all of your investment. Additional risks and uncertainties that are not yet identified or that we currently believe to be immaterial may also materially harm our business, financial condition, results of operations and prospects and could result in a complete loss of your investment.

Risks Related to the Pre-Funded Warrant, the Common Stock and this Offering

We have broad discretion in the use of the net proceeds from this offering and may not use them effectively.

Our management will have broad discretion in the application of the net proceeds from this offering and could spend the proceeds in ways that do not necessarily improve our results of operations or enhance the value of our Common Stock. Our failure to apply these funds effectively could have a material adverse effect on our business, financial condition, operating results and cash flow, and could cause the price of our Common Stock to decline.

There is no public market for the pre-funded warrant in this offering.

There is no established public trading market for the pre-funded warrant being offered in this offering, and we do not expect a market to develop. In addition, we do not intend to apply for listing of the pre-funded warrant on any national securities exchange or other nationally recognized trading system. Without an active market, the liquidity of the pre-funded warrant will be limited.

Any holder of the pre-funded warrant will have no rights as common stockholder until such holder exercises its pre-funded warrant and acquires our Common Stock.

Until the holder of the pre-funded warrant exercises its pre-funded warrant and acquires shares of our Common Stock, such holder will have no rights with respect to the shares of our Common Stock underlying such pre-funded warrant, except as explicitly provided by the terms of the pre-funded warrant. Upon exercise of the pre-funded warrant, the holder will be entitled to exercise the rights of a common stockholder only as to matters for which the record date occurs after the exercise date.

A significant holder or beneficial holder of our Common Stock may not be permitted to exercise the pre-funded warrant that it holds.

A holder of the pre-funded warrant will not be entitled to exercise any portion of the pre-funded warrant that, upon giving effect to such exercise, would cause the aggregate number of shares of our Common Stock beneficially owned by such holder (together with its affiliates and any other persons whose beneficial ownership of Common Stock would be aggregated with the holder for purposes of Section 13(d) of the Securities Exchange Act of 1934, as amended (the "Exchange Act")) to exceed 9.99% of the total number of then issued and outstanding shares of Common Stock, as such percentage ownership is determined in accordance with the terms of the pre-funded warrant and subject to such holder's rights under the pre-funded warrant to increase or decrease such percentage to any other percentage not in excess of 19.99% upon at least 61 days' prior notice from such holder to us. As a result, you may not be able to exercise your pre-funded warrant for shares of our Common Stock at a time when it would be financially beneficial for you to do so. In such a circumstance, you could seek to sell your pre-funded warrant to realize value, but you may be unable to do so in the absence of an established trading market.

CAUTIONARY STATEMENT ON FORWARD-LOOKING STATEMENTS

This prospectus supplement, the accompanying prospectus, and the information incorporated by reference in this prospectus supplement and the accompanying prospectus contain forward-looking statements. All statements, other than statements of historical facts, contained or incorporated by reference in this prospectus supplement or the accompanying prospectus are forward-looking statements. In some cases, you can identify forward-looking statements by words such as "anticipate," "believe," "contemplate," "continue," "could," "estimate," "expect," "intend," "may," "plan," "potential," "predict," "project," "seek," "should," "target," "will," "would" or the negative of these words or other comparable terminology, although not all forward-looking statements contain these identifying words. Forward-looking statements include, but are not limited to, statements about:

- the timing, progress and success of our clinical trials of belrestotug, inupadenant, EOS-984 and any other product candidates, including statements regarding the timing of initiation and completion of studies or trials and related preparatory work, the period during which the results of the trials will become available and our research and development programs;
- whether the results of our trials will be sufficient to support domestic or foreign regulatory filings or approvals for our product candidates;
- regulatory actions with respect to our product candidates or our competitors' products and product candidates;
- our ability to obtain, including on an expedited basis, and maintain regulatory approval of our product candidates or any other product candidates that we may identify and pursue;
- the outcomes of our preclinical studies;
- our ability to enroll patients in our clinical trials at the pace that we project;
- the costs of development of our product candidates or clinical development programs;
- our expectations regarding the anticipated development of our pipeline of candidates;
- the period of time over which our existing capital resources will be sufficient to fund our operating expenses and capital expenditures, and the degree to which such resources will enable us to fund our planned development of our product candidates;
- the potential attributes and clinical benefits of our product candidates;
- our ability to successfully establish or maintain collaborations or strategic relationships for our product candidates;
- the expected benefits of collaborations, including potential milestones and royalty payments from GSK
- pursuant to the GSK Collaboration Agreement (each as defined herein);
- the rate and degree of market acceptance of our product candidates;
- our ability to obtain orphan drug or Breakthrough Therapy designation or other accelerated approval for any of our product candidates;
- our ability to manufacture our product candidates in conformity with the Food and Drug Administration's requirements and to scale up manufacturing of our product candidates to commercial scale, if approved;
- our ability to compete with companies currently producing or engaged in the clinical development of treatments for the disease indications that we pursue or treatment modalities that we develop;
- our reliance on third parties to conduct our clinical trials;
- our reliance on third-party contract manufacture organizations (CMOs) to manufacture and supply our product candidates for us;
- our ability to retain and recruit key personnel;

- our ability to use the proceeds of this offering in ways that increase the value of your investment;
- our ability to obtain and maintain intellectual property protection for our product candidates;
- our estimates of our expenses, ongoing losses, future revenue, cash runway, capital requirements and our need for or ability to obtain additional financing;
- our expectations regarding the time during which we will be an emerging growth company under the Jumpstart Our Business Startups Act, or JOBS Act;
- our future financial performance;
- the impact of laws and regulations applicable to our industry;
- developments and projections relating to our competitors or our industry; and
- other risks and uncertainties, including those listed under the caption "Risk Factors" beginning on page S-5.

Any forward-looking statements presented in this prospectus supplement or the accompanying prospectus, are based on management's beliefs and assumptions, and information currently available to management. These forward-looking statements are neither promises nor guarantees of future performance due to a variety of risks and uncertainties, many of which are beyond our control, which could cause actual results to differ materially from those indicated by these forward-looking statements, including, without limitation, interim and early data may change as more patient data become available and are subject to audit and verification procedures; that expected benefits and opportunities related to the GSK Collaboration Agreement may not be realized or may take longer to realize than expected due to a variety of reasons, including any inability of the parties to perform their commitments and obligations under the GSK Collaboration Agreement and challenges and uncertainties inherent in product research and development and biologics manufacturing; we may encounter unanticipated costs or may expend cash more rapidly or more slowly than currently anticipated; success in preclinical testing and early clinical trials does not ensure that later clinical trials will be successful, and early results from a clinical trial do not necessarily predict final results; the data for our product candidates may not be sufficient for obtaining regulatory approval to move into later stage trials or to commercialize products; we may not be able to execute on our business plans, including meeting our expected or planned regulatory milestones and timelines, research and clinical development plans, and bringing our product candidates to market, for various reasons, some of which may be outside of our control, including possible limitations of our financial and other resources, manufacturing limitations that may not be anticipated or resolved for in a timely manner, regulatory, court or agency decisions such as decisions by the United States Patent and Trademark Office with respect to patents that cover our product candidates; as well as the risk factors and cautionary statements described in other documents that we file from time to time with the SEC, specifically under "Item 1A: Risk Factors" and elsewhere in our most recent Annual Report on Form 10-K, and in any subsequent SEC filing, and the section of this prospectus supplement titled "Risk Factors" beginning on page S-5.

Given these uncertainties, you should not place undue reliance on these forward-looking statements. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures or investments we may make or enter into. Except as required by law, we assume no obligation to update or revise these forward-looking statements for any reason, whether as a result of new information, future events or otherwise.

USE OF PROCEEDS

We estimate that our net proceeds from the sale of the securities offered pursuant to this prospectus supplement will be approximately $120 million after deducting estimated offering expenses that are payable by us. We anticipate that the net proceeds from the sale of the securities offered under this prospectus supplement will be used to advance our clinical programs and preclinical pipeline, and for working capital and other general corporate purposes.

DESCRIPTION OF THE SECURITIES WE ARE OFFERING

Pre-Funded Warrant

We are offering a pre-funded warrant to purchase up to 5,714,285 shares of Common Stock. The following is a brief summary of certain terms and conditions of the pre-funded warrant. The following description is subject in all respects to the provisions contained in the pre-funded warrant. The pre-funded warrant will be filed as an exhibit to our Current Report on Form 8-K that we expect to file with the SEC in connection with this offering.

Term

The pre-funded warrant does not expire.

Exercisability

The pre-funded warrant is exercisable at any time after their original issuance. The pre-funded warrant will be exercisable, at the option of the holder, in whole or in part by delivering to us a duly executed exercise notice and by payment in full of the exercise price in immediately available funds for the number of shares of Common Stock purchased upon such exercise. As an alternative to payment in immediately available funds, the holder may elect to exercise the pre-funded warrant through a cashless exercise, in which the holder would receive upon such exercise the net number of shares of Common Stock determined according to the formula set forth in the pre-funded warrant. No fractional shares of Common Stock will be issued in connection with the exercise of the pre-funded warrant. In lieu of any fractional shares that would otherwise be issuable upon exercise, we will pay in cash to the holder the fair market value, determined according to the terms of the pre-funded warrant, for any such fractional shares.

Exercise Limitations

Under the pre-funded warrant, we may not effect the exercise of the pre-funded warrant, and the holder will not be entitled to exercise any portion of the pre-funded warrant, which, upon giving effect to such exercise, would cause the aggregate number of shares of our Common Stock beneficially owned by the holder (together with its attribution parties (as defined below)) to exceed 9.99% of the number of shares of our Common Stock that would be outstanding immediately after giving effect to the exercise. However, the holder may increase or decrease such percentage to any other percentage not in excess of 19.99% upon at least 61 days' prior notice from the holder to us. For purposes of the foregoing, "attribution parties" means, collectively, the following persons and entities with respect to the holder: (i) its direct and indirect affiliates, (ii) any person acting or who could be deemed to be acting as a Section 13(d) "group" together with the holder or any attribution parties and (iii) any other persons whose beneficial ownership of our Common Stock would or could be aggregated with the holder and/or any other attribution parties for purposes of Section 13(d) or Section 16 of the Exchange Act.

Exercise Price

The exercise price per whole share of our Common Stock purchasable upon the exercise of the pre-funded warrant is $0.001 per share of Common Stock. The exercise price of the pre-funded warrant and the number of shares of our Common Stock issuable upon exercise of the pre-funded warrant are subject to appropriate adjustment in the event of certain stock dividends and distributions, stock splits, stock combinations, reclassifications or similar events affecting our Common Stock.

Charges, Taxes and Expenses

Issuance and delivery for shares of Common Stock upon exercise of the pre-funded warrant will be made without charge to the holder for any issue or transfer tax, transfer agent fee or other incidental tax or expense (excluding any applicable stamp duties) in respect of the issuance thereof, all of which taxes and expenses shall be paid by

us. However, we are not required to pay any tax that may be payable in respect of any transfer involved in the registration of any warrant shares or pre-funded warrant in a name other than that of the holder or an affiliate thereof. The holder shall be responsible for all other tax liability that may arise as a result of holding or transferring its pre-funded warrant or receiving shares of Common Stock upon exercise thereof.

Transferability

Subject to applicable laws, the pre-funded warrant may be assigned by the holder without our consent. The ownership of the pre-funded warrant and any transfers of the pre-funded warrants will be registered in a warrant register maintained by the warrant agent. We will initially act as warrant agent.

Exchange Listing

We do not plan on applying to list the pre-funded warrant on The Nasdaq Global Market, any other national securities exchange or any other nationally recognized trading system.

Fundamental Transactions

In the event of a "fundamental transaction" (as described in the pre-funded warrant and generally including but not limited to any reorganization, recapitalization, spin-off or reclassification of our Common Stock, the sale, transfer or other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the tender and acceptance for payment of shares representing more than 50% of the voting power of our capital stock pursuant to any tender or exchange offer (whether by us or another person), the acquisition by another person of more than 50% of the voting power of our capital stock pursuant to a stock purchase agreement or other business combination (except for any such transaction in which our stockholders immediately prior to such transaction maintain, in substantially the same proportions, voting power of us immediately after the transaction)), upon consummation of such a fundamental transaction, the holder of the pre-funded warrant will be entitled to receive upon exercise of the pre-funded warrant the kind and amount of securities, cash or other property that the holder would have received had they exercised the pre-funded warrant immediately prior to such fundamental transaction without regard to any limitations on exercise contained in the pre-funded warrant.

No Rights as a Stockholder

Except by virtue of the holder's ownership of shares of our Common Stock, the holder of the pre-funded warrant does not have the rights or privileges of a holder of our Common Stock, including any voting rights, until the holder exercises the pre-funded warrant. In the event of certain distributions, including cash dividends, if any, to all holders of our Common Stock for no consideration, the holder of the pre-funded warrant shall be entitled to participate in such distributions to the same extent as if the holder held the number of shares of our Common Stock acquirable upon exercise of its pre-funded warrant (without regard to any limitations on exercise). If such distribution would result in the holder and the other attribution parties exceeding the exercise limitations described above, a portion of such distribution shall be held in abeyance for the benefit of the holder until the earlier of such time as the ownership limitations would not be exceeded or the warrant is exercised.

Common Stock

The material terms and provisions of our Common Stock are described under the caption "Description of Capital Stock" in the accompanying prospectus. This prospectus supplement also relates to the offering of the shares of Common Stock issuable upon exercise of the pre-funded warrant.

PLAN OF DISTRIBUTION

We have agreed to sell directly to the Investors 1,142,857 shares of our Common Stock and a pre-funded warrant to purchase up to 5,714,285 shares of our Common Stock pursuant to this prospectus supplement. The aggregate consideration for this offering is approximately $120 million.

No underwriters or agents were engaged by us for this transaction. We have entered into a securities purchase agreement directly with the Investors in connection with this offering. The securities purchase agreement contains certain representations, warranties and covenants for the benefit of the parties to the securities purchase agreement and should not be relied upon by any of our Investors who are not parties to the agreement, nor should any such Investors rely upon any descriptions thereof as characterizations of the actual state of facts or condition. Such Investors are not third-party beneficiaries under the securities purchase agreement.

The purchase and sale of the pre-funded warrant under the securities purchase agreement (and the shares issuable upon exercise of the pre-funded warrant) are being registered pursuant to our shelf registration statement on Form S-3 (File No. 333-271793), as to which this prospectus supplement relates.

The foregoing description of the securities purchase agreement is only a summary, does not purport to be complete and is qualified in its entirety by reference to the securities purchase agreement, a copy of which will be attached to a Current Report on Form 8-K in connection with this offering.

DIVIDEND POLICY

We have never declared or paid cash dividends on our capital stock. We intend to retain all of our future earnings, if any, for the foreseeable future to finance the growth and development of our business. We do not intend to pay cash dividends to our stockholders in the foreseeable future.

LEGAL MATTERS

The validity of the Common Stock and the pre-funded warrant (and shares of Common Stock issuable upon exercise of the pre-funded warrant) offered by this prospectus supplement will be passed upon for us by Ropes & Gray LLP, Boston, Massachusetts.

EXPERTS

The financial statements of iTeos Therapeutics, Inc. incorporated by reference in this Prospectus have been audited by Deloitte Bedrijfsrevisoren/Réviseurs d'Entreprises BV/SRL, an independent registered public accounting firm, as stated in their report. Such financial statements are incorporated by reference in reliance upon the report of such firm, given their authority as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We file annual, quarterly and current reports, proxy statements and other information with the SEC. Our SEC filings are available to the public over the Internet at the SEC's website at www.sec.gov. Copies of certain information filed by us with the SEC are also available on our website at www.iteostherapeutics.com. Our website is not a part of this prospectus and is not incorporated by reference in this prospectus.

This prospectus is part of a registration statement we filed with the SEC. This prospectus omits some information contained in the registration statement in accordance with SEC rules and regulations. You should review the information and exhibits in the registration statement for further information on us and the securities we are offering. Statements in this prospectus concerning any document we filed as an exhibit to the registration statement or that we otherwise filed with the SEC are not intended to be comprehensive and are qualified by reference to these filings. You should review the complete document to evaluate these statements. You can obtain a copy of the registration statement from the SEC at the address listed above or from the SEC's website.

INCORPORATION OF CERTAIN INFORMATION BY REFERENCE

The SEC allows us to incorporate by reference the information we file with the SEC, which means that we can disclose important information to you by referring you to those publicly available documents. The information that we incorporate by reference in this prospectus supplement is considered to be part of this prospectus supplement.

Because we are incorporating by reference future filings with the SEC, this prospectus supplement and the accompanying prospectus are continually updated and those future filings may modify or supersede some of the information included or incorporated in this prospectus. This means that you must look at all of the SEC filings that we incorporate by reference to determine if any of the statements in this prospectus supplement, the accompanying prospectus or in any document previously incorporated by reference have been modified or superseded. This prospectus supplement incorporates by reference the documents listed below and any future filings made by us with the SEC under Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act (in each case, other than those documents or the portions of those documents not deemed to be filed) between the date of the initial registration statement and until the offering of the securities under the registration statement is terminated or completed:

- our Annual Report on Form 10-K for the fiscal year ended December 31, 2023, filed with the SEC on March 6, 2024;
- our Definitive Proxy Statement on Schedule 14A (other than information furnished rather than filed), filed with the SEC on April 25, 2024; and
- the description of our common stock contained in our registration statement on Form 8-A filed with the SEC on July 21, 2020, including any amendments or reports filed for the purposes of updating this description.

Notwithstanding the foregoing, unless specifically stated to the contrary, information that we furnish (and that is not deemed "filed" with the SEC) under Items 2.02 and 7.01 of any Current Report on Form 8-K, including the related exhibits under Item 9.01, is not incorporated by reference into this prospectus supplement, the accompanying prospectus or the registration statement of which this prospectus supplement is a part.

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PROSPECTUS

$300,000,000

Common Stock
Preferred Stock
Warrants
Units

We may offer and sell from time to time up to $300,000,000 in aggregate principal amount of our common stock, preferred stock, warrants and/or units in one or more offerings and in any combination. This prospectus describes the general terms of these securities and the general manner in which these securities will be offered. We will provide the specific terms of these securities in one or more supplements to this prospectus. The prospectus supplements will also describe the specific manner in which these securities will be offered and may also supplement, update or amend information contained in this document. You should carefully read this prospectus and any applicable prospectus supplement or amendment as well as the documents incorporated or deemed to be incorporated by reference in this prospectus before you invest in our securities.

We may offer these securities in amounts, at prices and on terms determined at the time of offering. The securities may be sold directly to you, through agents, or through underwriters and dealers. If agents, underwriters or dealers are used to sell the securities, we will name them and describe their compensation in a prospectus supplement.

Our common stock is listed on The Nasdaq Global Market under the symbol "ITOS." On May 9, 2023, the closing price for our common stock, as reported on The Nasdaq Global Market, was $14.18 per share.

Investing in our securities involves significant risks. See "Risk Factors" included in any accompanying prospectus supplement and in the documents incorporated by reference in this prospectus for a discussion of the factors you should carefully consider before deciding to purchase these securities.

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

The date of this prospectus is May 19, 2023

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ABOUT THIS PROSPECTUS

This prospectus is part of a registration statement on Form S-3 that we filed with the SEC using a "shelf" registration process. Under this shelf registration process, from time to time, we may sell any combination of the securities described in this prospectus in one or more offerings for an aggregate of up to $300,000,000.

This prospectus provides you with a general description of the securities we may offer. Each time we offer securities under this prospectus, we will provide one or more prospectus supplements that will contain specific information about the terms of the offering. We may also authorize one or more free writing prospectuses to be provided to you that may contain material information relating to these offerings. Each prospectus supplement and any related free writing prospectus may also add, update or change information contained in this prospectus or the documents incorporated by reference into this prospectus. You should read both this prospectus and the accompanying prospectus supplement and any related free writing prospectus together with the additional information described under the heading "Where You Can Find More Information" and "Incorporation of Certain Information by Reference" before you invest in our securities.

This prospectus does not include all of the information that is in the registration statement. We refer you to the registration statement and its exhibits for additional information about us and the securities that may be sold under this prospectus. We further note that the representations, warranties and covenants made by us in any agreement that is filed as an exhibit to any document that is incorporated by reference in this prospectus were made solely for the benefit of the parties to such agreement, including, in some cases, for the purpose of allocating risk among the parties to such agreements, and should not be deemed to be a representation, warranty or covenant to you. Moreover, such representations, warranties or covenants were accurate only as of the date when made. Accordingly, such representations, warranties and covenants should not be relied on as accurately representing the current state of our affairs.

You should rely only on the information contained in or incorporated by reference in this prospectus, any accompanying prospectus supplement or in any related free writing prospectus filed by us with the SEC. We have not authorized anyone to provide you with different or additional information. This prospectus and any accompanying prospectus supplement do not constitute an offer to sell or the solicitation of an offer to buy any securities other than the securities described in any accompanying prospectus supplement or an offer to sell or the solicitation of an offer to buy such securities in any circumstances in which such offer or solicitation is unlawful. You should assume that the information appearing in this prospectus, any prospectus supplement, the documents incorporated by reference and any related free writing prospectus is accurate only as of their respective dates, even though this prospectus and any accompanying prospectus supplement may be delivered or securities may be sold on a later date. Our business, financial condition, results of operations and prospects may have changed materially since those dates.

Unless the context suggests otherwise, all references in this prospectus to "us," "our," "iTeos," "we," the "Company" and similar designations refer to iTeos Therapeutics, Inc. and, where appropriate, our subsidiary. We use various trademarks and trade names in our business, including without limitation our corporate name and logo. All other trademarks or trade names referred to in this prospectus are the property of their respective owners. Solely for convenience, the trademarks and trade names in this prospectus may be referred to without the ® and ™ symbols, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus, any related prospectus supplement or free writing prospectus and the information incorporated by reference in this prospectus contain forward-looking statements. All statements, other than statements of historical facts, contained or incorporated by reference in this prospectus are forward-looking statements. In some cases, you can identify forward-looking statements by words such as "anticipate," "believe," "contemplate," "continue," "could," "estimate," "expect," "intend," "may," "plan," "potential," "predict," "project," "seek," "should," "target," "will," "would" or the negative of these words or other comparable terminology, although not all forward-looking statements contain these identifying words. Forward-looking statements include, but are not limited to, statements about:

- the timing, progress and success of our clinical trials, including statements regarding the timing of initiation and completion of studies or trials and related preparatory work, the period during which the results of the trials will become available and our research and development programs;
- whether the results of our trials will be sufficient to support domestic or foreign regulatory filings or approvals;
- regulatory actions with respect to our product candidates or our competitors' products and product candidates;
- our ability to obtain, including on an expedited basis, and maintain regulatory approval of our product candidates;
- the outcomes of our preclinical studies;
- our ability to enroll patients in our clinical trials at the pace that we project;
- the costs of development of our product candidates or clinical development programs;
- the period of time over which our existing capital resources will be sufficient to fund our operating expenses and capital expenditures, and the degree to which such resources will enable us to fund our planned development of our product candidates;
- the potential attributes and clinical benefits of our product candidates;
- our ability to successfully establish or maintain collaborations or strategic relationships for our product candidates;
- the expected benefits of collaborations, including potential milestones and royalty payments from GSK (as defined herein) pursuant to the Collaboration Agreement (as defined herein);
- the rate and degree of market acceptance of our product candidates;
- our ability to obtain orphan drug or Breakthrough Therapy designation or other accelerated approval for any of our product candidates or any other product candidates that we may identify and pursue;
- our ability to manufacture our product candidates in conformity with the Food and Drug Administration's requirements and to scale up manufacturing of our product candidates to commercial scale, if approved;
- our ability to compete with companies currently producing or engaged in the clinical development of treatments for the disease indications that we pursue or treatment modalities that we develop;
- our reliance on third parties to conduct our clinical trials;
- our reliance on third-party contract manufacture organizations, or CMOs, to manufacture and supply our product candidates for us;
- our ability to retain and recruit key personnel;
- our ability to use the proceeds of this offering in ways that increase the value of your investment;

- our ability to obtain and maintain intellectual property protection for our product candidates;
- our estimates of our expenses, ongoing losses, future revenue, cash runway, capital requirements and our need for or ability to obtain additional financing;
- our expectations regarding the time during which we will be an emerging growth company under the Jumpstart Our Business Startups Act, or JOBS Act;
- our future financial performance;
- the effect of the COVID-19 pandemic, including mitigation efforts and economic effects, on any of the foregoing or other aspects of our business operations, including but not limited to our preclinical studies and future preclinical and clinical trials;
- the impact of laws and regulations applicable to our industry; and
- developments and projections relating to our competitors or our industry.

Any forward-looking statements that we may make in this prospectus or any accompanying prospectus supplement are based on management's beliefs and assumptions, and information currently available to management. These forward-looking statements are neither promises nor guarantees of future performance due to a variety of risks and uncertainties, many of which are beyond our control, which could cause actual results to differ materially from those indicated by these forward-looking statements, including, without limitation, that expected benefits and opportunities related to the Collaboration Agreement may not be realized or may take longer to realize than expected due to a variety of reasons, including any inability of the parties to perform their commitments and obligations under the Collaboration Agreement and challenges and uncertainties inherent in product research and development and biologics manufacturing; we may encounter unanticipated costs or may expend cash more rapidly or more slowly than currently anticipated; success in preclinical testing and early clinical trials does not ensure that later clinical trials will be successful, and early results from a clinical trial do not necessarily predict final results; the data for our product candidates may not be sufficient for obtaining regulatory approval to move into later stage trials or to commercialize products; we may not be able to execute on our business plans, including meeting our expected or planned regulatory milestones and timelines, research and clinical development plans, and bringing our product candidates to market, for various reasons, some of which may be outside of our control, including possible limitations of our financial and other resources, manufacturing limitations that may not be anticipated or resolved for in a timely manner, regulatory, court or agency decisions such as decisions by the United States Patent and Trademark Office with respect to patents that cover our product candidates and the impact of the COVID-19 pandemic; as well as the risk factors and cautionary statements described in other documents that we file from time to time with the SEC, specifically under "Item 1A: Risk Factors" and elsewhere in our most recent Annual Report on Form 10-K and our most recent Quarterly Report on Form 10-Q, and in any subsequent SEC filings, and in the "Risk Factors" section in the applicable prospectus supplement.

Given these uncertainties, you should not place undue reliance on these forward-looking statements. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures or investments we may make or enter into. Except as required by law, we assume no obligation to update or revise these forward-looking statements for any reason, whether as a result of new information, future events or otherwise.

SUMMARY

This summary highlights information contained in other parts of this prospectus or incorporated by reference in this prospectus from our Annual Report on Form 10-K for the year ended December 31, 2022, and our other filings with the SEC listed below under the heading "Incorporation of Information by Reference." This summary may not contain all the information that you should consider before investing in securities. You should read the entire prospectus and the information incorporated by reference in this prospectus carefully, including "Risk Factors" and the financial data and related notes and other information incorporated by reference, before making an investment decision. See "Cautionary Note Regarding Forward-Looking Statements."

Our Business

We are a clinical-stage biopharmaceutical company pioneering the discovery and development of a new generation of immuno-oncology therapeutics for people living with cancer. We leverage our deep understanding of tumor immunology and immunosuppressive pathways to design novel product candidates with the aim of restoring the immune response against cancer. Our innovative pipeline includes two clinical-stage programs targeting novel, validated immuno-oncology pathways. Each of our therapies in development has optimized pharmacologic properties designed to improve clinical outcomes. Our lead antibody product candidate, belrestotug (formerly EOS-448), is an antagonist of TIGIT, or T-cell immunoreceptor with lg and ITIM domains, an immune checkpoint with multiple mechanisms of action. Belrestotug was selected for its affinity for TIGIT, its potency and its potential to engage the Fc gamma receptor, or FcgR, to activate dendritic cells, natural killer cells and macrophages and to promote cytokine release, activation of antigen presenting cells and antibody-dependent cellular cytotoxicity, or ADCC, activity.

On June 11, 2021, our wholly owned subsidiary, iTeos Belgium S.A. and GlaxoSmithKline Intellectual Property (No. 4) Limited, or GSK, executed a Collaboration and License Agreement, or the Collaboration Agreement, which became effective on July 26, 2021. Pursuant to the Collaboration Agreement, we granted GSK a license under certain of our intellectual property rights to develop, manufacture, and commercialize products comprised of or containing belrestotug, which license is exclusive in all countries outside of the United States and co-exclusive, with iTeos, in the United States. GSK and iTeos intend to develop belrestotug in combination, including with other oncology assets of GSK, and iTeos and GSK will jointly own the intellectual property created under the Collaboration Agreement that covers such combinations.

We are also advancing inupadenant, a next-generation adenosine A_{2A} receptor antagonist tailored to overcome the specific adenosine-mediated immunosuppression found in tumor microenvironment, into proof-of concept trials in several indications following encouraging single-agent activity in Phase 1. We continue to progress research programs focused on additional targets that complement our TIGIT and adenosine pathway programs or address additional immunosuppressive pathways.

Implications of Being an Emerging Growth Company

We qualify as an "emerging growth company" as defined in the JOBS Act. As an emerging growth company, we may take advantage of specified reduced disclosure and other requirements that are otherwise applicable generally to public companies. We would cease to be an emerging growth company on the date that is the earliest of: (i) the last day of the fiscal year in which we have total annual gross revenues of $1.235 billion or more; (ii) December 31, 2025; (iii) the date on which we have issued more than $1 billion in nonconvertible debt during the previous three years; or (iv) the last date of the fiscal year in which we are deemed to be a large accelerated filer under the rules of the SEC, which requires the market value of our common stock that is held by non-affiliates to exceed $700 million as of the prior June 30th.

Corporate Information

We were incorporated in October 2019 under the laws of the State of Delaware. Our principal executive offices are located at 321 Arsenal Street, Watertown, Massachusetts 02472, and our telephone number is (339) 217-0161. Our Belgian subsidiary, iTeos Belgium SA, was incorporated in August 2011 under the laws of Belgium. Our website address is *www.iteostherapeutics.com*. No portion of our website is incorporated by reference into this prospectus and you should not consider any information on, or that can be accessed through, our website as part of this prospectus. Our common stock trades on The Nasdaq Global Market under the symbol "ITOS."

RISK FACTORS

Investing in our securities involves significant risks. Before making an investment decision with respect to the securities described in this prospectus and any accompanying prospectus supplement relating to a specific offering, you should carefully consider the risks and uncertainties described in this prospectus and any accompanying prospectus supplement or in any related free writing prospectus, and the risk factors set forth in our filings with the SEC that are incorporated by reference herein, including the risk factors in our most recent Annual Report on Form 10-K, in our subsequent Quarterly Reports on Form 10-Q and any of our subsequent filings with the SEC, each of which are incorporated by reference in this prospectus, and all of the other information in this prospectus, including our financial statements and related notes incorporated by reference herein. See "Where You Can Find More Information." If any of these risks is realized, our business, financial condition, results of operations and prospects could be materially and adversely affected.

USE OF PROCEEDS

We intend to use the net proceeds from the sale of any securities offered under this prospectus for general corporate purposes unless the applicable prospectus supplement provides otherwise. General corporate purposes may include research and development costs, sales and marketing costs, clinical studies, manufacturing development, the acquisition or licensing of other businesses or technologies, repayment and refinancing of debt, working capital and capital expenditures. We may temporarily invest the net proceeds in a variety of capital preservation instruments, including short-term, investment grade, interest bearing instruments and U.S. government securities, until they are used for their stated purpose. We have not determined the amount of net proceeds to be used specifically for such purposes. As a result, management will retain broad discretion over the allocation of net proceeds.

DILUTION

If there is a material dilution of the purchasers' equity interest from the sale of common equity securities offered under this prospectus, we will set forth in any prospectus supplement the following information regarding any such material dilution of the equity interests of purchasers purchasing securities in an offering under this prospectus:

- the net tangible book value per share of our equity securities before and after the offering;
- the amount of the increase in such net tangible book value per share attributable to the cash payments made by the purchasers in the offering; and
- the amount of the immediate dilution from the public offering price which will be absorbed by such purchasers.

DESCRIPTION OF CAPITAL STOCK

The following description of our capital stock is intended as a summary only. This description is based upon, and is qualified by reference to, our amended and restated certificate of incorporation, or our certificate of incorporation, our amended and restated bylaws, or bylaws, and applicable provisions of the Delaware General Corporation Law. This summary is not intended to be a complete description of our capital stock. You should read our certificate of incorporation and bylaws for the provisions that are important to you.

General

Our authorized capital stock consists of 150,000,000 shares of common stock, par value $0.001 per share, and 10,000,000 shares of preferred stock, par value $0.001 per share, all of which shares of preferred stock are undesignated.

As of March 31, 2023, 35,760,627 shares of our common stock were outstanding and held by 192 stockholders of record.

Common Stock

The holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of the stockholders. The holders of our common stock do not have any cumulative voting rights. Holders of our common stock are entitled to receive ratably any dividends declared by our board of directors out of funds legally available for that purpose, subject to any preferential dividend rights of any outstanding preferred stock. Our common stock has no preemptive rights, conversion rights or other subscription rights or redemption or sinking fund provisions.

In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in all assets remaining after payment of all debts and other liabilities and any liquidation preference of any outstanding preferred stock.

Exchange Listing

Our common stock is listed on The Nasdaq Global Market under the trading symbol “ITOS.”

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is Computershare Trust Company, N.A. The transfer agent and registrar’s address is 150 Royall Street, Canton, Massachusetts 02021, and its telephone number is (800) 962-4284.

Preferred Stock

Under our certificate of incorporation, our board of directors is authorized, without further action by our stockholders, to issue up to 10,000,000 shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences, sinking fund terms and the number of shares constituting, or the designation of, such series, any or all of which may be greater than the rights of common stock. The issuance of our preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon our liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change in control of our company or other corporate action.

Anti-Takeover Effects of our Certificate of Incorporation and Bylaws and Delaware Law

Our certificate of incorporation and bylaws include a number of provisions that may have the effect of delaying, deferring or preventing another party from acquiring control of us and encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Board Composition and Filling Vacancies

Our certificate of incorporation provides for the division of our board of directors into three classes serving staggered three-year terms, with one class being elected each year. Our certificate of incorporation also provides that directors may be removed only for cause and then only by the affirmative vote of the holders of two-thirds or more of the shares then entitled to vote at an election of directors. Furthermore, any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of our board, may only be filled by the affirmative vote of a majority of our directors then in office even if less than a quorum. The classification of directors, together with the limitations on removal of directors and treatment of vacancies, has the effect of making it more difficult for stockholders to change the composition of our board of directors.

No Written Consent of Stockholders

Our certificate of incorporation provides that all stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting, and that stockholders may not take any action by written consent in lieu of a meeting. This limit may lengthen the amount of time required to take stockholder actions and would prevent the amendment of our bylaws or removal of directors by our stockholders without holding a meeting of stockholders.

Meetings of Stockholders

Our certificate of incorporation and bylaws provide that only a majority of the members of our board of directors then in office may call special meetings of stockholders and only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of stockholders. Our bylaws limit the business that may be conducted at an annual meeting of stockholders to those matters properly brought before the meeting.

Advance Notice Requirements

Our bylaws establish advance notice procedures with regard to stockholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our stockholders. These procedures provide that notice of stockholder proposals must be timely given in writing to our corporate secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary date of the annual meeting for the preceding year. Our bylaws specify the requirements as to form and content of all stockholders' notices. These requirements may preclude stockholders from bringing matters before the stockholders at an annual or special meeting.

Amendment to Certificate of Incorporation and Bylaws

Any amendment of our certificate of incorporation must first be approved by a majority of our board of directors, and if required by law or our certificate of incorporation, must thereafter be approved by a majority of the outstanding shares entitled to vote on the amendment and a majority of the outstanding shares of each class entitled to vote thereon as a class, except that the amendment of the provisions relating to stockholder action, board composition, limitation of liability and the amendment of our bylaws and certificate of incorporation must

be approved by not less than two-thirds of the outstanding shares entitled to vote on the amendment, and not less than two-thirds of the outstanding shares of each class entitled to vote thereon as a class. Our bylaws may be amended by the affirmative vote of a majority of the directors then in office, subject to any limitations set forth in the bylaws; and may also be amended by the affirmative vote of at least two-thirds of the outstanding shares entitled to vote on the amendment, or, if our board of directors recommends that the stockholders approve the amendment, by the affirmative vote of the majority of the outstanding shares entitled to vote on the amendment, in each case voting together as a single class.

Undesignated Preferred Stock

Our certificate of incorporation provides for 10,000,000 authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of our stockholders, our board of directors could cause shares of preferred stock to be issued without stockholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent stockholder or stockholder group. In this regard, our certificate of incorporation grants our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Choice of forum

Our bylaws provide that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the exclusive forum for any state law claim for (i) any derivative action or proceeding brought on our behalf, (ii) any action asserting a breach of fiduciary duty by one or more of our directors, officers or employees, (iii) any action asserting a claim against us arising pursuant to the Delaware General Corporation Law or (iv) any action asserting a claim against us that is governed by the internal affairs doctrine, in each case subject to the Court of Chancery having personal jurisdiction over the indispensable parties named as defendants therein, or the Delaware Forum Provision. The Delaware Forum Provision will not apply to any causes of action arising under the Securities Act or the Exchange Act. Our bylaws further provide that, unless we consent in writing to an alternative forum, the United States District Court for the District of Massachusetts will be the sole and exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, or the Federal Forum Provision, as our principal office is located in Watertown, Massachusetts. In addition, our bylaws provide that any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and consented to the foregoing provisions. The enforceability of similar choice of forum provisions in other companies' certificates of incorporation and bylaws has been challenged in legal proceedings, and it is possible that a court could find these types of provisions to be inapplicable or unenforceable.

Section 203 of the Delaware General Corporation Law

We are subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions:

- before the stockholder became interested, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;

- upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances, but not the outstanding voting stock owned by the interested stockholder; or
- at or after the time the stockholder became interested, the business combination was approved by our board of directors and authorized at an annual or special meeting of the stockholders by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Section 203 defines a business combination to include:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, lease, pledge or other disposition involving the interested stockholder of 10% or more of the assets of the corporation;
- subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder; or
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

In general, Section 203 defines an interested stockholder as any entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by the entity or person.

DESCRIPTION OF WARRANTS

We may issue warrants to purchase common stock or preferred stock. We may offer warrants separately or together with one or more additional warrants, common stock, or preferred stock, or any combination of those securities in the form of units, as described in the applicable prospectus supplement. If we issue warrants as part of a unit, the accompanying prospectus supplement will specify whether those warrants may be separated from the other securities in the unit prior to the expiration date of the warrants. The applicable prospectus supplement will describe the following terms of any warrants:

- the specific designation and aggregate number of, and the offering price at which we will issue, the warrants;
- the currency or currency units in which the offering price, if any, and the exercise price are payable;
- the date on which the right to exercise the warrants will begin and the date on which that right will expire or, if you may not continuously exercise the warrants throughout that period, the specific date or dates on which you may exercise the warrants;
- whether the warrants are to be sold separately or with other securities as parts of units;
- whether the warrants will be issued in definitive or global form or in any combination of these forms, although, in any case, the form of a warrant included in a unit will correspond to the form of the unit and of any security included in that unit;
- any applicable material U.S. federal income tax consequences;
- the identity of the warrant agent for the warrants and of any other depositaries, execution or paying agents, transfer agents, registrars or other agents;
- the proposed listing, if any, of the warrants or any securities purchasable upon exercise of the warrants on any securities exchange;
- the designation and terms of any equity securities purchasable upon exercise of the warrants;
- if applicable, the designation and terms of the common stock or preferred stock with which the warrants are issued and, the number of warrants issued with each security;
- if applicable, the date from and after which any warrants issued as part of a unit and the related common stock or preferred stock will be separately transferable;
- the number of shares of common stock or preferred stock purchasable upon exercise of a warrant and the price at which those shares may be purchased;
- if applicable, the minimum or maximum amount of the warrants that may be exercised at any one time;
- information with respect to book-entry procedures, if any;
- the antidilution provisions of, and other provisions for changes to or adjustment in the exercise price of, the warrants, if any;
- any redemption or call provisions; and
- any additional terms of the warrants, including terms, procedures and limitations relating to the exchange or exercise of the warrants.

Specific warrant agreements will contain additional important terms and provisions and will be incorporated by reference as an exhibit to the registration statement of which this prospectus forms a part.

DESCRIPTION OF UNITS

The following description, together with the additional information that we include in any applicable prospectus supplements and in any related free writing prospectuses, summarizes the material terms and provisions of the units that we may offer under this prospectus. While the terms we have summarized below will apply generally to any units that we may offer under this prospectus, we will describe the particular terms of any series of units in more detail in the applicable prospectus supplement. The terms of any units offered under a prospectus supplement may differ from the terms described below.

We will file as exhibits to the registration statement of which this prospectus is a part, or will incorporate by reference from reports that we file with the SEC, the form of unit agreement that describes the terms of the series of units we are offering, and any supplemental agreements, before the issuance of the related series of units. The following summaries of material terms and provisions of the units are subject to, and qualified in their entirety by reference to, all the provisions of the unit agreement and any supplemental agreements applicable to a particular series of units. We urge you to read the applicable prospectus supplements related to the particular series of units that we may offer under this prospectus, as well as any related free writing prospectuses and the complete unit agreement and any supplemental agreements that contain the terms of the units.

General

We may issue units comprised of shares of common stock, preferred stock, and warrants in any combination. Each unit will be issued so that the holder of the unit is also the holder of each security included in the unit. Thus, the holder of a unit will have the rights and obligations of a holder of each included security. The unit agreement under which a unit is issued may provide that the securities included in the unit may not be held or transferred separately, at any time or at any time before a specified date.

We will describe in the applicable prospectus supplement the terms of the series of units, including:

- the title of the series of units;
- designation and terms of the units, including whether and under what circumstances the securities comprising the units may be held or transferred separately;
- the price or prices at which the units will be issued;
- a discussion of certain United States federal income tax considerations applicable to the units;
- any provisions of the governing unit agreement that differ from those described below; and
- any provisions for the issuance, payment, settlement, transfer or exchange of the units or of the securities comprising the units.

The provisions described in this section, as well as those described under “Description of Capital Stock,” and “Description of Warrants,” will apply to each unit and to the common stock, preferred stock and warrants included in each unit, respectively.

Issuance in Series

We may issue units in such amounts and in such numerous distinct series as we determine.

Enforceability of Rights by Holders of Units

Each unit agent will act solely as our agent under the applicable unit agreement and will not assume any obligation or relationship of agency or trust with any holder of any unit. A single bank or trust company may act as unit agent for more than one series of units. A unit agent will have no duty or responsibility in case of any

default by us under the applicable unit agreement or unit, including any duty or responsibility to initiate any proceedings at law or otherwise, or to make any demand upon us. Any holder of a unit may, without the consent of the related unit agent or the holder of any other unit, enforce by appropriate legal action its rights as holder under any security included in the unit.

Title

We, the unit agent and any of its agents, may treat the registered holder of any unit certificate as an absolute owner of the units evidenced by that certificate for any purpose and as the person entitled to exercise the rights attaching to the units so requested, despite any notice to the contrary.

PLAN OF DISTRIBUTION

We may sell securities through any one or more of the following methods from time to time:

- to or through one or more underwriters, brokers or dealers;
- through one or more agents;
- directly to one or more purchasers in negotiated sales or competitively bid transactions;
- through a block trade in which the broker or dealer engaged to handle the block trade will attempt to sell the securities as agent, but may position and resell a portion of the block as principal to facilitate the transaction; or
- through a combination of any of the above methods of sale.

We may directly solicit offers to purchase securities, or agents may be designated to solicit such offers. We will, in the prospectus supplement relating to such offering, name any agent that could be viewed as an underwriter under the Securities Act and describe any commissions that we must pay. Any such agent will be acting on a best efforts basis for the period of its appointment or, if indicated in the applicable prospectus supplement, on a firm commitment basis. This prospectus may be used in connection with any offering of our securities through any of these methods or other methods described in the applicable prospectus supplement.

The distribution of the securities may be effected from time to time in one or more transactions:

- at a fixed price, or prices, which may be changed from time to time;
- in "at the market offerings," within the meaning of Rule 415(a)(4) of the Securities Act to or through a market maker or into an existing trading market, on an exchange or otherwise;
- through a market maker or into an existing trading market on an exchange or otherwise;
- at prices related to such prevailing market prices; or
- at negotiated prices.

Each prospectus supplement will describe the method of distribution of the securities and any applicable restrictions.

The prospectus supplement with respect to the securities of a particular series will describe the terms of the offering of the securities, including the following:

- the name of the agent or any underwriters;
- the terms of the securities being offered, including the public offering or purchase price and the proceeds to us;
- any discounts and commissions to be allowed or paid to the agent or underwriters and any other items constituting underwriters' or agent's compensation;
- any options under which underwriters may purchase additional securities from us;
- any discounts or concessions allowed or reallowed or paid to dealers; and
- any exchanges on which the securities will be listed.

If any underwriters or agents are utilized in the sale of the securities in respect of which this prospectus is delivered, we will enter into an underwriting agreement or other agreement with them at the time of sale, and we will set forth in the prospectus supplement relating to such offering the names of the underwriters or agents and the terms of the related agreement with them.

If a dealer is utilized in the sale of the securities in respect of which the prospectus is delivered, we will sell such securities to the dealer, as principal. The dealer may then resell such securities to the public at varying prices to be determined by such dealer at the time of resale.

Agents, underwriters, dealers and other persons may be entitled under agreements which they may enter into with us to indemnification by us against certain civil liabilities, including liabilities under the Securities Act, and may be customers of, engage in transactions with or perform services for us in the ordinary course of business.

If so indicated in the applicable prospectus supplement, we will authorize underwriters or other persons acting as our agents to solicit offers by certain institutions to purchase securities from us pursuant to delayed delivery contracts providing for payment and delivery on the date stated in the prospectus supplement. Each contract will be for an amount not less than, and the aggregate amount of securities sold pursuant to such contracts shall not be less nor more than, the respective amounts stated in the prospectus supplement. Institutions with whom the contracts, when authorized, may be made include commercial and savings banks, insurance companies, pension funds, investment companies, educational and charitable institutions and other institutions, but shall in all cases be subject to our approval. Unless specified in the applicable prospectus supplement, delayed delivery contracts will not be subject to any conditions except that:

- the purchase by an institution of the securities covered under that contract shall not at the time of delivery be prohibited under the laws of the jurisdiction to which that institution is subject; and
- if the securities are also being sold to underwriters acting as principals for their own account, the underwriters shall have purchased such securities not sold for delayed delivery. The underwriters and other persons acting as our agents will not have any responsibility in respect of the validity or performance of delayed delivery contracts.

Certain agents, underwriters and dealers, and their associates and affiliates may be customers of, have borrowing relationships with, engage in other transactions with, or perform services, including investment banking services, for us or one or more of our respective affiliates in the ordinary course of business.

In order to facilitate the offering of the securities, any underwriters may engage in transactions that stabilize, maintain or otherwise affect the price of the securities or any other securities the prices of which may be used to determine payments on such securities. Specifically, any underwriters may overallot in connection with the offering, creating a short position for their own accounts. In addition, to cover overallotments or to stabilize the price of the securities or of any such other securities, the underwriters may bid for, and purchase, the securities or any such other securities in the open market. Finally, in any offering of the securities through a syndicate of underwriters, the underwriting syndicate may reclaim selling concessions allowed to an underwriter or a dealer for distributing the securities in the offering if the syndicate repurchases previously distributed securities in transactions to cover syndicate short positions, in stabilization transactions or otherwise. Any of these activities may stabilize or maintain the market price of the securities above independent market levels. Any such underwriters are not required to engage in these activities and may end any of these activities at any time.

Under Rule 15c6-1 of the Exchange Act, trades in the secondary market generally are required to settle in two business days, unless the parties to any such trade expressly agree otherwise. The applicable prospectus supplement may provide that the original issue date for your securities may be more than two scheduled business days after the trade date for your securities. Accordingly, in such a case, if you wish to trade securities on any date prior to the third business day before the original issue date for your securities, you will be required, by virtue of the fact that your securities initially are expected to settle in more than two scheduled business days after the trade date for your securities, to make alternative settlement arrangements to prevent a failed settlement.

The securities may be new issues of securities and may have no established trading market. The securities may or may not be listed on a national securities exchange. We can make no assurance as to the liquidity of or the existence of trading markets for any of the securities.

LEGAL MATTERS

Unless the applicable prospectus supplement indicates otherwise, the validity of the securities in respect of which this prospectus is being delivered will be passed upon by Ropes & Gray LLP, Boston, Massachusetts. Additional legal matters may be passed upon for us, the selling stockholders or any underwriters, dealers or agents, by counsel that we will name in the applicable prospectus supplement. As appropriate, legal counsel representing the underwriters, dealers or agents will be named in the accompanying prospectus supplement and may opine to certain legal matters.

EXPERTS

The financial statements of iTeos Therapeutics, Inc. incorporated by reference in this Prospectus have been audited by Deloitte Bedrijfsrevisoren/Réviseurs d'Entreprises BV/SRL, an independent registered public accounting firm, as stated in their report. Such financial statements are incorporated by reference in reliance upon the report of such firm, given their authority as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We file annual, quarterly and current reports, proxy statements and other information with the SEC. Our SEC filings are available to the public over the Internet at the SEC's website at *www.sec.gov*. Copies of certain information filed by us with the SEC are also available on our website at *www.iteostherapeutics.com*. Our website is not a part of this prospectus and is not incorporated by reference in this prospectus.

This prospectus is part of a registration statement we filed with the SEC. This prospectus omits some information contained in the registration statement in accordance with SEC rules and regulations. You should review the information and exhibits in the registration statement for further information on us and the securities we are offering. Statements in this prospectus concerning any document we filed as an exhibit to the registration statement or that we otherwise filed with the SEC are not intended to be comprehensive and are qualified by reference to these filings. You should review the complete document to evaluate these statements. You can obtain a copy of the registration statement from the SEC at the address listed above or from the SEC's website.

Table of Contents

1,142,857 Shares of Common Stock
Pre-Funded Warrant to Purchase up to 5,714,285 Shares of Common Stock

PROSPECTUS SUPPLEMENT

May 10, 2024