

PROSPECTUS



900,000 Shares of Common Stock

This prospectus relates to the resale by the Selling Stockholders named in this prospectus (the "Selling Stockholders") of 900,000 shares of common stock, par value \$0.0001 per share (the "Common Stock"), of Benitec Biopharma Inc. (the "Company").

We are registering the resale of these shares of Common Stock to satisfy certain registration rights we have granted pursuant to the terms of the Registration Rights Agreement (as defined in the prospectus). We entered into the Registration Rights Agreement in connection with our registered direct offering that closed on March 26, 2025. We will not receive any of the proceeds from the sale of the Common Stock by the Selling Stockholders. We will pay the expenses associated with registering the sale by the Selling Stockholders, as described in more detail in the section titled "Use of Proceeds" appearing elsewhere in this prospectus.

The registration for resale of the shares of Common Stock covered by this prospectus does not mean that the Selling Stockholders will offer or sell any of the shares of Common Stock. The Selling Stockholders may sell the shares of Common Stock covered by this prospectus in a number of different ways and at varying prices. For additional information on the possible methods of sale that may be used by the Selling Stockholders, you should refer to the section of this prospectus entitled "Plan of Distribution" beginning on page 14 of this prospectus. For information on the Selling Stockholders, see the section entitled "Selling Stockholders" on page 12 of this prospectus.

Our common stock is listed on The Nasdaq Capital Market under the symbol "BNTC." On May 30, 2025, the last reported sale price of our Common Stock on The Nasdaq Capital Market was \$15.36 per share.

Investing in our securities involves risks. You should carefully consider the risk factors included under the heading "Risk Factors" in this prospectus and under that heading or similar headings in the other documents incorporated by reference in this prospectus or any supplement to this prospectus before making a decision to purchase our securities.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of the securities described in this prospectus 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 June 2, 2025.

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ABOUT THIS PROSPECTUS

Unless the context otherwise requires, the terms “Benitec,” the “Company,” “we,” “us,” “our” and similar terms used in this prospectus refer to Benitec Biopharma Inc., a Delaware corporation, and its subsidiaries.

This prospectus is part of a registration statement on Form S-3 that we filed with the Securities and Exchange Commission (“SEC”). You should rely only on the information contained in or incorporated by reference into this prospectus or contained in any free writing prospectus or prospectus supplement prepared by or on behalf of us or to which we have referred you. We have not, and the Selling Stockholders have not, authorized anyone to provide you with information that is different from that contained in such prospectus or prospectus supplement. The Selling Stockholders are offering to sell shares of Common Stock, and are seeking offers to buy shares of Common Stock, only in jurisdictions where such offers and sales are permitted. For investors outside the United States: We have not, and the Selling Stockholders have not, taken any action that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons outside the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of the securities covered hereby and the distribution of this prospectus outside the United States. The information in this prospectus is accurate only as of the date of this prospectus, regardless of the time of delivery of this prospectus or any sale of our shares of Common Stock.

You should read this prospectus and the information incorporated by reference in this prospectus before making an investment in our securities. See “Documents Incorporated by Reference” and “Where You Can Find More Information” for more information. You should rely only on the information contained in or incorporated by reference in this prospectus. We have not authorized anyone to provide you with different information. This prospectus and the information incorporated herein by reference contain summaries of certain provisions contained in some of the documents described herein, but reference is made to the actual documents for complete information. All of the summaries are qualified in their entirety by the actual documents. You should not assume that information contained in this prospectus or in any document incorporated by reference is accurate as of any date other than the date on the front page of the document that contains the information, regardless of when this prospectus is delivered or when any sale of our securities occurs.

We further note that the representations, warranties and covenants made by us in any document that is filed as an exhibit to the registration statement of which this prospectus is a part and in any document that is incorporated by reference herein 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.

TRADEMARKS AND TRADENAMES

We have proprietary and licensed rights to trademarks used in this prospectus which are important to our business, many of which are registered under applicable intellectual property laws. These trademarks include:

- BENITEC BIOPHARMA®
- BENITEC®
- GIVING DISEASE THE SILENT TREATMENT®
- SILENCING GENES FOR LIFE®

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Solely for convenience, trademarks and trade names referred to in this prospectus appear without the “®” or “™” symbols, but such references are not intended to indicate, in any way, that we will not assert, to the fullest extent possible under applicable law, our rights or the rights of the applicable licensor to these trademarks and trade names. We do not intend our use or display of other companies’ trade names, trademarks or service marks to imply a relationship with, or endorsement or sponsorship of us by, any other companies. Each trademark, trade name or service mark of any other company appearing in this prospectus is the property of its respective holder.

SUMMARY

This summary highlights information contained elsewhere or incorporated by reference into this prospectus. This summary does not contain all of the information that you should consider before deciding to invest in our securities. You should read this entire prospectus and each applicable prospectus supplement carefully, including the “Risk Factors” section contained in this prospectus and in each applicable prospectus supplement, and our consolidated financial statements and the related notes and the other documents incorporated by reference into this prospectus and into each applicable prospectus supplement.

Company Overview

We endeavor to become the leader in discovery, development, and commercialization of therapeutic agents capable of addressing significant unmet medical need via the application of the silence and replace approach to the treatment of genetic disorders.

Benitec Biopharma Inc. (“Benitec” or the “Company” or in the first person, “we” or “our”) is a clinical-stage biotechnology company focused on the advancement of novel genetic medicines with headquarters in Hayward, California. The proprietary platform, called DNA-directed RNA interference, or ddRNAi, combines RNA interference, or RNAi, with gene therapy to create medicines that facilitate sustained silencing of disease-causing genes following a single administration. The unique therapeutic constructs also enable the simultaneous delivery of wildtype replacement genes, facilitating the proprietary “silence and replace” approach to the treatment of genetically defined diseases. The Company is developing a silence and replace-based therapeutic (BB-301) for the treatment of Oculopharyngeal Muscular Dystrophy (OPMD), a chronic, life-threatening genetic disorder.

BB-301 is a silence and replace-based genetic medicine currently under development by Benitec. BB-301 is an AAV-based gene therapy designed to permanently silence the expression of the disease-causing gene (to slow, or halt, the biological mechanisms underlying disease progression in OPMD) and to simultaneously replace the mutant gene with a wildtype gene (to drive restoration of function in diseased cells). This fundamental therapeutic approach to disease management is called “silence and replace.” The silence and replace mechanism offers the potential to restore the normative physiology of diseased cells and tissues and to improve treatment outcomes for patients suffering from the chronic, and potentially fatal, effects of OPMD. BB-301 has been granted Orphan Drug Designation in the United States and the European Union.

The targeted gene silencing effects of RNAi, in conjunction with the durable transgene expression achievable via the use of modified viral vectors, imbues the silence and replace approach with the potential to produce permanent silencing of disease-causing genes along with simultaneous replacement of the wild type gene function following a single administration of the proprietary genetic medicine. We believe that this novel mechanistic profile of the current and future investigational agents developed by Benitec could facilitate the achievement of robust and durable clinical activity while greatly reducing the frequency of drug administration traditionally expected for medicines employed for the management of chronic diseases. Additionally, the achievement of permanent gene silencing and gene replacement may significantly reduce the risk of patient non-compliance during the course of medical management of potentially fatal clinical disorders.

We will require additional financing to progress our product candidates through to key inflection points.

Closing of Concurrent Underwritten and Registered Direct Offerings

On March 26, 2025, we closed the sale of (i) an aggregate of 1,143,000 shares of Common Stock and pre-funded warrants to purchase 300,000 shares of Common Stock pursuant to an Underwriting Agreement with Leerink Partners LLC and TD Securities (USA) LLC, as representatives of the several underwriters named therein (such

offering, the “Underwritten Offering”), and (ii) an aggregate of 900,000 shares of Common Stock pursuant to a Securities Purchase Agreement between the Company, Averill Master Fund, Ltd. (“Averill”) and Averill Madison Master Fund, Ltd. (“Averill Madison,” and together with Averill, the “Selling Stockholders”) (such offering, the “Registered Direct Offering,” and together with the Underwritten Offering, the “Offerings”). The purchase price for each share of Common Stock sold in the Offerings was \$13.00. The purchase price for each pre-funded warrant sold in the Underwritten Offering was \$12.9999. Upon the closing of the Offerings, the Company received aggregate gross proceeds of approximately \$30 million, before deducting underwriting discounts and commissions and estimated offering expenses payable by the Company.

In connection with the closing of the Registered Direct Offering, on March 26, 2025 (the “Closing Date”), we entered into a Registration Rights Agreement (the “Registration Rights Agreement”) with the Selling Stockholders, pursuant to which we agreed to register for resale the shares of Common Stock sold to the Selling Stockholders in the Registered Direct Offering (the “Registrable Securities”). Under the Registration Rights Agreement, we agreed to file a registration statement covering the resale of the Registrable Securities by no later than the 60th calendar day following the Closing Date. We filed the registration statement of which this prospectus forms a part pursuant to the terms of the Registration Rights Agreement.

Corporate Information

We were incorporated as a Delaware corporation on November 22, 2019, and completed a re-domiciliation to Delaware on April 15, 2020. Our predecessor, Benitec Limited, was incorporated under the laws of Australia in 1995. Our stock is traded on The Nasdaq Capital Market, or Nasdaq, under the symbol “BNTC.”

Our principal executive offices are located at 3940 Trust Way, Hayward, California 94545. Our telephone number is (510) 780-0819, and our Internet website is <https://benitec.com>. The information on, or that can be accessed through, our website is not part of this prospectus and is not incorporated by reference herein.

THE OFFERING	
Issuer	Benitec Biopharma Inc.
Securities offered by the Selling Stockholders	900,000 shares of Common Stock.
Common Stock outstanding	26,250,469 shares as of May 30, 2025 (without giving effect to the issuance of additional shares upon the exercise of our outstanding warrants, pre-funded warrants, or stock options).
Use of Proceeds	We will not receive any of the proceeds from the sale of the shares being offered by the Selling Stockholders.
Plan of Distribution	Each Selling Stockholder may sell all or a portion of the shares of Common Stock beneficially owned by it and offered hereby from time to time directly or through one or more underwriters, broker-dealers or agents. Registration of the Common Stock covered by this prospectus does not mean, however, that such shares necessarily will be offered or sold. See “Plan of Distribution.”
Risk Factors	An investment in our securities involves a high degree of risk. You should read the “Risk Factors” section of this prospectus, as well as those risk factors included in our Annual Report on Form 10-K for the fiscal year ended June 30, 2024 and any subsequent Quarterly Report on Form 10-Q, in the documents incorporated by reference herein for a discussion of factors to consider carefully before deciding to invest in our securities.
Nasdaq Capital Market symbol	“BNTC.”

RISK FACTORS

Investing in our securities involves a high degree of risk. You should carefully consider the risks and uncertainties described below, as well as those risk factors included in our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and in the documents incorporated by reference herein, together with all of the other information contained in this prospectus and incorporated by reference herein, including our consolidated financial statements and the related notes, before deciding to invest in our securities. The risks and uncertainties described below and in the documents incorporated by reference herein are not the only ones we face. Additional risks and uncertainties that we are unaware of, or that we currently believe are not material, may also become important factors that affect us. If any of the following risks actually occurs, our business, financial condition, results of operations and prospects could be materially and adversely affected, the trading price of our Common Stock could decline and you could lose all or part of your investment.

Risks Related to this Offering and our Common Stock

An active trading market for our Common Stock may not be sustained, which may cause shares of our Common Stock to trade at a discount and make it difficult to sell shares of our Common Stock.

Our Common Stock is listed on the Nasdaq Capital Market under the symbol “BNTC”. However, we cannot assure you that an active trading market for our Common Stock will be sustained. Accordingly, we cannot assure you of the future the liquidity of any trading market for our Common Stock, your ability to sell your shares of our Common Stock when desired or the prices that you may obtain for your securities.

A number of our stockholders hold significant amounts of our Common Stock and unexercised Warrants to acquire Common Stock, and therefore could exert significant influence over us.

While our stockholder base and relative holdings may change over time, a number of institutional investors and similar stockholders currently hold significant ownership positions in our outstanding Common Stock and outstanding warrants to acquire Common Stock. In addition, Kishen Mehta, a Portfolio Manager at Suvretta Capital Management, LLC (“Suvretta”) sits on our Board of Directors (the “Board”). Furthermore, as previously disclosed, in connection with the Registered Direct Offering, the Company has discussed with Suvretta appointing David Friedman, managing director at Suvretta, to the Board. Any such appointment would be subject to approval by the Board and review by its Nominating and Governance Committee. Suvretta is the beneficial owner of 16,280,464 shares of Common Stock as of May 30, 2025, which includes shares underlying Pre-Funded Warrants which are subject to limitations on beneficial ownership and cannot be exercised if Suvretta would beneficially own more than 49.9% of the total issued and outstanding shares of our Common Stock following such issuance, and is therefore able to exert influence not only as a significant stockholder but also through Mr. Mehta’s position on the Board.

The interests of these significant stockholders might not always coincide with the interests of other stockholders, and any influence exerted over our business and affairs by these significant stockholders directly or through an appointee to the Board might not always coincide with the wishes of other stockholders. In addition, the control and influence held by these significant stockholders might have the effect of delaying, deferring, or preventing a transaction or change in control of us, which might involve a premium price for shares of our Common Stock, or which otherwise could have been in your best interests as a stockholder.

Sales of a substantial amount of the Common Stock in the public markets may cause the market price of the Common Stock to decline.

Sales of the shares registered for resale hereunder, or the perception in the market that the holders of a large number of shares intend to sell shares, could reduce the market price of our Common Stock. The sale or possibility of sale of these shares could have the effect of increasing the volatility in the price of our Common

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Stock or the market price of our Common Stock could decline if the holders of shares of Common Stock sell them or are perceived by the market as intending to sell them. Moreover, the sale of shares issued in the Offerings, any announcement or other public disclosure regarding any sales should they occur, the perceived risk of such sales, and the resulting downward pressure on our share price as a result of the foregoing could encourage investors to engage in short sales of our Common Stock. By increasing the number of shares of Common Stock offered for sale as a result of this resale registration statement, material amounts of short selling could further contribute to progressive price declines in our Common Stock.

The exercise of warrants to purchase our Common Stock would increase the number of shares eligible for future resale in the public market and result in dilution to our stockholders.

As of May 30, 2025, we had outstanding (i) pre-funded warrants to purchase an aggregate of 15,270,807 shares of our Common Stock and (ii) common warrants to purchase an aggregate of 5,172,685 shares of our Common Stock. The likelihood that those warrants will be exercised increases if the trading price of shares of our stock exceeds the exercise price of the warrants (or the purchase price of the warrants). To the extent the warrants are exercised, additional shares of Common Stock will be issued, which will result in dilution to the holders of our stock and increase the number of shares eligible for resale in the public market. Sales of substantial numbers of shares of Common Stock issued upon the exercise of warrants in the public market or the potential that such warrants may be exercised could also adversely affect the market price of our Common Stock.

Provisions of our outstanding warrants could discourage an acquisition of us by a third party.

Certain provisions of our warrants could make it more difficult or expensive for a third party to acquire us. Such warrants prohibit us from engaging in certain transactions constituting “fundamental transactions” unless, among other things, the surviving entity assumes our obligations under the warrants. Further, the warrants provide that, in the event of certain transactions constituting “fundamental transactions,” with some exception, holders of the warrants will have the right, at their option, to require us to repurchase such warrants at a price described in the warrants. These and other provisions of our outstanding warrants could prevent or deter a third party from acquiring us even where the acquisition could be beneficial to you.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains, and may incorporate by reference, forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. We claim the protection of the safe harbor contained in the Private Securities Litigation Reform Act of 1995 for these forward looking statements. Our forward-looking statements relate to future events or our future performance and include, but are not limited to, statements concerning our business strategy, future commercial revenues, market growth, capital requirements, new product introductions, expansion plans and the adequacy of our funding. Other statements contained in this prospectus and in any applicable prospectus supplement that are not historical facts are also forward-looking statements. We have tried, wherever possible, to identify forward-looking statements by terminology such as “may,” “will,” “could,” “should,” “expects,” “anticipates,” “intends,” “plans,” “believes,” “seeks,” “estimates” and other comparable terminology.

Some of the risks and uncertainties that may cause our actual results, performance or achievements to differ materially from those expressed or implied by forward-looking statements include the following:

- the success of our plans to develop and potentially commercialize our product candidates;
- the timing of the completion of preclinical studies and clinical trials;
- the timing and sufficiency of patient enrollment and dosing in any future clinical trials;
- the timing of the availability of data from our clinical trials;
- the timing and outcome of regulatory filings and approvals;
- the development of novel AAV vectors;
- our potential future out-licenses and collaborations;
- the plans of licensees of our technology;
- the clinical utility and potential attributes and benefits of ddRNAi and our product candidates, including the potential duration of treatment effects and the potential for a “one shot” cure;
- our intellectual property position and the duration of our patent portfolio;
- expenses, ongoing losses, future revenue, capital needs and needs for additional financing, and our ability to access additional financing given market conditions and other factors, including our capital structure;
- the length of time over which we expect our cash and cash equivalents to be sufficient to execute on our business plan;
- unanticipated delays;
- further research and development and the results of clinical trials possibly being unsuccessful or insufficient to meet applicable regulatory standards or warrant continued development;
- the ability to enroll sufficient numbers of subjects in clinical trials;
- determinations made by the U.S. Food and Drug Administration and other governmental authorities;
- regulatory developments in the United States of America;
- our ability to protect and enforce our patents and other intellectual property rights;
- our dependence on our relationships with our collaboration partners and other third parties;
- the efficacy or safety of our products and the products of our collaboration partners;
- the acceptance of our products and the products of our collaboration partners in the marketplace and market competition;
- sales, marketing, manufacturing and distribution requirements;

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- greater than expected expenses, expenses relating to litigation or strategic activities;
- the impact of, and our ability to remediate, the identified material weakness in our internal controls over financial reporting;
- our ability to satisfy our capital needs through increasing revenue and obtaining additional financing; and
- the impact of local, regional and national and international economic conditions and events;

as well as other risks detailed under the caption “Risk Factors” in this prospectus and in each applicable prospectus supplement and our reports filed with the SEC.

We caution investors that any forward-looking statements presented in this prospectus or any prospectus supplement or the documents incorporated by reference herein or therein, or those that we may make orally or in writing from time to time, are based upon management’s beliefs and assumptions and are made based on information available to us as of the time made. Such statements are based on assumptions and the actual outcome will be affected by known and unknown risks, trends, uncertainties and factors that are beyond our control or ability to predict. Although we believe that our assumptions are reasonable, they are not guarantees of future performance and some will inevitably prove to be incorrect. As a result, our actual future results can be expected to differ from our expectations, and those differences may be material. Accordingly, investors should use caution in relying on past forward-looking statements, which are based on known results and trends at the time they are made, to anticipate future results or trends. Except as required by law, we undertake no obligation to publicly update or revise any forward-looking statements included or incorporated by reference in this prospectus or any prospectus supplement or to update the reasons why actual results could differ from those contained in such statements, whether as a result of new information, future events or otherwise, except to the extent required by federal securities laws. Any investor in us should consider all risks and uncertainties disclosed in our filings with the SEC described below under the heading “Where You Can Find More Information,” all of which are accessible on the SEC’s website at <https://www.sec.gov>.

All forward-looking statements included herein or in documents incorporated herein by reference are expressly qualified in their entirety by the cautionary statements contained or referred to elsewhere in this prospectus.

USE OF PROCEEDS

We will receive no proceeds from the sale of the shares of Common Stock by the Selling Stockholders. The Selling Stockholders will pay any underwriting fees, discounts and commissions attributable to the sale of the shares of Common Stock and any similar expenses it incurs in disposing of the shares of Common Stock. We will bear all other costs, fees and expenses incurred in effecting the registration of the shares of Common Stock covered by this prospectus. These may include, without limitation, all registration and filing fees, printing fees and fees and expenses of our legal counsel and accountants in connection with the registration of the shares of Common Stock covered by this prospectus.

DESCRIPTION OF CAPITAL STOCK

The following description of our common stock summarizes the material terms and provisions of the common stock that the Selling Stockholders may offer pursuant to this prospectus. For the complete terms of our common stock, please refer to our amended and restated certificate of incorporation, as amended, or our Certificate, and our amended and restated bylaws, or our Bylaws, each as amended from time to time, which are exhibits to the registration statement of which this prospectus is a part. The terms of these securities may also be affected by the General Corporation Law of the State of Delaware, or the DGCL. The summary below is qualified in its entirety by reference to our Annual Report on Form 10-K for the fiscal year ended June 30, 2024, our Certificate and our Bylaws, as either may be amended from time to time after the date of this prospectus, but before the date of any such prospectus supplement, and the applicable provisions of the DGCL.

General

Our authorized capital stock consists of 160,000,000 shares of our common stock, par value \$0.0001 per share and 5,000,000 shares of preferred stock, par value \$0.0001 per share.

Common Stock

Dividend Rights. Subject to preferences that may be applicable to any then outstanding preferred stock, holders of the Company's common stock are entitled to receive dividends, if any, as may be declared from time to time by the Company's Board out of legally available funds. Dividends may be paid in cash, in property or in shares of common stock, subject to the provisions of the Certificate and applicable law. Declaration and payment of any dividend will be subject to the discretion of the Board. The time and amount of dividends will be dependent upon the Company's financial condition, operations, cash requirements and availability, debt repayment obligations, capital expenditure needs, restrictions in the Company's debt instruments, industry trends, the provisions of Delaware law affecting the payment of distributions to stockholders and any other factors the Board may consider relevant.

Voting Rights. Each holder of common stock is entitled to one vote for each share on all matters submitted to a vote of the stockholders, including the election of directors. The Company's stockholders do not have cumulative voting rights in the election of directors.

Liquidation Rights. In the event of the Company's liquidation, dissolution or winding up, holders of the Company's common stock are entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of the Company's debts and other liabilities and the satisfaction of any liquidation preference granted to the holders of any then outstanding shares of preferred stock.

Rights and Preferences. Holders of the Company's common stock have no pre-emptive, conversion, subscription or other rights, and there are no redemption or sinking fund provisions applicable to the Company's common stock. The rights, preferences and privileges of the holders of the Company's common stock are subject to and may be adversely affected by the rights of the holders of shares of any series of preferred stock that the Company may designate in the future.

Fully Paid and Nonassessable. All outstanding shares of the Company's common stock are fully paid and non-assessable.

Annual Stockholder Meetings. The Certificate and Bylaws provide that annual stockholder meetings will be held at a date, place (if any) and time, as exclusively selected by the Board. To the extent permitted under applicable law, the Company may but is not obligated to conduct meetings by remote communications, including by webcast.

Anti-Takeover Effects of Provisions of the Certificate and Bylaws and DGCL

Some provisions of the DGCL, the Certificate and Bylaws could make the following transactions difficult: (i) acquisition of the Company by means of a tender offer; (ii) acquisition of the Company by means of a proxy contest or otherwise; or (iii) removal of incumbent officers and directors of the Company. It is possible that these provisions could make it more difficult to accomplish or could deter transactions that stockholders may otherwise consider to be in their best interest or in the best interests of the Company, including transactions that might result in a premium over the market price for the Company's common stock.

These provisions, summarized below, are expected to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed to encourage persons seeking to acquire control of the Company to first negotiate with the Board.

Delaware Anti-Takeover Statute. The Company is subject to Section 203 of the DGCL, which prohibits persons deemed "interested stockholders" from engaging in a "business combination" with a publicly-held Delaware corporation for three years following the date these persons become interested stockholders unless the business combination is, or the transaction in which the person became an interested stockholder was, approved in a prescribed manner or another prescribed exception applies. Generally, an "interested stockholder" is a person who, together with affiliates and associates, owns, or within three years prior to the determination of interested stockholder status did own, 15% or more of a corporation's voting stock, and a "business combination" includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. The existence of this provision may have an anti-takeover effect with respect to transactions not approved in advance by the Board, such as discouraging takeover attempts that might result in a premium over the market price of the Company's common stock.

Special Stockholder Meetings. The Bylaws provide that a special meeting of stockholders may be called by (i) the Chairman of the Board, if any, (ii) the President or Chief Executive Officer, or (iii) the Board pursuant to a resolution adopted by a majority of the total number of directors then in office.

Requirements for Advance Notification of Stockholder Nominations and Proposals. The Bylaws establish advance notice procedures with respect to stockholder proposals and the nomination of candidates for election as directors.

Preferred Stock. Our Amended and Restated Certificate of Incorporation gives our Board the authority to issue shares of Preferred Stock, in one or more series, with any rights, preferences and privileges as they may designate.

Composition of the Board of Directors; Election and Removal of Directors; Filling Vacancies

The Company's Board may, from time to time, fix the authorized number of directors by resolution of the Board. The Board is divided into three classes, designated Class I, Class II and Class III. Directors need not be stockholders of the Company.

Directors shall serve for a term ending on the date of the third annual meeting of stockholders following the annual meeting of stockholders at which such director was elected. The term of each director shall continue until the election and qualification of his or her successor and be subject to his or her earlier death, disqualification, resignation or removal. Except as otherwise provided by the DGCL, the Certificate or the Bylaws, directors shall be elected by a plurality of the votes of the shares present in person, by remote communication, if applicable, or represented by a duly authorized and executed proxy at the meeting and entitled to vote on the election of directors.

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Subject to applicable law or by the Certificate, any director of the entire Board of the Company may be removed without cause by the affirmative vote of a majority of the holders of the Company's then-outstanding common stock entitled to vote generally at an election of directors. Furthermore, any vacancy on the Company's Board, however occurring, including a vacancy resulting from an increase in the size of the board, may be filled only by a majority vote of the Board then in office, even if less than a quorum, or by the sole remaining director.

Amendment of the Certificate and Bylaws. The Certificate may be amended in any manner permitted under the DGCL and the Bylaws may be amended by the vote or written consent of holders of a majority of the outstanding shares entitled to vote. The Board may also amend the Bylaws, other than a bylaw or amendment thereof specifying or changing a fixed number of directors or the maximum or minimum number or changing from a fixed to a variable board or vice versa.

Limitations of Liability and Indemnification Matters

Each of the Certificate and Bylaws provide that the Company is required to indemnify its directors and officers to the fullest extent not prohibited by Delaware law. The Bylaws also obligates the Company to advance expenses incurred by a director or officer in advance of the final disposition of any action or proceeding upon delivery to the Company of an undertaking, by or on behalf of such indemnitee, to repay all amounts so advanced if it shall ultimately be determined by final judicial decision, from which there is no further right to appeal, that such indemnitee is not entitled to be indemnified for such expenses.

To the fullest extent permitted by the DGCL, or any other applicable law, the Company, upon approval by the Board, may purchase insurance on behalf of any person required or permitted to be indemnified pursuant to the Bylaws.

Forum for Adjudication of Disputes

The Certificate provides that, unless the Company consents in writing to the selection of an alternative forum, the sole and exclusive forum for (i) derivative actions or proceedings brought on behalf of the Company, (ii) any action asserting a claim of breach of fiduciary duty owed by any director, officer or employee of the Company to the Company or the Company's stockholders, (iii) an action asserting a claim arising pursuant to any provision of the DGCL, or (iv) any action asserting a claim governed by the internal affairs doctrine shall be a state or federal court located within the state of Delaware. The Certificate further provides that the federal district courts of the United States of America shall, to the fullest extent permitted by law, be the exclusive forum for any complaint asserting a cause of action arising under the Securities Act.

Transfer Agent and Registrar

The transfer agent and registrar for the Company's common stock is Computershare Trust Company, N.A. The transfer agent and registrar's address is 150 Royall St., Canton, Massachusetts 02021.

Listing

Our common stock is listed on Nasdaq under the symbol "BNTC."

SELLING STOCKHOLDERS

The Common Stock being offered by the Selling Stockholders are those previously issued to the Selling Stockholders pursuant to the Registered Direct Offering. For additional information regarding the issuances of those shares of Common Stock, see “Closing of Concurrent Underwritten and Registered Direct Offerings” above. We are registering the shares of Common Stock in order to permit the Selling Stockholders to offer the shares for resale from time to time.

The table below lists the Selling Stockholders and other information regarding the beneficial ownership of the shares of Common Stock by each of the Selling Stockholders. The second column lists the number of shares of Common Stock beneficially owned by each Selling Stockholder, based on its ownership of the shares of Common Stock as of May 30, 2025.

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

In accordance with the terms of the Registration Rights Agreement with the Selling Stockholders, this prospectus generally covers the resale of an aggregate of 900,000 shares of Common Stock issued to the Selling Stockholders in the Registered Direct Offering, as described in “Closing of Concurrent Underwritten and Registered Direct Offerings” above. The fourth column assumes the sale of all of the shares offered by the Selling Stockholders pursuant to this prospectus. The Selling Stockholders may sell all, some or none of their shares in this offering. See “Plan of Distribution.”

<u>Name of Selling Stockholder</u>	<u>Number of shares of Common Stock Beneficially Owned Prior to Offering</u>	<u>Maximum Number of shares of Common Stock to be Sold Pursuant to this Prospectus</u>	<u>Number of shares of Common Stock Beneficially Owned After Offering</u>
Entities Affiliated with Suvretta Capital Management, LLC	16,280,464(1)	900,000(2)	15,380,464(3)

- (1) Consists of (a) 8,807,805 shares of Common Stock held by Averill, (b) 1,068,701 shares of Common Stock held by Averill Madison, (c) Pre-Funded Warrants exercisable for 5,699,468 shares of Common Stock, at an exercise price of \$0.0001 per share, held by Averill and (d) Pre-Funded Warrants exercisable for 704,490 shares of Common Stock, at an exercise price of \$0.0001 per share, held by Averill Madison. The Pre-Funded Warrants are subject to limitations on beneficial ownership of up to 49.9% of the total issued and outstanding shares of Common Stock, reflecting an aggregate of 6,403,958 shares of Common Stock upon the exercise of the Pre-Funded Warrants. Suvretta is the investment manager of Averill and Averill Madison. Aaron Cowen is a control person of Suvretta and as such may be deemed to beneficially own these shares. Mr. Cowen disclaims beneficial ownership of all Common Stock beneficially held shares by Averill and Averill Madison, other than, to the extent of any pecuniary interest therein. The address of the principal business office of Suvretta, Mr. Cowen, Averill and Averill Madison is 540 Madison Avenue, 7th Floor, New York, NY 10022.
- (2) Consists of 793,800 shares of Common Stock held by Averill and 106,200 shares of Common Stock held by Averill Madison.
- (3) 15,233,011 shares of our Common Stock were previously registered for resale on behalf of the Selling Stockholders on a Registration Statement on Form S-1 (File No. 333-279439) filed by the Company with the SEC on May 16, 2024 and declared effective on May 28, 2024, which now consists of 8,829,053 shares of Common Stock and 6,403,958 shares of Common Stock underlying warrants, after the exercise of warrants for 7,137,763 shares of Common Stock.

Certain Relationships with Suvretta

On April 22, 2024, the Company entered into a Board Designation Agreement with Suvretta, pursuant to which Suvretta has the right to designate one member to the Company's board of directors, subject to certain customary limitations. On June 26, 2024, the Company appointed Kishan ("Kishen") Mehta, a portfolio manager at Suvretta, to the Board pursuant to the Board Designation Agreement. In connection with the Registered Direct Offering, the Company has discussed with Suvretta appointing David Friedman, managing director at Suvretta, to the Board, subject to the review and approval of the Board and its Nominating and Governance Committee.

PLAN OF DISTRIBUTION

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

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

The Selling Stockholders may also sell securities under Rule 144 or any other exemption from registration under the Securities Act of 1933, as amended (the “Securities Act”), if available, rather than under this prospectus.

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

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

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

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The Company is required to pay certain fees and expenses incurred by the Company incident to the registration of the securities. The Company has agreed to indemnify the Selling Stockholders against certain losses, claims, damages and liabilities, including liabilities under the Securities Act.

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

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

LEGAL MATTERS

Certain legal matters relating to the validity of the securities offered by this prospectus will be passed upon for us by Proskauer Rose LLP, Los Angeles, California.

EXPERTS

The consolidated financial statements of Benitec Biopharma Inc. as of June 30, 2024 and 2023 and for each of the two years in the period ended June 30, 2024, incorporated in this Prospectus by reference from the Company's Annual Report on Form 10-K for the year ended June 30, 2024 have been audited by Baker Tilly US, LLP, an independent registered public accounting firm, as stated in their report thereon, incorporated herein by reference, and have been incorporated in this Prospectus and Registration Statement in reliance upon such report and upon the authority of such firm as experts in accounting and auditing.

DOCUMENTS INCORPORATED BY REFERENCE

The SEC allows us to "incorporate by reference" information that we file with them, which means that we can disclose important information to you by referring you to those documents. The information incorporated by reference is an important part of this prospectus, and the information that we file later with the SEC will automatically update and supersede this information. The following documents have been previously filed by us with the SEC pursuant to the Exchange Act and are hereby incorporated by reference in this prospectus and the registration statement of which this prospectus forms a part (excluding any document or portion thereof to the extent such disclosure is furnished and not filed):

- our Annual Report on [Form 10-K](#) for the fiscal year ended June 30, 2024, filed with the SEC on September 26, 2024 (including the information incorporated by reference from our Definitive Proxy Statement on [Schedule 14A](#) filed with the SEC on October 22, 2024);
- our Quarterly Report for the period ended September 30, 2024, filed with the SEC on [November 14, 2024](#), our Quarterly Report for the period ended December 31, 2024 filed with the SEC on [February 14, 2025](#), and our Quarterly Report for the period ended March 31, 2025 filed on [May 14, 2025](#);
- our Current Reports on Form 8-K filed with the SEC on [July 1, 2024](#), [September 5, 2024](#), [October 8, 2024](#), [October 11, 2024](#), [November 14, 2024](#) (with respect to the information provided under Item 5.02 thereof), [December 6, 2024](#), [December 10, 2024](#), [December 13, 2024](#) (as amended by the Current Report on Form 8-K/A filed on [December 31, 2024](#)), [March 20, 2025](#), [March 26, 2025](#), [March 27, 2025](#), and [March 28, 2025](#); and
- the description of the Company's Common Stock contained in the Company's [Form 8-K12B](#), filed with the SEC on April 15, 2020, together with any amendment or report filed for the purpose of updating such description.

Certain Current Reports on Form 8-K dated both prior to and after the date of this prospectus are or will be furnished to the SEC and shall not be deemed "filed" with the SEC and will not be incorporated by reference into this prospectus. However, all other reports and documents filed by us after the date of this prospectus under Sections 13(a), 13(c), 14 and 15(d) of the Exchange Act prior to the termination of the offering of the securities covered by this prospectus will also be deemed incorporated by reference in this prospectus and considered to be part of this prospectus from the date those documents are filed. If you make a request, orally or in writing, for any information that has been incorporated by reference into this prospectus but not delivered with this

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prospectus, we will provide you, without charge, a copy of any or all of that information. Requests for this information should be submitted in writing or by telephone at the following address or phone number:

Benitec Biopharma Inc.
3940 Trust Way
Hayward, CA 94545
(510) 780-0819
info@benitec.com

This prospectus is part of a registration statement we have filed with the SEC. You should rely only on the information incorporated by reference or provided in this prospectus, or any applicable prospectus supplement. No one else is authorized to provide you with different information. You should not rely on any other representations. We are not making an offer of these securities in any state where the offer is not permitted. Our affairs may change after this prospectus or any prospectus supplement is distributed. You should not assume that the information in or incorporated by reference into this prospectus or any prospectus supplement is accurate as of any date other than the date on the front of those documents. You should read all information supplementing or incorporated by reference into this prospectus or any prospectus supplement.

WHERE YOU CAN FIND MORE INFORMATION

We have filed with the SEC a registration statement on Form S-3, of which this prospectus is a part, including exhibits, schedules and amendments filed with, or incorporated by reference in, this registration statement, under the Securities Act, with respect to the securities registered thereby. This prospectus does not contain all of the information set forth in the registration statement and exhibits and schedules to the registration statement. For further information with respect to our company and the securities registered thereby, reference is made to the registration statement, including the exhibits to the registration statement. Statements contained in this prospectus as to the contents of any contract or other document referred to in, or incorporated by reference in, this prospectus are not necessarily complete and, where that contract is an exhibit to the registration statement, each statement is qualified in all respects by the exhibit to which the reference relates. Copies of the registration statement, including the exhibits and schedules to the registration statement, may be examined and copied (upon payment of applicable fees) at the SEC's Public Reference Room at 100 F Street, N.E., Washington D.C. 20549. Please call the SEC at 1-800-SEC-0330 for further information on the operation of the Public Reference Room. The SEC also maintains a website that contains reports, proxy and information statements and other information regarding registrants that file electronically with the SEC. The Internet address is <https://www.sec.gov>.

We are subject to the information and periodic reporting requirements of the Exchange Act, and we file periodic reports, proxy statements and other information with the SEC. These periodic reports, proxy statements and other information are available for inspection and copying at the public reference room and website of the SEC referred to above. We maintain a website at <https://benitec.com>. You may access our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act with the SEC free of charge at our website as soon as reasonably practicable after such material is electronically filed with, or furnished to, the SEC. The information contained in, or that can be accessed through, our website is not incorporated by reference in, and is not part of, this prospectus, and any references to such website or any other website are inactive textual references only. You may also request a copy of these filings, at no cost, by writing us at 3940 Trust Way, Hayward, California 94545 or info@benitec.com or telephoning us at (510) 780-0819.

900,000 Shares of Common Stock



PROSPECTUS

June 2, 2025
