

PROSPECTUS SUPPLEMENT NO. 1
(To the Prospectus dated September 24, 2025)

Prospectus for 352,693,006 Shares of Common Stock of atai Delaware*



This prospectus supplement (this “Supplement”) supplements the prospectus dated September 24, 2025 (the “Prospectus”) which forms a part of the Registration Statement on Form S-4 (Registration No. 333-290446) of atai Life Sciences Luxembourg S.A. (“atai LuxCo”) filed with the U.S. Securities and Exchange Commission in connection with (i) the proposed acquisition by atai Life Sciences N.V. (the “Company” or “atai”) of Beckley Psytech Limited (the “Acquisition”) and (ii) the proposed redomiciliation transaction (the “Redomiciliation”) by means of a cross-border merger of the Company with and into atai LuxCo, with atai LuxCo surviving the merger, and atai LuxCo’s subsequent conversion into a corporation incorporated under the laws of the State of Delaware (as converted, “atai Delaware”). The purpose of this Supplement is to supplement the Prospectus with certain information as indicated herein. Capitalized terms used in this Supplement and not otherwise defined herein have the meanings specified in the Prospectus.

This Supplement may add, update or change information in the Prospectus. If the information in this Supplement is inconsistent with the Prospectus, this Supplement will apply and will supersede the information in the Prospectus.

Investing in shares of atai Delaware common stock involves risks. See “Risk Factors” beginning on page 23 of the Prospectus.

The Company’s ordinary shares are listed on the Nasdaq Global Market under the symbol “ATAI.” We will seek, and expect to receive, approval from Nasdaq to list the shares of common stock of atai Delaware under the same symbol after the Redomiciliation.

NEITHER THE SECURITIES AND EXCHANGE COMMISSION NOR ANY STATE SECURITIES COMMISSION HAS APPROVED OR DISAPPROVED THE REDOMICILIATION AND OTHER TRANSACTIONS DESCRIBED IN THE PROSPECTUS, NOR HAVE THEY APPROVED OR DISAPPROVED OF THE SECURITIES TO BE REGISTERED UNDER THE PROSPECTUS OR DETERMINED IF THE PROSPECTUS IS ACCURATE OR COMPLETE. ANY REPRESENTATION TO THE CONTRARY IS A CRIMINAL OFFENSE.

The date of this Supplement is October 24, 2025.

* Subject to the adoption of certain resolutions by the shareholders of atai Life Sciences N.V. and satisfaction of other conditions, atai Life Sciences Luxembourg S.A., a Luxembourg public limited liability company (société anonyme) (“atai LuxCo”), intends to convert into a corporation incorporated under the laws of the State of Delaware (the “Delaware Conversion”), after which atai LuxCo will continue as an entity under the name “Atai Beckley Inc.,” if the acquisition of Beckley Psytech Limited is consummated, or “Atai Life Sciences Inc.” (“atai Delaware”), if the acquisition is not consummated, and existing shareholders of atai LuxCo would hold shares in atai Delaware rather than in a Luxembourg company.

Recent Developments

Amendment to Share Purchase Agreement

On October 23, 2025, the Company entered into a Side Letter Deed to the Share Purchase Agreement (the “SPA Amendment”) to the previously announced Share Purchase Agreement, dated June 2, 2025 (as amended, the “Share Purchase Agreement”), with Beckley Psytech Limited (“Beckley Psytech”), a company incorporated in England and Wales, and certain other parties thereto.

The SPA Amendment provides that the number of ordinary shares of atai, nominal value EUR 0.10 per share (“atai Shares”), to be issued to shareholders of Beckley Psytech pursuant to the Share Purchase Agreement will be reduced on a pro-rata basis by an aggregate of 1,221,712 atai Shares, with a total of 103,823,190 atai Shares to now be distributed to shareholders of Beckley Psytech or to underlie Replacement Awards issued to certain Beckley Psytech optionholders.

The SPA Amendment also provides that 900,901 atai Shares will be issued to Cantor Fitzgerald & Co (“CF&CO”) in connection with services rendered as financial advisor to Beckley Psytech. The atai Shares received by CF&CO will not be subject to any lock-up restrictions and will be registered for resale on a prospectus supplement to be filed by atai immediately following the closing of the transaction.

The SPA Amendment further provides, in addition to the revisions described above, additional changes to the “Permitted Costs” definition to adjust the amount of permitted leakage and to include as a “Permitted Cost” certain payments to be made pursuant to a fee reduction amendment agreement between Beckley Psytech and CF&CO.

The foregoing description of the SPA Amendment does not purport to be complete and is qualified in its entirety by the full text of the SPA Amendment, a copy of which is filed as Exhibit 2.1 hereto and is incorporated by reference herein.

Supplemental Disclosure

This Supplement discloses certain additional information relating to the Acquisition in addition to the information previously provided by atai LuxCo in the Prospectus. This Supplement should be read in conjunction with the Prospectus, which you are urged to read in its entirety. To the extent that information in this Supplement differs from or updates information contained in the Prospectus, the information in this Supplement shall supersede or supplement the information in the Prospectus. Paragraph and page references used herein refer to the Prospectus before any additions or deletions resulting from this Supplement. Capitalized terms used herein, but not otherwise defined, shall have the meanings ascribed to such terms in the Prospectus. Unless stated otherwise, new text is bolded, italicized and underlined and deleted text is bolded, italicized and denoted with a strikethrough to highlight the supplemental information being provided to you.

On page iii of the Prospectus, the definition of “Buyer Share Price” is amended as follows:

“Buyer Share Price” means the higher of (i) the VWAP for the period commencing January 1, 2025 to the date falling ten Business Days prior to the date of atai’s general meeting where Shareholder Approval is adopted (the “Reference Date”); or (ii) the VWAP for the 30 trading day period prior to the Reference Date.

On page vi of the Prospectus, the definition of “VWAP” is amended as follows:

“VWAP” means the volume-weighted average price per share of ~~Ordinary Shares~~ Buyer’s publicly traded shares, calculated by reference to the daily closing price for such shares.

On page 55 of the Prospectus, the section entitled “The Acquisition – Background of the Acquisition” is amended to add the following paragraphs:

On October 23, 2025, atai and the Seller Representative entered into a Side Letter Deed to the Share Purchase Agreement (the “SPA Amendment”) which provides, among other clerical revisions, changes to the “Permitted Costs” definition to adjust the amount of permitted leakage and to include as a “Permitted Cost” certain payments to be made pursuant to an engagement letter between Beckley Psytech and Cantor Fitzgerald & Co. Additionally, the SPA Amendment provides that, in settlement of certain leakages, the number of Consideration Shares to be issued to shareholders of Beckley Psytech pursuant to the Share Purchase Agreement will be reduced on a pro-rata basis by an aggregate of 1,221,712 Consideration Shares. 900,901 of such Consideration Shares will instead be issued to Cantor Fitzgerald & Co in connection with services rendered to Beckley Psytech.

On page 76 of the Prospectus, the first full paragraph in the section entitled “The Share Purchase Agreement—Delivery of Consideration” is amended as follows:

At least five Business Days prior to the date of the Extraordinary General Meeting (or such later date as may be agreed in writing between the Seller Representative and atai), the Seller Representative shall deliver to atai and each Seller ***(in each case in respect of itself only and to the extent applicable)*** a schedule setting out, amongst other things, (i) the calculations required to determine the number of Consideration Shares and/or Replacement Awards that may (at atai’s election) be issued to Beckley Optionholders who hold vested and in the money Beckley Options and (ii) details of all vested and in the money Beckley Options and unvested and underwater Beckley Options.

On page 76 of the Prospectus, the first full paragraph in the section entitled “The Share Purchase Agreement—Leakage” is amended as follows:

The Share Purchase Agreement contains leakage provisions designed to prevent the transfer of value out of the Beckley Group prior to Closing. Prior to Closing, each Seller severally undertakes to atai that, if any leakage (other than certain items of pre-agreed permitted leakage) occurs, then, subject to Closing occurring, the Sellers shall pay to atai on demand an amount in cash equal to their respective proportions of the aggregate amount of such leakage, minus (i) the amount by which a cash tax liability for which Beckley Psytech or its subsidiaries would otherwise have been accountable or liable to be assessed (in respect of the accounting period in which the relevant Leakage occurs or the next subsequent accounting period) is or will be reduced (or extinguished) as a result of the utilisation of any relief arising in respect of any matter giving rise to the relevant Leakage or (ii) the amount of any cash refund in respect of tax received or which will be received by a member of the Beckley Group from a tax authority in respect of the accounting period in which the relevant Leakage occurs or the subsequent accounting period as a result of any matter giving rise to the relevant Leakage (in each case of clauses (i) and (ii), determining whether a cash tax liability would have arisen or, as the case may be, a cash refund of tax would have been received after taking into account all other reliefs available to the Beckley Group (or which would have been available, or could have been made available, but for the relevant leakage or relevant relief)); ***provided, that certain Leakage related to Transaction Costs or Carve-out Costs, up to \$6,780,500 in the aggregate, shall instead be settled by the Sellers by way of a pro-rata reduction (based on their respective proportions of the aggregate amount of such leakage) in the number of Consideration Shares to be issued to each Seller.***

On page 76 of the Prospectus, the fifth bullet point under the third full paragraph in the section entitled “The Share Purchase Agreement—Leakage” is amended as follows:

- the payment of any costs or expenses incurred in relation to the Acquisition or the Beckley Carve-Out in excess of ~~\$2,000,000~~ 3,780,500 in aggregate

On page 77 of the Prospectus, the final bullet point under the first paragraph in the section entitled “The Share Purchase Agreement—Leakage” is amended as follows:

- the payment of any costs or expenses incurred in relation to the Acquisition or the Beckley Carve-Out (in aggregate) up to ~~\$2,000,000~~ 3,780,500.

On page 78 of the Prospectus, the first full paragraph in the section entitled “The Share Purchase Agreement—Treatment of Outstanding Beckley Options in the Acquisition—Vested and in the money Beckley Options—Replacement Awards” is amended as follows:

If atai elects to grant Replacement Awards to Beckley Optionholders who hold vested and in the money Beckley Options, such awards shall be granted to the relevant Beckley Optionholders within five Business Days of Closing. Any Replacement Awards shall be subject to the same lock-up provisions as are applicable to the Consideration Shares (as described in the section titled “—Lock-up Covenants” below). ***atai may, in its sole discretion, allow up to 0.75% of the Consideration Shares to be released from the lock-up provisions to allow certain Beckley Optionholders to make payments in respect of tax obligations associated with the exercise of vested and in the money Beckley Options.***

On page 78 of the Prospectus, the first full paragraph in the section entitled “The Share Purchase Agreement—Treatment of Outstanding Beckley Options in the Acquisition—Calculations relating to the treatment of Beckley Options” is amended as follows:

In addition to the schedule setting out the calculations regarding the allocation of the Consideration Shares described in the section above titled “—Closing—Delivery of Consideration”, the Seller Representative shall, at

least three Business Days prior to Closing, deliver to atai, each Seller and Beckley Optionholder (in each case in respect of itself only and to the extent applicable), a schedule setting out the relevant calculations in respect of the treatment of the Beckley Options, including the corresponding number of Consideration Shares and/or Replacement Awards (as applicable) to be issued to each Beckley Optionholder holding vested and in the money Beckley Options.

On page 84 of the Prospectus, the first full paragraph in the section entitled “The Share Purchase Agreement—Covenants—Lock-up Covenants” is amended as follows:

All Consideration Shares (including those received by Beckley Optionholders in respect of their Beckley Options, if any) and any Replacement Awards received by Beckley Optionholders, if applicable, are also subject to certain lock-up restrictions, pursuant to which such holders will, subject to certain customary exceptions including the Company's ability to waive such lock-up restrictions in its sole discretion, not transfer any equity securities of atai for the Lock-Up Period. atai may, in its sole discretion, allow up to 0.75% of the Consideration Shares to be released from the lock-up provisions to allow certain Beckley Optionholders to make payments in respect of tax obligations associated with the exercise of vested and in the money Beckley Options. The Lock-Up Period commenced on the date of execution of the Share Purchase Agreement and terminates on the date that is the later of (i) sixty days following the public announcement of the results of Beckley Psytech's Phase 2b Clinical Trial (as defined in the Share Purchase Agreement) in respect of BPL-003, (ii) the Closing or (iii) the date on which the Share Purchase Agreement is terminated. At the expiration of the Lock-Up Period, the lock-up restrictions will fall away in part on a monthly basis until the date that is twelve months following the expiration of such period.

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