

PROSPECTUS



1,250,015 Shares of Common Stock

This prospectus relates to the offer and resale from time to time of up to 1,250,015 shares, or the Shares, of common stock of Lexeo Therapeutics, Inc., a Delaware corporation, or the Company, par value \$0.0001 per share, or the Common Stock, by the selling stockholder identified in this prospectus, including its transferees, pledgees or donees or their respective successors, or the Selling Stockholder. The Shares are issuable upon the exercise of outstanding pre-funded warrants to purchase shares of Common Stock held by the Selling Stockholder, or the Pre-Funded Warrants. The Pre-Funded Warrants were issued by us in a private placement, or the Private Placement, pursuant to a securities purchase agreement between us and the Selling Stockholder dated October 16, 2025, or the Purchase Agreement. Concurrently with the Purchase Agreement, we entered into a registration rights agreement, or the Registration Rights Agreement, with the Selling Stockholder, and we are registering the Shares being offered hereunder pursuant to such registration rights agreement on behalf of the Selling Stockholder, to be offered and sold by them from time to time.

The Selling Stockholder may sell any, all or none of the Shares and we do not know when or in what amount the Selling Stockholder may sell its Shares hereunder following the date of this prospectus. The Selling Stockholder may sell the Shares described in this prospectus in a number of different ways and at varying prices. We provide more information about how the Selling Stockholder may sell its Shares in the section titled “*Plan of Distribution*” appearing elsewhere in this prospectus.

We are not selling any Shares under this prospectus and will not receive any of the proceeds from the sale of the Shares by the Selling Stockholder. Upon any exercise of the Pre-Funded Warrants by payment of cash we will receive nominal proceeds equal to the exercise price of the Pre-Funded Warrants. We will pay the expenses associated with registering the sales by the Selling Stockholder other than any underwriting discounts and commissions, as described in more detail in the section titled “*Use of Proceeds*” appearing elsewhere in this prospectus.

Our Common Stock is listed on The Nasdaq Global Market, or Nasdaq, under the symbol “LXEO”. On November 25, 2025, the last quoted sale price for our Common Stock as reported on Nasdaq was \$9.72 per share.

We are an “emerging growth company” and a “smaller reporting company” as defined under the federal securities laws, and, as such, may elect to comply with certain reduced public company reporting requirements for this prospectus and for future filings. See the section titled “*Prospectus Summary—Implications of Being an Emerging Growth Company and a Smaller Reporting Company*.”

Investing in our securities involves a high degree of risk. Before buying any securities, you should carefully read the discussion of the risks and uncertainties of investing in our securities described in the section titled “[Risk Factors](#)” beginning on page 6 of this prospectus, and under similar headings in any amendments or supplements to this prospectus as well as the documents incorporated by reference in this prospectus.

You should rely only on the information contained in this prospectus or any prospectus supplement or amendment hereto. We have not authorized anyone to provide you with different information.

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

Prospectus dated November 26, 2025.

TABLE OF CONTENTS

	<u>Page</u>
About this Prospectus	ii
Prospectus Summary	1
The Offering	5
Risk Factors	6
Special Note Regarding Forward-Looking Statements	7
Use of Proceeds	10
Selling Stockholder	11
Plan of Distribution	13
Legal Matters	15
Experts	15
Where You Can Find More Information	15
Incorporation by Reference	16

ABOUT THIS PROSPECTUS

This prospectus is part of a registration statement on Form S-3 that we filed with the Securities and Exchange Commission, or the SEC, using the “shelf” registration process. Under this shelf registration process, the Selling Stockholder and its permitted transferees may, from time to time, sell the shares offered by them as described in the section titled “*Plan of Distribution*.” We will not receive any proceeds from the sale by the Selling Stockholder of the Shares. Upon any exercise of the Pre-Funded Warrants by payment of cash we will receive nominal proceeds equal to the exercise price of the Pre-Funded Warrants.

This prospectus provides you with a general description of the securities that may be offered. To the extent necessary, each time that the Selling Stockholder offers and sells securities, we or the Selling Stockholder may provide a prospectus supplement to this prospectus that contains specific information about the securities being offered and sold and the specific terms of that offering. To the extent permitted by law, we may also authorize one or more free writing prospectuses that may contain material information relating to these offerings. Such prospectus supplement or free writing prospectus may also add, update or change information contained in this prospectus with respect to that offering. If there is any inconsistency between the information in this prospectus and the applicable prospectus supplement or free writing prospectus, you should rely on the prospectus supplement or free writing prospectus, as applicable. Before purchasing any securities, you should carefully read both this prospectus and any applicable prospectus supplement (and any applicable free writing prospectuses) together with the additional information described under the sections titled “*Where You Can Find More Information*” and “*Incorporation by Reference*.”

Neither we nor the Selling Stockholder have authorized anyone to provide you with any information or to make any representations other than those contained, or incorporated by reference, in this prospectus, any applicable prospectus supplement or in any related free writing prospectus. Neither we nor the Selling Stockholder take any responsibility for, nor provide any assurance as to the reliability of, any other information that others may give you. This prospectus and any applicable prospectus supplement or any related free writing prospectus do not constitute an offer to sell or the solicitation of an offer to buy any securities other than the securities described in the applicable 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 and any applicable prospectus supplement to this prospectus is accurate only as of the date on its respective cover, that the information appearing in any applicable free writing prospectus is accurate only as of the date of that free writing prospectus, and that any information incorporated by reference is accurate only as of the date of the document incorporated by reference, unless we indicate otherwise. Our business, financial condition, results of operations and prospects may have changed materially since those dates.

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

For investors outside of the United States: Neither we nor the Selling Stockholder have done anything that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons outside the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of our securities and the distribution of this prospectus outside the United States.

[Table of Contents](#)

The Lexeo design logo and the Lexeo mark appearing in this prospectus are the property of Lexeo Therapeutics, Inc. Trade names, trademarks and service marks of other companies appearing in this prospectus are the property of their respective holders. We have omitted the ® and TM designations, as applicable, for the trademarks used in this prospectus.

PROSPECTUS SUMMARY

This summary highlights, and is qualified in its entirety by, information contained elsewhere in or incorporated by reference in this prospectus. This summary does not contain all of the information you should consider before investing in our Common Stock. You should carefully read this entire prospectus, especially the section of this prospectus titled “Risk Factors” and the financial statements and related notes and other information that we incorporate by reference herein, including our Annual Report on Form 10-K and our Quarterly Reports on Form 10-Q. As used in this prospectus, unless the context otherwise requires, references to “we,” “us,” “our,” “the Company,” and “Lexeo” refer to Lexeo Therapeutics, Inc.

Company Overview

We are a clinical stage genetic medicine company dedicated to reshaping heart health by applying pioneering science to fundamentally change how cardiovascular diseases are treated. We are advancing a portfolio of therapeutic candidates that take aim at the underlying genetic causes of conditions, including Friedreich ataxia, or FA, cardiomyopathy, plakophilin-2, or PKP2, arrhythmogenic cardiomyopathy, or ACM, and other devastating diseases with high unmet need.

Our most advanced cardiovascular product candidate, LX2006 for the treatment of FA cardiomyopathy, is currently being evaluated in SUNRISE-FA, our ongoing Phase 1/2 clinical trial, and in a Cornell investigator-initiated trial. In October 2025, we announced progress in regulatory interactions with the U.S. Food and Drug Administration, or the FDA, on LX2006. In response to questions from us regarding the possibility of a faster path to a Biologics License Application, or BLA, the FDA has indicated openness to a BLA submission for accelerated approval that includes clinical data from our ongoing Phase 1/2 studies of LX2006 pooled with new clinical data to be generated in the planned pivotal study. To enable pooling of these data to support licensure, we will submit enhanced manufacturing comparability data and meet an additional nonclinical requirement, given our intention to leverage our optimized, high-yield Sf9-baculovirus manufacturing platform for future clinical and commercial drug supply, compared to the adherent HEK293 process used for our Phase 1/2 clinical supply. In October 2025, we shared Chemistry, Manufacturing and Controls, or CMC, data for LX2006, which were submitted to the FDA to support analytical comparability between the HEK293 manufacturing process and the Sf9-baculovirus manufacturing platform. These data demonstrate similar frataxin expression *in vitro* between the two processes as measured by a quantitative relative potency assay in cardiomyocytes. In November 2025, the FDA approved this analytical comparability report establishing comparability between LX2006 HEK293 and Sf9 manufacturing processes, endorsing use of the optimized, high-yield Sf9 final commercial manufacturing process for LX2006 in the planned pivotal study and clearing compatibility requirements to begin dosing patients.

Along with the regulatory announcement, we provided an interim clinical update on LX2006, which included baseline characteristics and safety data from the 17 treated participants across the two studies, and clinical efficacy data from the 16 participants who had reached at least six months of follow up as of that time. These data showed sustained or deepening improvements in the majority of participants across both cardiac and neurologic measures of FA, exceeding the thresholds previously agreed with FDA for co-primary endpoints LVMI and frataxin expression. We shared that the FDA had previously agreed to evaluate the co-primary endpoint of LVMI at a time point earlier than 12 months. LX2006 has been generally well-tolerated across both trials to date, with no clinically significant complement activation. We continue to engage with the FDA on the planned pivotal study protocol and comparability. In discussions to date, there have been no changes to the previously disclosed alignment with the FDA on key parameters related to the LX2006 planned pivotal study.

Our second most advanced cardiovascular product candidate, LX2020 for the treatment of ACM caused by mutations in the PKP2 gene, referred to as PKP2-ACM, is currently being evaluated in HEROIC-PKP2, an ongoing Phase 1/2 clinical trial. We have completed enrollment and dosing in this trial, with ten participants

dosed: three in the low dose cohort 1 (2×10^{13} vg/kg), three in the high dose cohort 2 (6×10^{13} vg/kg), and four in the dose-expansion high dose cohort 3 (6×10^{13} vg/kg). Across all participants dosed, LX2020 has been generally well-tolerated, with no clinically significant complement activation to date. In October 2025, we reported that one Grade 3 serious adverse event, which was assessed as possibly treatment related, of sustained ventricular tachycardia, or SVT, had been observed three months after dosing in a single participant in the high dose cohort of the HEROIC-PKP2 Phase 1/2 clinical trial. The participant was successfully treated with anti-arrhythmic medication and was discharged with no additional intervention required. This patient had a documented history of prior VTs and had an implantable cardioverter defibrillator in place.

For the three participants in low dose cohort 1 (n=2 at 12 months; n=1 at 9 months), multiple cardiac parameters were assessed at latest visit relative to baseline:

- Arrhythmia burden: Premature ventricular contractions were reduced in one of three participants and non-sustained ventricular tachycardia was reduced or stable in two of three participants.
- Electrical activity: QRS duration was normalized or stable in two of three participants and T-wave inversions were reduced in two of three participants.
- Cardiac function: Left ventricular ejection fraction and right ventricular ejection fraction were stable in three of three participants.

We anticipate sharing additional safety and clinical efficacy data in January 2026 at the J.P. Morgan Healthcare Conference once most participants in the high dose cohorts reach at least six months of follow up. This data update is expected to include data from such high dose cohort patients and three low dose participants with at least 12 months of follow up, as well as five cardiac biopsies from the high dose cohorts analyzed at baseline and three months after dosing.

Each of our gene therapy candidates utilizes the vector construct, dose and route of administration that we believe will result in the most favorable biodistribution and safety profile for our product candidate for each disease. Our most advanced programs use the AAVrh10 vector due to its high transduction efficiency in myocardial cells, potential for lower toxicity given the opportunity to utilize lower doses compared to other well-established AAV serotypes, and low pre-existing immunity.

Implications of Being an Emerging Growth Company and a Smaller Reporting Company

We qualify as an “emerging growth company” as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. For so long as we remain an emerging growth company, we may take advantage of relief from certain reporting requirements and other burdens that are otherwise applicable generally to public companies. These provisions include:

- reduced obligations with respect to financial data, including only being required to present two years of audited financial statements, in addition to any required unaudited interim financial statements with correspondingly reduced “Management’s Discussion and Analysis of Financial Condition and Results of Operations” disclosure;
- an exception from compliance with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended;
- reduced disclosure about our executive compensation arrangements in our periodic reports, proxy statements and registration statements;
- exemptions from the requirements of holding non-binding advisory votes on executive compensation or golden parachute arrangements; and

- an exemption from compliance with the requirements of the Public Company Accounting Oversight Board regarding the communication of critical audit matters in the auditor’s report on financial statements.

We may take advantage of these provisions until we no longer qualify as an emerging growth company. We will cease to qualify as an emerging growth company on the date that is the earliest of: (i) December 31, 2028, (ii) the last day of the fiscal year in which we have more than \$1.235 billion in total annual gross revenues, (iii) the date on which we are deemed to be a “large accelerated filer” under the rules of the SEC, which means the market value of our Common Stock that is held by non-affiliates exceeds \$700.0 million as of the prior June 30, or (iv) the date on which we have issued more than \$1.0 billion of non-convertible debt over the prior three-year period. We may choose to take advantage of some but not all of these reduced reporting burdens.

We have taken advantage of certain reduced reporting requirements in the documents incorporated by reference into this prospectus. Accordingly, the information contained and incorporated by reference herein may be different than you might obtain from other public companies in which you hold equity interests.

In addition, under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have elected to take advantage of the extended transition period to comply with new or revised accounting standards and to adopt certain of the reduced disclosure requirements available to emerging growth companies. As a result of the accounting standards election, we will not be subject to the same implementation timing for new or revised accounting standards as other public companies that are not emerging growth companies, which may make comparison of our financials to those of other public companies more difficult. As a result of these elections, the information that we provide in this prospectus may be different than the information you may receive from other public companies in which you hold equity interests. In addition, it is possible that some investors will find our Common Stock less attractive as a result of these elections, which may result in a less active trading market for our Common Stock and higher volatility in our share price.

We are also a “smaller reporting company,” meaning that the market value of our shares held by non-affiliates plus the proposed aggregate amount of gross proceeds to us as a result of this offering is less than \$700.0 million and our annual revenue was less than \$100.0 million during the most recently completed fiscal year. We may continue to be a smaller reporting company after this offering if either (i) the market value of our shares held by non-affiliates is less than \$250.0 million measured on the last business day of the second fiscal quarter of the preceding fiscal year or (ii) our annual revenue was less than \$100.0 million during the most recently completed fiscal year and the market value of our shares held by non-affiliates is less than \$700.0 million measured on the last business day of the second fiscal quarter of the preceding fiscal year. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, as a smaller reporting company, we may choose to present only the two most recent fiscal years of audited financial statements in our Annual Report on Form 10-K and, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation. Accordingly, the information contained or incorporated by reference herein may be different than the information you receive from other public companies in which you hold stock.

Corporate Information

In February 2017, we were formed as a Delaware limited liability company under the name LEXEO Therapeutics, LLC. In November 2020, we converted into a Delaware corporation and were renamed Lexeo Therapeutics, Inc. Our principal executive offices are located at 345 Park Avenue South, Floor 6, New York, New York 10010, and our telephone number is (212) 547-9879. Our website address is www.lexeotx.com. The

information contained on, or accessible through, our website is not incorporated by reference in this prospectus. Our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to reports filed pursuant to Sections 13(a) and 15(d) of the Securities Exchange Act of 1934, as amended, or the Exchange Act, are filed with the SEC. Such reports and other information filed by us with the SEC are available free of charge on our website at ir.lexeotx.com when such reports are available on the SEC's website. The SEC maintains an internet site that contains reports, proxy and information statements and other information regarding issuers that file electronically with the SEC at www.sec.gov. The information contained on the websites referenced in this prospectus and in the documents that are incorporated by reference in this prospectus is not incorporated by reference in this filing. Further, our references to website URLs are intended to be inactive textual references only.

Private Placement

On October 16, 2025, in connection with the Private Placement, we entered into the Purchase Agreement and the Registration Rights Agreement with the Selling Stockholder. Under the terms of the Registration Rights Agreement, we agreed to prepare and file, within 30 days after the closing of the Private Placement, one or more registration statements with the SEC to register the Shares for resale, and to use best efforts to cause such registration statement to become effective as soon as practicable.

At the closing of the Private Placement, on October 20, 2025, we sold and issued to the Selling Stockholder Pre-Funded Warrants to purchase 1,250,015 shares of Common Stock. The purchase price per Pre-Funded Warrant was \$7.9999. The total purchase price paid by the Selling Stockholder in the Private Placement was approximately \$10 million.

Each Pre-Funded Warrant has an exercise price of \$0.0001 per Share and does not expire until exercised in full, and is exercisable at any time. We may not effect the exercise of any Pre-Funded Warrant and a holder will not be entitled to request the exercise of any portion of any Pre-Funded Warrant if, upon giving effect to such exercise, the aggregate number of Shares of Common Stock beneficially owned by the holder (together with its affiliates and other specified parties) would exceed 9.99% of the number of Shares of Common Stock outstanding immediately after giving effect to the exercise, or the Beneficial Ownership Limitation. The holder may reset the Beneficial Ownership Limitation as to itself to a higher percentage (not to exceed 19.99%), effective 61 days after written notice to us.

The offer and sale of the securities in the Private Placement were not registered under the Securities Act or any state securities laws. We relied on the exemption from the registration requirements afforded by Rule 4(a)(2) under the Securities Act for the Private Placement. The Selling Stockholder has represented to us that it is an "accredited investor" as defined in Regulation D of the Securities Act, and that the securities purchased by the Selling Stockholder were being acquired solely for its own account and for investment purposes and not with a present view to its future public sale or distribution.

The description of the Purchase Agreement and the Registration Rights Agreement are not complete and are qualified in their entirety by reference to the Purchase Agreement and the Registration Rights Agreement, which were filed as exhibits to our Current Report on Form 8-K, filed on October 17, 2025. See the sections titled "*Where You Can Find More Information*" and "*Information Incorporated by Reference*." The representations, warranties and covenants made by us in such agreements were made solely for the benefit of the parties to such agreements, including, in some cases, for the purpose of allocating risk among the parties thereto, and should not be deemed to be a representation, warranty or covenant to you. Moreover, such representations, warranties or covenants were made as of an earlier date. Accordingly, such representations, warranties and covenants should not be relied on as accurately representing the current state of our affairs.

THE OFFERING

Shares of Common Stock Offered by the Selling Stockholder Hereunder	1,250,015 shares of Common Stock issuable upon the exercise of outstanding Pre-Funded Warrants held by the Selling Stockholder.
Use of Proceeds	We will not receive any proceeds from the sale of the Shares covered by this prospectus. Upon any exercise of the Pre-Funded Warrants by payment of cash we will receive nominal proceeds equal to the exercise price of the Pre-Funded Warrants. See the section titled “ <i>Use of Proceeds</i> ” for more information.
Risk Factors	See the section titled “ <i>Risk Factors</i> ” on page 6 and the documents incorporated herein by reference for a discussion of factors that you should consider carefully before deciding to invest in our Common Stock.
Nasdaq Global Market Symbol	“LXEO”

Unless otherwise noted, the number of our shares of Common Stock outstanding is based on 54,935,477 shares of Common Stock outstanding as of September 30, 2025, and excludes:

- 4,476,094 shares of Common Stock issuable upon the exercise of outstanding options as of September 30, 2025, with a weighted-average exercise price of \$9.74 per share;
- 942,700 shares of Common Stock issuable upon the vesting of restricted stock units, or RSUs, outstanding as of September 30, 2025 under our 2023 Equity Incentive Plan, or the 2023 Plan;
- 2,052,039 shares of Common Stock reserved for future issuance under the 2023 Plan as of September 30, 2025, as well as any automatic increases in the number of shares of Common Stock reserved for issuance under the 2024 Plan;
- 733,239 shares of Common Stock reserved for future issuance under our 2023 Employee Stock Purchase Plan, or the 2023 ESPP, as of September 30, 2025, as well as any automatic increases in the number of shares of Common Stock reserved for issuance under the 2023 ESPP;
- 13,876,838 shares of our Common Stock issuable upon the exercise of warrants issued in our May 2025 private placement, or the May Private Placement, at an exercise price of \$2.82 per share; and
- 6,096,254 shares of our Common Stock issuable upon the exercise of pre-funded warrants issued in the May Private Placement at an exercise price of \$0.0001 per share.

Up to \$75.0 million of shares of our Common Stock may be sold from time to time under our “at-the-market” program that we entered into on March 24, 2025, with Leerink Partners LLC, or the ATM Facility. As of the date of this prospectus, we have not sold any shares of our Common Stock under the ATM Facility.

Unless otherwise noted, the information in this prospectus assumes no exercise of outstanding options or warrants, vesting of RSUs or issuance of shares of Common Stock under the ATM Facility subsequent to September 30, 2025.

RISK FACTORS

Investing in our Common Stock involves a high degree of risk. Before making an investment decision, you should consider carefully the risks, uncertainties and assumptions described under “Part I—Item 1A—Risk Factors” of our most recent Annual Report on Form 10-K and in “Part II—Item 1A—Risk Factors” in our most recent Quarterly Report on Form 10-Q filed subsequent to such Form 10-K that are incorporated herein by reference as may be amended, supplemented or superseded from time to time by other reports we file with the SEC in the future, and all other information contained or incorporated by reference in this prospectus, as updated by our subsequent filings under the Exchange Act, and the risk factors and other information contained in any applicable prospectus supplement and any applicable free writing prospectus. Our business, operating results, financial condition or prospects could also be harmed by risks and uncertainties not currently known to us or that we currently do not believe are material. If any of the risks actually occur, our business, operating results, financial condition and prospects could be adversely affected. In that event, the market price of our Common Stock could decline, and you could lose part or all of your investment. Please also carefully read the sections titled “Special Note Regarding Forward-Looking Statements” and “Incorporation by Reference.”

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus, any prospectus supplement or free writing prospectus, and the documents incorporated by reference herein and therein contain certain statements that constitute forward-looking statements within the meaning of Section 27A of the Securities Act and Section 21E of the Exchange Act that involve risks and uncertainties. In some cases, you can identify forward-looking statements by terms such as “may,” “will,” “should,” “expect,” “plan,” “anticipate,” “could,” “intend,” “target,” “project,” “estimate,” “believe,” “predict,” “potential” or “continue” or the negative of these terms or other similar expressions intended to identify statements about the future, but these are not the exclusive means of identifying such statements. Those statements appear in this prospectus, any accompanying prospectus supplement or free writing prospectus and the documents incorporated herein and therein by reference, particularly in the sections titled “*Business*,” “*Risk Factors*” and “*Management’s Discussion and Analysis of Financial Condition and Results of Operations*” and include statements regarding the intent, belief or current expectations of our management that are subject to known and unknown risks, uncertainties and assumptions. We make such forward-looking statements pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995 and other federal securities laws. Forward-looking statements contained or incorporated by reference in this prospectus, any applicable prospectus supplement or free writing prospectus include, without limitation, statements about:

- the timing, progress and results of our preclinical studies and clinical trials of our 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;
- the timing of our planned investigational new drug, or IND, submissions, initiation of planned clinical trials and timing of expected clinical results for LX2006 and LX2020, if applicable, and our other future product candidates;
- the timing for receipt and announcement of data from our preclinical studies and clinical trials;
- the timing of any submission of filings for regulatory approval of and our ability to obtain and maintain regulatory approvals for LX2006, LX2020 and any other product candidates;
- the impact of public health crises and other adverse global economic conditions on our operations and the potential disruption in the operations and business of third-party manufacturers, contract research organizations, or CROs, other service providers, and collaborators with whom we conduct business;
- our ability to identify patients with the diseases treated by our product candidates, and to enroll patients in trials;
- the beneficial characteristics, safety, efficacy and therapeutic effects of our product candidates;
- the ability of our preclinical studies and clinical trials to demonstrate safety and efficacy of our product candidates, and other positive results;
- our expectations regarding the size of the patient populations, market acceptance and opportunity for and clinical utility of our product candidates, if approved for commercial use;
- our manufacturing capabilities and strategy, including the scalability and commercial viability of our manufacturing methods and processes;
- our reliance on third party manufacturing partners to comply with significant regulations with respect to manufacturing our products;
- our expectations regarding the scope of any approved indication for LX2006, LX2020 or any other product candidate;
- our ability to successfully commercialize our product candidates, if approved;
- our ability to leverage our platform to identify and develop future product candidates;

Table of Contents

- our estimates of our expenses, ongoing losses, future revenue, capital requirements and our need for or ability to obtain additional funding before we can expect to generate any revenue from product sales;
- our ability to establish or maintain collaborations or strategic relationships and any expected benefits related thereto;
- our ability to identify, recruit and retain key personnel;
- our reliance upon intellectual property licensed from third parties and our ability to obtain such licenses on commercially reasonable terms or at all;
- our ability to protect and enforce our intellectual property position for our product candidates, and the scope of such protection;
- our financial performance;
- our competitive position and the development of and projections relating to our competitors or our industry;
- our estimates regarding future revenue, expenses and needs for additional financing;
- our anticipated use of our cash, cash equivalents, and investments balances and any proceeds from the ATM Facility;
- the impact of current and future laws and regulations; and
- our expectations regarding the time during which we will be an emerging growth company under the JOBS Act.

We caution you that the foregoing list does not contain all of the forward-looking statements made in this prospectus, any applicable prospectus supplement or free writing prospectus, and the documents incorporated by reference into this prospectus, any applicable prospectus supplement or free writing prospectus.

We have based these forward-looking statements largely on our current expectations and projections about our business, the industry in which we operate and financial trends that we believe may affect our business, financial condition, results of operations and prospects, and these forward-looking statements are not guarantees of future performance or development. The forward-looking statements contained in this prospectus, any prospectus supplement or free writing prospectus, and the information incorporated by reference herein and therein speak only as of the applicable date of such document and are subject to a number of risks, uncertainties and assumptions described in the section titled “*Risk Factors*” and elsewhere in this prospectus, any prospectus supplement or free writing prospectus, and the information incorporated by reference herein and therein. Because forward-looking statements are inherently subject to risks and uncertainties, some of which cannot be predicted or quantified, you should not rely upon forward-looking statements as predictions of future events. The events and circumstances reflected in the forward-looking statements may not be achieved or occur and actual results could differ materially from those projected in the forward-looking statements. Except as required by applicable law, including the securities laws of the United States and the rules and regulations of the SEC, we do not plan to publicly update or revise any forward-looking statements contained in this prospectus, any applicable prospectus supplement or free writing prospectus, and the documents incorporated by reference into this prospectus, any applicable prospectus supplement or free writing prospectus after we distribute this prospectus, whether as a result of any new information, future events or otherwise.

In addition, statements that “we believe” and similar statements reflect our beliefs and opinions on the relevant subject. These statements are based upon information known to us as of the date of the document containing such statement, and although we believe such information forms a reasonable basis for such statements, such information may be limited or incomplete, and our statements should not be read to indicate that we have conducted a thorough inquiry into, or review of, all potentially available relevant information. These statements are inherently uncertain and investors are cautioned not to unduly rely upon these statements.

[Table of Contents](#)

This prospectus, any applicable prospectus supplement or free writing prospectus, and the documents incorporated by reference into this prospectus, any applicable prospectus supplement or free writing prospectus may contain market data that we obtain from industry sources. These sources do not guarantee the accuracy or completeness of the information. Although we believe that our industry sources are reliable, we do not independently verify the information. The market data may include projections that are based on a number of other projections. While we believe these projections to be reasonable as of the date of this prospectus, actual results may differ from the projections.

USE OF PROCEEDS

We are filing the registration statement of which this prospectus is a part to permit holders of the shares of our Common Stock described in the section entitled “*Selling Stockholder*” to resell such shares. We are not selling any securities under this prospectus and we will not receive any proceeds from the sale or other disposition of shares of our Common Stock held by the Selling Stockholder. We will receive nominal proceeds, if any, from any exercise of Pre-Funded Warrants for cash.

The Pre-Funded Warrants are exercisable at any time and will not expire until exercised in full. The Pre-Funded Warrants are only exercisable on a net exercise cashless basis if, at the time of the exercise thereof, there is no effective registration statement registering, or no current prospectus available for, the resale of the Shares of Common Stock issuable upon exercise of the Pre-Funded Warrants. If the Pre-Funded Warrants are exercised on a cashless basis, we would not receive any cash payment from the Selling Stockholder upon any such exercise of the Pre-Funded Warrants.

The Selling Stockholder will pay any discounts, commissions, fees of underwriters, selling brokers or dealer managers and expenses incurred by the Selling Stockholder for brokerage, accounting, tax or legal services or any other expenses incurred by the Selling Stockholder in disposing of the Shares. We will bear all other costs, fees and expenses incurred in effecting the registration of the shares covered by this prospectus, including, without limitation, all registration and filing fees, printing fees, Nasdaq listing fees and fees and expenses of our counsel and our accountants.

SELLING STOCKHOLDER

This prospectus relates to the resale by the Selling Stockholder of up to 1,250,015 Shares issuable upon the exercise of outstanding Pre-Funded Warrants held by the Selling Stockholder. We cannot predict when or whether the Selling Stockholder will exercise its Pre-Funded Warrants. For additional information, see the section titled “*Prospectus Summary—Private Placement.*”

The Selling Stockholder may from time to time offer and sell any or all of the Shares set forth below pursuant to this prospectus and any accompanying prospectus supplement.

The following table is prepared based on information provided to us by the Selling Stockholder and 72,987,327 shares of Common Stock outstanding as of October 31, 2025. It sets forth, as of the date of this prospectus, the name of the Selling Stockholder, and the aggregate number of Shares that the Selling Stockholder may offer pursuant to this prospectus. Shares offered and beneficially owned are based primarily on information initially provided to us by the Selling Stockholder. For purposes of this table, we have assumed that the Selling Stockholder will have sold all of the Shares covered by this prospectus upon the completion of the offering, without regard to any limitations on the exercise of the Pre-Funded Warrants. Under the terms of the Pre-Funded Warrants, the holder will not be entitled to request the exercise of any portion of any Pre-Funded Warrant if, upon giving effect to such exercise, the aggregate number of shares of our Common Stock beneficially owned by the holder (together with its affiliates and other specified parties) would exceed the Beneficial Ownership Limitation.

We cannot advise you as to whether the Selling Stockholder will in fact sell any or all of such Shares. In particular, the Selling Stockholder may have sold, transferred or otherwise disposed of all or a portion of its Shares after the date on which the Selling Stockholder provided us with information regarding its securities. Any changed or new information given to us by the Selling Stockholder, including regarding the identity of, and the securities held by, the Selling Stockholder, will be set forth in a prospectus supplement or amendments to the registration statement of which this prospectus is a part, if and when necessary.

Please see the section titled “*Plan of Distribution*” for further information regarding the Selling Stockholder’s method of distributing these securities.

We have determined beneficial ownership in accordance with the rules and regulations of the SEC and the information is not necessarily indicative of beneficial ownership for any other purpose. Generally, a person “beneficially owns” shares of our Common Stock if the person has or shares with others the right to vote those shares or to dispose of them, or if the person has the right to acquire voting or disposition rights within 60 days. Except as indicated by the footnotes below, we believe, based on information furnished to us, that the persons and entities named in the table below have sole voting and sole investment power with respect to all shares that they beneficially own, subject to applicable community property laws. The inclusion of any shares in this table does not constitute an admission of beneficial ownership for the Selling Stockholder named below.

Name of Selling Stockholder	Shares Beneficially Owned Prior to this Offering		Shares Offered	Shares Beneficially Owned After this Offering	
	Number of Shares	Percentage		Number of Shares	Percentage
Atlas Private Holdings (Cayman) Ltd. ⁽¹⁾	6,721,674	9.2%	1,250,015	5,471,659	7.5%

- (1) Consists of (i) 1,135,145 shares of Common Stock held by Atlas Private Holdings (Cayman) Ltd., or Atlas, prior to the Private Placement, (ii) 4,336,514 shares of Common Stock issuable upon exercise of warrants to purchase Common Stock held by Atlas prior to the Private Placement and (iii) 1,250,015 shares of Common Stock issuable upon exercise of the Pre-Funded Warrants purchased by Atlas in the Private Placement. The

[Table of Contents](#)

warrants to purchase Common Stock held by Atlas, including the Pre-Funded Warrants, prohibit the exercise thereof if, after giving effect to such exercise, the beneficial ownership of Atlas, its affiliates and any person whose beneficial ownership would be attributable to such entities, would exceed 9.99%. Balyasny Asset Management L.P. is Atlas' investment adviser. Dmitry Balyasny, via intermediate entities, manages Balyasny Asset Management L.P. and has voting and investment control over the reported securities. The address and principal office of Balyasny Asset Management L.P. is 767 5th Avenue, 35th Floor New York, NY 10153.

Relationship with the Selling Stockholder

As discussed in greater detail above in the section titled "*Prospectus Summary—Private Placement*," on October 16, 2025, we entered into the Purchase Agreement and Registration Rights Agreement with the Selling Stockholder pursuant to which, on October 20, 2025, we sold the Pre-Funded Warrants to the Selling Stockholder and agreed to file a registration statement to enable the resale of the Shares covered by this prospectus. Neither the Selling Stockholder nor any persons having control over the Selling Stockholder has held any position or office with us or our affiliates within the last three years or has had a material relationship with us or any of our predecessors or affiliates within the past three years, other than as a result of the ownership of our shares or other securities.

PLAN OF DISTRIBUTION

The Selling Stockholder may, from time to time, sell, transfer, distribute in kind for no consideration or otherwise dispose of any or all of its shares of our Common Stock or interests in shares of Common Stock on any stock exchange, market or trading facility on which the shares are traded or in private transactions. These dispositions may be at fixed prices, at prevailing market prices at the time of sale, at prices related to the prevailing market price, at varying prices determined at the time of sale, or at negotiated prices.

The Selling Stockholder may use any one or more of the following methods when disposing of shares or interests therein:

- ordinary brokerage transactions and transactions in which the broker-dealer solicits purchasers;
- block trades in which the broker-dealer will attempt to sell the shares 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;
- short sales effected after the date the registration statement of which this prospectus is a part is declared effective by the SEC;
- through the writing or settlement of options or other hedging transactions, whether through an options exchange or otherwise;
- broker-dealers may agree with the Selling Stockholder to sell a specified number of such Shares at a stipulated price per share;
- through the distribution of the securities by any Selling Stockholder to its partners, members or stockholders;
- by pledge to secured debts and other obligations or any transfer upon the foreclosure under such pledges;
- directly to one or more purchasers;
- through delayed delivery requirements;
- a combination of any such methods of sale; and
- any other method permitted by applicable law.

The Selling Stockholder may, from time to time, pledge or grant a security interest in some or all of the shares of Common Stock owned by the Selling Stockholder and, if the Selling Stockholder defaults in the performance of its secured obligations, the pledgees or secured parties may offer and sell the shares of Common Stock, from time to time, under this prospectus, or under an amendment to this prospectus under Rule 424(b)(3) or other applicable provision of the Securities Act, amending the named Selling Stockholder to include the pledgee, transferee or other successors in interest as Selling Stockholders under this prospectus. The Selling Stockholder also may transfer the shares of Common Stock in other circumstances, in which case the transferees, pledgees or other successors in interest will be the Selling Stockholder for purposes of this prospectus.

In connection with the sale of our Common Stock or interests therein, the Selling Stockholder may enter into hedging transactions with broker-dealers or other financial institutions, which may in turn engage in short sales of the Common Stock in the course of hedging the positions they assume. The Selling Stockholder may also sell shares of our Common Stock short and deliver these securities to close out its short positions, or loan or pledge the Common Stock to broker-dealers that in turn may sell these securities. The Selling Stockholder may

Table of Contents

also enter into option or other transactions with broker-dealers or other financial institutions or the creation of one or more derivative securities which require the delivery to such broker-dealer or other financial institution of shares offered by this prospectus, which shares such broker-dealer or other financial institution may resell pursuant to this prospectus (as supplemented or amended to reflect such transaction).

The aggregate proceeds to the Selling Stockholder from the sale of the Common Stock offered by them will be the purchase price of the Common Stock less discounts or commissions, if any. The Selling Stockholder reserves the right to accept and, together with its agents from time to time, to reject, in whole or in part, any proposed purchase of Common Stock to be made directly or through agents. The Company will not receive any of the proceeds from this offering. Upon any exercise of the Pre-Funded Warrants by payment of cash the Company will receive nominal proceeds equal to the exercise price of the Pre-Funded Warrants.

The Selling Stockholder also may resell all or a portion of the Shares in open market transactions in reliance upon Rule 144 under the Securities Act, provided that the Selling Stockholder meets the criteria and conforms to the requirements of that rule, or another available exemption from the registration requirements of the Securities Act.

The Selling Stockholder and any underwriters, broker-dealers or agents that participate in the sale of the Common Stock or interests therein may be “underwriters” within the meaning of Section 2(a)(11) of the Securities Act (it being understood that the Selling Stockholder shall not be deemed to be an underwriter solely as a result of its participation in this offering). Any discounts, commissions, concessions or profit earned on any resale of the shares may be underwriting discounts and commissions under the Securities Act. If the Selling Stockholder is an “underwriter” within the meaning of Section 2(a)(11) of the Securities Act the Selling Stockholder will be subject to the prospectus delivery requirements of the Securities Act.

To the extent required, the shares of our Common Stock to be sold, the name of the Selling Stockholder, the respective purchase prices and public offering prices, the names of any agents, dealer or underwriter, and any applicable commissions or discounts with respect to a particular offer will be set forth in an accompanying prospectus supplement or, if appropriate, a post-effective amendment to the registration statement that includes this prospectus.

In order to comply with the securities laws of some states, if applicable, the Common Stock may be sold in these jurisdictions only through registered or licensed brokers or dealers. In addition, in some states the Common Stock may not be sold unless it has been registered or qualified for sale or an exemption from registration or qualification requirements is available and is complied with.

We have advised the Selling Stockholder that the anti-manipulation rules of Regulation M under the Securities Exchange Act of 1934, as amended, may apply to sales of shares in the market and to the activities of the Selling Stockholder and its affiliates. In addition, to the extent applicable, we will make copies of this prospectus (as it may be supplemented or amended from time to time) available to the Selling Stockholder for the purpose of satisfying the prospectus delivery requirements of the Securities Act. The Selling Stockholder may indemnify any broker-dealer that participates in transactions involving the sale of the shares against certain liabilities, including liabilities arising under the Securities Act.

We have agreed to indemnify the Selling Stockholder against liabilities, including liabilities under the Securities Act and state securities laws, relating to the registration of the Shares offered by this prospectus.

We have agreed with the Selling Stockholder to use commercially reasonable efforts to cause the registration statement of which this prospectus constitutes a part to become effective and to remain continuously effective until the earlier of (1) such time as all of the Shares covered by the registration statement of which this prospectus forms a part have been disposed of pursuant to and in accordance with such registration statement, (2) the date that all the Shares covered by the registration statement of which this prospectus forms a part cease to be Registrable Securities (as defined in the Registration Rights Agreement) and (3) five years from the date of effectiveness of the registration statement of which this prospectus forms a part.

LEGAL MATTERS

The validity of the shares of our Common Stock offered hereby is being passed upon for us by Wilson Sonsini Goodrich & Rosati, Professional Corporation, New York, New York.

EXPERTS

The financial statements of Lexeo Therapeutics, Inc. as of December 31, 2024 and 2023, and for the years then ended, have been incorporated by reference herein in reliance upon the report of KPMG LLP, independent registered public accounting firm, incorporated by reference herein, and upon the authority of said firm as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We file annual, quarterly and current reports, proxy statements and other information with the SEC. The SEC maintains an Internet website at www.sec.gov that contains reports, proxy and information statements and other information about issuers, like us, that file electronically with the SEC. We also maintain a website at www.lexeotx.com. We make available, free of charge, on our investor relations website at ir.lexeotx.com, our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to these reports as soon as reasonably practicable after electronically filing or furnishing those reports to the SEC. Information contained on our website is not a part of or incorporated by reference in this prospectus and the inclusion of our website and investor relations website addresses in this prospectus is an inactive textual reference only.

This prospectus and any prospectus supplement is part of a registration statement that we filed with the SEC and do not contain all of the information in the registration statement. You should review the information and exhibits in the registration statement for further information on us and the securities that we are offering. Forms of any documents establishing the terms of the offered securities are filed as exhibits to the registration statement of which this prospectus forms a part or under cover of a Current Report on Form 8-K and incorporated in this prospectus by reference. Statements in this prospectus or any prospectus supplement about these documents are summaries and each statement is qualified in all respects by reference to the document to which it refers. You should read the actual documents for a more complete description of the relevant matters.

INCORPORATION BY REFERENCE

The SEC allows us to “incorporate by reference” information from other documents that we file with it, which means that we can disclose important information to you by referring you to those documents. The information incorporated by reference is considered to be part of this prospectus. We incorporate by reference into this prospectus and the registration statement of which this prospectus is a part the information or documents listed below that we have filed with the SEC (File No. 001-41855):

- our Annual Report on [Form 10-K](#) for the fiscal year ended December 31, 2024, filed with the SEC on March 24, 2025;
- our definitive Proxy Statement on [Schedule 14A](#), filed with the SEC on April 28, 2025, as supplemented by the additional definitive proxy soliciting materials filed with the SEC on [June 5, 2025](#) (excluding those portions that are not incorporated by reference into our Annual Report on [Form 10-K](#) for the fiscal year ended December 31, 2024);
- our Quarterly Report on Form 10-Q for the quarter ended March 31, 2025, filed with the SEC on [May 12, 2025](#), as amended by our Quarterly Report on Form 10-Q/A, filed with the SEC on [May 15, 2025](#); our Quarterly Report on Form 10-Q for the quarter ended June 30, 2025, filed with the SEC on [August 14, 2025](#); and our Quarterly Report on Form 10-Q for the quarter ended September 30, 2025, filed with the SEC on [November 5, 2025](#);
- our Current Reports on Form 8-K filed with the SEC on [January 13, 2025](#), [April 7, 2025](#), [May 27, 2025](#), [June 30, 2025](#), [August 14, 2025](#), [October 7, 2025](#), and [October 17, 2025](#) (in each case to the extent the information included in such reports is filed and not furnished); and
- the description of our Common Stock contained in the Registration Statement on [Form 8-A](#) relating thereto, filed with the SEC on November 1, 2023, including any amendment or report filed for the purpose of updating such description, including [Exhibit 4.3](#) of our Annual Report on Form 10-K for the year ended December 31, 2024.

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

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

We will furnish without charge to you, on written or oral request, a copy of any or all of the documents incorporated by reference in this prospectus, including exhibits to these documents. You should direct any requests for documents to Lexeo Therapeutics, Inc., Attn: Corporate Secretary, 345 Park Avenue South, Floor 6, New York, New York 10010; telephone: (212)-547-9879.

You also may access these filings on our website at ir.lexeotx.com. We do not incorporate the information on our website into this prospectus or any supplement to this prospectus and you should not consider any information on, or that can be accessed through, our website as part of this prospectus or any supplement to this prospectus (other than those filings with the SEC that we specifically incorporate by reference into this prospectus or any supplement to this prospectus). The inclusion of our website address is an inactive textual reference only.

1,250,015 Shares of Common Stock



PROSPECTUS

November 26, 2025
