UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

DIVISION OF
CORPORATION FINANCE

March 3, 2022

R. Nolan Townsend
Chief Executive Officer
Lexeo Therapeutics, Inc.
430 East 29th Street, Floor 14
New York, NY 10016

**Re: Lexeo Therapeutics, Inc.**
**Draft Registration Statement on Form S-1**
**Submitted February 4, 2022**
**CIK No. 0001907108**

Dear Mr. Townsend:

We have reviewed your draft registration statement and have the following comments. In some of our comments, we may ask you to provide us with information so we may better understand your disclosure.

Please respond to this letter by providing the requested information and either submitting an amended draft registration statement or publicly filing your registration statement on EDGAR. If you do not believe our comments apply to your facts and circumstances or do not believe an amendment is appropriate, please tell us why in your response.

After reviewing the information you provide in response to these comments and your amended draft registration statement or filed registration statement, we may have additional comments.

Draft Registration Statement on Form S-1 submitted February 4, 2022

Prospectus summary
Overview, page 1

1. We note your disclosure here and throughout that you are focused on "diseases affecting both larger-rare and prevalent patient populations." However, we note your disclosure at the bottom of page 4 that depicts CLN2 Batten disease as an "Ultra Rare Disease," which appears to be your indication for your LX1004 product candidate. Please update your disclosure here to clarify that your most advanced product candidate is an "Ultra Rare Disease" or otherwise advise.

Lead cardiovascular programs, page 2

2. We note your disclosure at the top of page 3 that, "in [y]our preclinical studies, LX2020 resulted in fewer arrhythmias and increased survival." Please revise your disclosure here to clearly state, if true, that the studies preformed to date were animal trials. In this regard, we note your disclosure on page 138.

Our pipeline, page 2

3. We note the inclusion of product candidates in your pipeline table, which appear to still be in the "discovery" phase. In addition, we note your disclosure elsewhere on page 33 where you state you "are primarily focused on the development of LX2006, LX1001 and LX1004" and your intellectual property disclosure on page 151 only appears to describe patents and pending patents related to LX2006, LX1020 and LX1021. Given the limited amount of disclosure related to your programs in discovery, please explain why these programs are sufficiently material to your business to warrant inclusion in your pipeline table. If they are material, please expand your disclosure in your Business section to provide a more fulsome discussion of these programs, including a description of preclinical studies or development activities conducted and expand your intellectual property disclosure if applicable. Alternatively, remove any programs that are not currently material from your pipeline table on pages 2 and 120.

4. Please revise your pipeline table to include separate columns for Phase 1, Phase 2 and Phase 3 trials or tell us the basis for your belief that you will be able to conduct Phase 1/2 and Phase 2/3 trials for all your product candidates.

5. We note your pipeline table states that LX1004's upcoming milestone is "1H 2023: Pivotal Study Start." However, your disclosure on page 3 indicates that you, "anticipate receiving feedback from the FDA on the design of [y]our potentially pivotal Phase 2/3 clinical trial in the second half of 2022." Please revise your disclosure in the pipeline table and elsewhere, as applicable, to make it clear, if true, that the U.S. Food and Drug Administration (FDA) or other regulators may require you to conduct sequential trials.

High Transduction Efficiency and Biodistribution, page 4

6. We note your disclosure here and elsewhere that the AAVrh10 vector is "optimal for delivery and expression of transgenes for the treatment of the cardiovascular and CNS diseases [you] are currently targeting." However, we note your disclosure on page 129 that you are collaborating with Weill Cornell Medicine on the discovery of second and third generation cardiac vector technology. Please provide your basis for your belief that the AAVrh10 vector is "optimal" or otherwise advise.

7. If your disclosure that the AAVrh10 vector has proven to be "effective at transducing myocardial cells and neurons" is based on preclinical studies on non-human cells, please make that clear. In this regard, we note from your disclosure on page 126 that this disclosure appears to be based on your preclinical studies on nonhuman primates and

murine models.

Our disease area strategy, page 4

8. We note your reference in the graphic at the bottom of page 4 to "early evidence of clinical benefit" as well as "promising preclinical data." In addition, we note your disclosure on page 144 that "LX1001 has promise as a therapeutic for APOE4 homozygous Alzheimer's disease patients." As safety and efficacy determinations are solely within the FDA's authority and they continue to be evaluated throughout all phases of clinical trials, please remove these and any such references in your prospectus. In the Business section, you may present objective data resulting from your trials without including conclusions related to efficacy.

Our company and team, page 6

9. We note that you identify certain "premier institutional investors" in your company in this section. Please limit the disclosure of specific investors to those identified in the principal stockholders table on page 198. Additionally, indicate that prospective investors should not rely on the named investors' investment decision, that these investors may have different risk tolerances and the recent offering was conducted as a significant discount to the IPO price.

Risks associated with our business, page 7

10. Please revise your risk factor summary to highlight that you currently do not own or license any composition of matter patents or patent applications covering your LX1001 and LX1004 product candidates, consistent with your disclosure on page 56. Please add similar clarifying disclosure in the "Intellectual property" section beginning on page 151.

Research collaboration agreement with Weill Cornell Medicine, page 104

11. We note your disclosure on page 46 that "[y]our collaboration with Cornell University is critical to [y]our business." Please file the Research Collaboration Agreement with Weill Cornell Medicine as an exhibit to the registration statement as required by Item 601(b)(10) of Regulation S-K or tell us why it is not material.

Exclusive license agreement with the Regents of the University of California, San Diego, page 105

12. We note your disclosure in this section regarding the UCSD Agreement and your disclosure on page 124 that your foundational science stems in part from your license agreement with UCSD. Please file the agreement as an exhibit to the registration statement, or provide your analysis supporting your conclusion that filing is not required. See Item 601(b)(10) of Regulation S-K for guidance. In addition, please update your disclosure to clarify which product candidate(s) are covered by the license agreement or otherwise advise.

Stelios Therapeutics Inc. acquisition, page 105

13. Please file the Stelios Therapeutics Inc. acquisition agreement as an exhibit to the registration statement or tell us why you are not required to do so. Refer to Item 601(b)(2) of Regulation S-K. In addition, please disclose more specific information about the "certain milestones" that must be reached in order for you to pay the additional $20.5 million in payments, including identifying the specific product candidate(s) that relate to the agreement or otherwise advise.

Management's Discussion and Analysis of Financial Condition and Results of Operations
Critical Accounting Policies and Significant Judgements and Estimates
Determination of Fair Value of Common Stock, page 115

14. Once you have an estimated offering price or range, please explain to us how you determined the fair value of the common stock underlying your equity issuances and the reasons for any differences between the recent valuations of your common stock leading up to the IPO and the estimated offering price. This information will help facilitate our review of your accounting for equity issuances. Please discuss with the staff how to submit your response.

Our strategy, page 123

15. We note your statement here that you established "a leading cardiovascular gene therapy pipeline." Please revise to disclose the basis for this statement.

Preclinical safety studies, page 135

16. We note your disclosure here that, "large body of available data suggests that HCC observed in mice after AAV treatment is unlikely to translate to risks for humans, as it has not been observed in higher species or humans (FDA 2021)." Please elaborate on and clarify what you mean by "large body of available data" and "(FDA 2021)," which appears at the end of the sentence.

Phase 1/2 clinical trial results, page 147

17. We note your disclosure at the top of page 149 discloses that there were "minimal serious adverse events." Please update your disclosure to disclose what the serious adverse events were and how many subjects experienced them.

Manufacturing, page 151

18. We note your disclosure here that you have partnered with Virovek, Inc., Millipore Corporation and Fujifilm Diosynth Biotechnologies U.S.A., Inc. in connection with manufacturing your vector product candidates. Please update your disclosure here to disclose the material terms of your manufacturing agreements and please file these agreements as exhibits to the registration statement as required by Item 601(b)(10) of

Regulation S-K or tell us why they are not material.

License agreements, page 152

19. Please revise your disclosure to include the aggregate milestone payments due under each of the license agreements with Cornell University.

Agreements with our named executive officers, page 180

20. Please file the employment agreements you have entered into with your named executive officers. Refer to Item 601(b)(10) of Regulation S-K.

2022 equity incentive plan, page 183

21. We note your disclosure on page 184 that the administrator of the 2022 Plan has the power to modify awards under your 2022 Plan, including the authority to reprice any outstanding option or stock appreciation right, or take any other action that is treated as a repricing. Please clarify if these repricing actions would require stockholder approval. If such actions would not require stockholder approval, please include appropriate risk factor disclosure, including whether proxy advisory firms could find such repricing without stockholder approval contrary to a performance-based pay philosophy.

Certain relationships and related party transactions
Agreements with Ronald G. Crystal, M.D., page 194

22. Please file the agreements disclosed in this section as exhibits as required by Item 601(b)(10) of Regulation S-K, or tell us why you believe they are not required to be filed.

General

23. Please supplementally provide us with copies of all written communications, as defined in Rule 405 under the Securities Act, that you, or anyone authorized to do so on your behalf, present to potential investors in reliance on Section 5(d) of the Securities Act, whether or not they retain copies of the communications.

You may contact Eric Atallah at 202-551-3663 or Lynn Dicker at 202-551-3616 if you have questions regarding comments on the financial statements and related matters. Please contact Jason Drory at 202-551-8342 or Tim Buchmiller at 202-551-3635 with any other questions.

Sincerely,

Division of Corporation Finance
Office of Life Sciences

cc: Dayne Brown, Esq.