

William Hinshaw
Chief Executive Officer
Axcella Health Inc.
840 Memorial Drive
Cambridge, MA 02139

Re: Axcella Health Inc.
Draft Registration Statement on Form S-1
Submitted January 28, 2019
CIK No. 0001633070

Dear Mr. Hinshaw:

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 filed January 28, 2019

Prospectus Summary
Overview, page 1

1. We note your disclosure on page 1 that, "We believe generating this rich human dataset at this early stage of development eliminates translational uncertainty." Please revise to clarify "translational uncertainty."
Our Pipeline, page 2

2. Given the early stage of development of AXA4010, and limited disclosure you have provided with respect to such product candidate, please provide us with an analysis as to why inclusion of AXA4010 in the pipeline table here and on page 111 is appropriate. The

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table is intended to provide information about your product candidates in development that are reasonably likely to result in an approved product in the foreseeable future.
Implications of being an emerging growth company, page 6

3. 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.
Use of Proceeds, page 88

4. Please describe with greater specificity how far the proceeds from the offering will allow you to advance your various programs. If any material amounts of other funds are necessary to accomplish the specified purposes, state the amounts and

sources of other funds needed for each specified purpose and the sources. Refer to Instruction 3 to Item 504 of Regulation S-K. Management's Discussion and Analysis of Financial Condition and Results of Operations Stock-based Compensation, page 106

5. 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 initial public offering and the estimated offering price or range. This information will help facilitate our review of your accounting for equity issuances. Business Our Human-Focused AXA Development Program, page 116

6. We note your disclosure on page 117 that the EMM Safety Database "synthesizes our own and third-party data on dose ranges for each EMM or combinations of EMM previously studied in humans without any or significant safety issues" and your disclosure on page 120 that, "We did not observe any significant safety issues with AXA1665 in this study ..." Please revise your disclosure throughout the prospectus that present conclusions regarding the safety or efficacy of products to the extent that such determinations have not been made by the FDA or comparable regulatory bodies. AXA1665 Program, page 120

7. To the extent possible, please discuss in greater detail the possible non-drug pathways that the company could pursue. Please revise accordingly your related disclosure on pages 135 and 143. William Hinshaw
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AXA2678 Muscle Program, page 141

8. We note the following disclosure on page 141: "The above clinical observations prompted additional cell-based experiments in cultured muscle cells to gain further mechanistic insights into AXA2678's effect on muscle mass and function." Please disclose what these additional cell-based experiments revealed. Certain Relationships and Related Party Transactions Services agreement, page 193

9. Please file the services agreement as an exhibit or advise us why such agreement is not required to be filed. See Item 601(b)(10) of Regulation S-K. Principal Stockholders, page 197

10. To the extent known, please provide the information for the first two columns of the beneficial ownership table on page 197. Description of Capital Stock Choice of forum, page 202

11. We note that your disclosure identifies the Court of Chancery of the State of Delaware as the exclusive forum for certain litigation, including any "derivative action." Please disclose whether this provision applies to actions arising under the federal securities laws. In this regard, we note that Section 27 of the Exchange Act creates exclusive federal jurisdiction over all suits brought to enforce any duty or liability

created by the Exchange
Act or the rules and regulations thereunder.

General

12. Please explain the meaning of all abbreviations and defined terms the first time they are used. For example, the abbreviation PCT, which first appears on page 145, is not explained.

13. Please provide us proofs of all graphics, visual, or photographic information you will provide in the printed prospectus prior to its use, for example in a preliminary prospectus.

Please note that we may have comments regarding this material.

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You may contact Li Xiao at 202-551-4391 or Jeffrey Lewis at 202-551-6216 if you have questions regarding comments on the financial statements and related matters. Please contact David Plattner at 202-551-8094 or Tom Kluck at 202-551-3233 with any other questions.

FirstName LastNameWilliam Hinshaw

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Insurance
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cc: Laurie A. Burlingame, Esq.
FirstName LastName

Sincerely,

Division of

Office of Healthcare &