Cooley

Richard Segal
+1 (617) 937-2332
rsegal@cooley.com

VIA EDGAR

January 15, 2021

United States Securities and Exchange Commission
Division of Corporation Finance
100 F Street, N.E.
Washington D.C., 20549

Attn: Eric Atallah
Kevin Kuhar
Joe McCann
Margaret Schwartz

Re: Vor Biopharma Inc.
Amendment No. 1 to the Draft Registration Statement on Form S-1
Submitted December 18, 2020
CIK No. 0001817229

Ladies and Gentlemen:

On behalf of Vor Biopharma Inc. (the "***Company***"), we are providing this response letter in response to the comments (the "***Comments***") received from the staff of the U.S. Securities and Exchange Commission's Division of Corporation Finance (the "***Staff***") contained in its letter, dated January 4, 2021 (the "***Comment Letter***"), relating to the Company's Amendment No. 1 to the Draft Registration Statement on Form S-1, as confidentially submitted to the Staff on December 18, 2020.

The Company is concurrently filing the Registration Statement on Form S-1 (the "***Registration Statement***"), which reflects changes made in response to certain of the Comments contained in the Comment Letter and certain other changes. The numbering of the paragraphs below corresponds to the numbering of the Comments contained in the Comment Letter, which for your convenience we have incorporated into this response letter in italics. Page references in the text of this response letter correspond to the page numbers of the Registration Statement. Capitalized terms used in this response letter but not otherwise defined in this response letter shall have the meanings set forth in the Registration Statement.

Summary

1. *We note your response to our prior comment number 1. Please revise your disclosure in the Overview section to clearly state that your lead candidate, VOR33 is preclinical. To explain the novelty and uniqueness of your approach and to highlight the associated challenges, please also revise the Overview to disclose that (i) engineered hematopoietic stem cells have never undergone clinical trials and (ii) the removal of CD33 from hematopoietic stem cells has never been studied in clinical trials.*

   Response to Comment 1: In response to the Staff's comment, the Company revised its disclosure as requested on page 2 of the Registration Statement.

2. We note your response to our prior comment number 4. On page 18 you state that you have not yet filed an IND application for VOR33. Please revise pages 2 or 4 to state when you plan to submit an IND for VOR33 for AML.

Response to Comment 2: In response to the Staff's comment, the Company revised its disclosure as requested on pages 2 and 4 of the Registration Statement.

Our Proprietary Vor Platform

3. We note that your disclosure on page 3 highlights that you have a highly efficient manufacturing process. Please revise page 3 to clarify the meaning of this statement in light of your risk factor disclosure on page 39, where you state that you "have not demonstrated that eHSCs or VCAR33 can be frozen and thawed in large quantities without damage, in a cost-efficient manner and without degradation" and, further, that you "may not be able to commercialize eHSCs, VCAR33 or other cell-based companion therapeutics we may develop on a large scale or in a cost-effective manner."

Response to Comment 3: The Company respectfully advises the staff that, while the Company has conducted preclinical tests of its manufacturing processes to establish that these processes are highly efficient and permit rapid manufacturing of eHSC products for its initial clinical trials, and while the Company believes these manufacturing processes can be scaled for commercialization of its eHSCs, the Company has not yet developed manufacturing capabilities at the scale required for later stage clinical trials or commercialization. To clarify its current manufacturing capabilities and the associated risks, and in response to the Staff's comment, the Company has revised its disclosure on pages 3 and 40 of the Registration Statement.

Risk Factors

4. We note your response to prior comment 6. With reference to your disclosure on page 28, please revise to clarify whether you will need to work with Pfizer to satisfy the requirement that you reference in this risk factor. In this regard, it should be clear whether you will need to negotiate a license and/or supply agreement so that Mylotarg can be used in combination or in sequence with VOR33.

Response to Comment 4: In response to the Staff's comment, the Company revised its disclosure as requested on pages 28 of the Registration Statement.

Business

5. We note your response to our prior comment number 11. Please revise pages 103 and 127 to expressly state that your companion therapeutic VCAR33, which is intended to be used in conjunction with VOR33, employs viral vectors.

Response to Comment 5: In response to the Staff's comment, the Company revised its disclosure as requested on pages 103 and 127 of the Registration Statement.

The Company respectfully requests the Staff's assistance in completing the review of this response letter. Please contact me at (617) 937 2332 with any questions regarding the Company's responses to the Staff's Comments or if you require further information. Thank you in advance for your attention to this matter.

Sincerely,

/S/ RICHARD SEGAL
RICHARD SEGAL

cc: Robert Ang, Vor Biopharma Inc.
Nathan Jorgensen, Vor Biopharma Inc.
Amy Mendel, Vor Biopharma Inc.
Charles S. Kim, Cooley LLP
Divakar Gupta, Cooley LLP
Peter N. Handrinos, Latham & Watkins LLP
Nathan Ajiashvili, Latham & Watkins LLP