



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

DIVISION OF
CORPORATION FINANCE

Mail Stop 4720

March 10, 2016

Robert W. Overell, Ph.D.
President and Chief Executive Officer
PhaseRx, Inc.
410 W. Harrison Street, Suite 300
Seattle, WA 98119

**Re: PhaseRx, Inc.
Draft Registration Statement on Form S-1
Submitted February 12, 2016
CIK No. 0001429386**

Dear Dr. Overell:

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.

Cover Page

1. We refer to your explanatory note regarding the two alternate prospectuses for the primary and secondary offering. Please provide us an analysis explaining your basis for determining that the secondary offering is eligible to be made under Rule 415(a)(1)(i). In responding, please consider the guidance provided in Compliance Disclosure Interpretations, Securities Act Rules, Question 612.09.

Overview, page 1

2. Please revise to explain briefly the meaning of “preclinical proof of concept with an approvable endpoint.” Also explain the term “in vivo gene editing” the first time it appears on page 2.
3. We refer to the second sentence of the summary. Please explain to us why it is appropriate to compare the market potential for intracellular enzyme replacement therapy to the existing large and growing market for conventional enzyme replacement therapy. In this regard, explain how and why the markets are “analogous.” Clarify whether you are expressing the belief that the current market potential for intracellular enzyme replacement therapy is \$4 billion and growing and provide us with support for the figure.
4. Please revise the diagram on page 3 to include Phase 2 and Phase 3
5. Please provide additional context for your statements in the fourth bullet point on page 4 that follow-on products potentially could be developed with “unusually low cost and risk” and that this development could be “rapid.” In this regard, we refer to your disclosures concerning the impact of orphan drug status on development and regulatory review time in the final sentence of the first paragraph on page 34 as well as your risk factors concerning the timeliness of regulatory reviews on pages 16 and pages 20 through 22.
6. On page 4 you state that one of your competitive strengths is that your technology enables you to target hepatocytes in the liver by attaching a GalNAc molecule to the polymer you use. Please revise to explain whether competitors use the same delivery mechanism. If they do, then please clarify how your technology is different.

Our Competitive Strengths, page 4

7. The prospectus summary should include a balanced presentation of your business, including your competitive position in the industry. In highlighting your competitive strengths, you present your technology as “leading-edge” and include several performance claims in this section and on page 1 notwithstanding the preclinical nature of your operations. Please tell us the basis for your performance claims and balance your summary presentation by providing equally prominent disclosure about the competitive, regulatory, technical challenges you face.

Risk Factors, page 5

8. Please highlight your accumulated deficit and the substantial doubt regarding your ability to continue as a going concern in the summary Risk Factors section.

Private Placement, page 6

9. Please revise to disclose the date of the agreement and the number of participating investors. Please also confirm to us that any shares issued in the private placement will be reflected in your disclosures on pages 114, 118, II-4 and elsewhere, as applicable.

Common Stock Issuances Upon the Consummation of this Offering, page 6

10. We note your disclosure indicating that you expect this offering will constitute a qualified offering. Given the material impact to your capitalization structure, please revise the disclosure prior to effectiveness to state clearly whether the offering will or will not be a qualified offering.
11. We refer to your disclosure here and elsewhere in the registration statement that you entered into the Loan and Security Agreement on December 21, 2015. Please revise to disclose when the escrow agent released the funds to you and the amount of funds you received at the closing.
12. Please revise the first paragraph under the heading to highlight the lock-up period applicable to the shares. Also revise here, and clarify on page 41, whether each of the three parties can unilaterally waive the lock-up period.

Sale of Our Common Stock by Our Stockholders, page 6

13. Please tell us the following:
- When the stock purchase agreements were executed?;
 - Which of your existing stockholders are making the transfers and the respective share transfer amounts?;
 - Whether any shares sold in the concurrent private placement shares are part of the transfer?;
 - Whether each “transfer” is a sale of all ownership rights in the shares?; and
 - Why the transfers/sales are for nominal value instead of market value?

In addition, explain to us why Titan, and each of its designees, is not reflected in your Principal Shareholders table. Explain to us, if known, why the new noteholders designated Titan and Mr. Honig as the Security Agent under the Loan and Security Agreement. In this regard, please tell us whether Titan played a role in the offering in addition to its role as a lender. We may have additional comments once we receive your response.

Management's Discussion and Analysis of Financial Condition and Results of Operations
Critical Accounting Policies and Significant Judgments and Estimates
Stock Based Compensation, page 61

14. Please disclose how you estimate the common stock fair value underlying the options granted, including the methods and material assumptions underlying those methods used to determine your common stock fair value. We may have additional comments on your accounting for equity issuances including stock based compensation and convertible instruments. In addition, once you have an estimated offering price, please provide us an analysis explaining the reasons for the differences between the recent valuations of your common stock leading up to the IPO and the estimated offering price.

Implications of Being An Emerging Growth Company, page 66

15. 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.

Our Competitive Strengths, page 71

16. In the penultimate bullet on this page, you state that your management team has over 120 years of experience. Please clarify whether this number of years includes the experience of your directors or founders as well as your current management team. If applicable, please provide conforming disclosure for similar statements appearing elsewhere.

Our Development Programs, page 73

17. At your first use of the term "statistically significant" on page 74, please provide an explanation of the term and discuss how statistical significance relates to the FDA's evidentiary standards of efficacy. Please also clarify the significance of the p-value provided in the accompanying chart on page 75.

Our Hybrid mRNA Technology, page 79

18. We refer to your figure on page 81. Please revise to provide a brief narrative to explain the table. Include a description of what the numbers 1-7 on the horizontal axis represent.
19. Please enlarge the figure on page 82 so that the legend is legible.

20. We note your discussion at the bottom of page 83 that the levels of cytokines were “generally similar” to untreated mice. Please disclose whether the differences in cytokine levels as compared to untreated mice were statistically significant. Please also revise the accompanying charts shown in the figure on page 84 to use a smaller scale of cytokine levels so that the differences between the levels shown in treated mice and untreated mice are decipherable as well as comparable.

Partnering Opportunities, page 84

21. Please revise to describe here or elsewhere, as applicable, your 2014 collaboration and development agreement with Synageva. Discuss the type of work performed with Synageva and the reasons why one or both parties determined not to renew the agreement after the 2015 expiration.

Officers and Directors, page 99

22. Please identify the Dr. Overell affiliate who is a party to your second amended and restated stockholder voting agreement. Also, disclose the identity of the Dr. Overell affiliate who you reference on page 115.

Certain Relationships, page 105

23. We note your reference to promoters in this section. Please provide the disclosure required by Item 404(c) of Regulation S-K for each promoter.

2016 Awards, page 109

24. Please disclose the reasons for the 2016 option awards described on pages 109 and 110. Please revise to include the values of the awards in your summary compensation table or advise.

Director Compensation, page 111

25. We note your discussion in the “Equity Compensation” section on page 112. Please clarify whether these option awards are in addition to the option grants disclosed in the first table on page 110.

Agreements with our Directors, page 112

26. Please revise to describe all material terms of your chairman agreement with Dr. Gillis, including the nature of the consulting services and the financial terms.

Certain Relationships and Related Party Transactions, page 114

27. In your discussions in this section relating to your stockholders ARCH Venture Fund VII, L.P., Versant Venture Capital III, L.P., Versant Side Fund III, L.P. and 5AM Ventures II, LP, please disclose the relationship your directors have with these entities. Refer to Item 404(a)(1) of Regulation S-K.
28. We refer to section 1.01 and Annex D to the Loan and Security Agreement that you filed as Exhibit 10.31. Please revise to disclose the terms of your Subordination Agreement with Titan and the subordinated lenders who all appear to have 5% ownership positions and board seats. Please tell us about any other agreements you or your board members have with Titan or its affiliates. File the subordination agreement as an exhibit.

Review, Approval or Ratification...., page 116

29. Please refer to Regulation S-K, Item 404(b)(1) and expand your disclosure to describe the policies and procedures utilized with respect to the transactions disclosed in this section.

Underwriting, page 133

30. Please revise this section to clarify whether Laidlaw is the sole underwriter. In this regard, the first sentence in the section suggests that Laidlaw may be serving as a representative for another underwriter. Additionally, the second sentence of the first paragraph after the table suggests that there are other underwriters in addition to Laidlaw. Please revise or advise.

Incorporation of Certain Documents by Reference, page 143

31. Please revise to remove the incorporation by reference language from pages 143 and SS-8. Refer to the General Instruction VII to Form S-1, which provides that the registrant must meet the enumerated requirements immediately prior to the time of filing the registration statement.

Notes to Financial Statements

2. Summary of Significant Accounting Policies

Unaudited Pro Forma Balance Sheet Information, page F-7

32. You state here that the warrants to purchase 2,452,242 shares of preferred stock will be exercised if the contemplated offering is completed. Please tell us whether such exercise is contractually required or firm commitments of such exercise have been received.

Dr. Robert W. Overell
PhaseRx, Inc.
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Page 7

7. Redeemable Convertible Preferred Stock and Stockholders' Deficit
Redeemable Convertible Preferred Stock, page F-14

33. You characterize your preferred stock in the second paragraph on page F-15 and on your balance sheet as being mandatorily redeemable yet you do not classify this preferred stock as liabilities under ASC 480-10-25-4. Please demonstrate to us why this preferred stock is mandatorily redeemable as defined in the glossary at ASC 480-10-20 when it appears to be conditionally redeemable. If this stock is indeed mandatorily redeemable, please classify it as liabilities on your balance sheet; otherwise remove reference to the word "mandatorily" throughout your filing.

Selling Stockholders, page SS-3

34. We refer to the disclosure at the bottom of page SS-5. Please revise to identify which selling stockholders are affiliates of broker-dealers.

You may contact Keira Nakada at 202-551-3659 or Mark Brunhofer at 202-551-3638 if you have questions regarding comments on the financial statements and related matters. Please contact Dorrie Yale at 202-551-8776 or Joseph McCann at 202-551-6262 with any other questions.

Sincerely,

/s/ Joseph McCann for

Suzanne Hayes
Assistant Director
Office of Healthcare and Insurance

cc: Rick A. Werner, Esq. - Haynes and Boone, LLP