



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

DIVISION OF
CORPORATION FINANCE

Mail Stop 4720

May 2, 2016

Keith M. Gottesdiener, M.D.
Chief Executive Officer
Rhythm Pharmaceuticals, Inc.
855 Boylston Street
11th Floor
Boston, MA 02116

**Re: Rhythm Pharmaceuticals, Inc.
Amendment No. 2 to
Draft Registration Statement on Form S-1
Submitted April 6, 2016
CIK No. 0001649904**

Dear Dr. Gottesdiener:

We have reviewed your amended draft registration statement and have the following comment. Please respond to this letter by either submitting another amended draft registration statement or publicly filing your registration statement on EDGAR. If you do not believe this comment applies to your facts and circumstances or do not believe another amendment is appropriate, please tell us why in your response.

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

Business
Licensing Agreements, page 103

1. In your description of the license agreement you entered into with Camurus AB, please include the duration and termination provisions of the agreement, as well as the amount of the upfront payment you made.

Keith M. Gottesdiener, M.D.
Rhythm Pharmaceuticals, Inc.
May 2, 2016
Page 2

You may contact James Peklenk at (202) 551-3661 or Joel Parker at (202) 551-3651 if you have questions regarding comments on the financial statements and related matters. Please contact Scot Foley at (202) 551-3383, Mary Beth Breslin at (202) 551-3625 or me at (202) 551-3675 with any other questions.

Sincerely,

/s/ Mary Beth Breslin for

Suzanne Hayes
Assistant Director
Office of Healthcare and Insurance

cc: Julio E. Vega
Morgan, Lewis & Bockius LLP