

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

SCHEDULE 13G  
Under the Securities Exchange Act of 1934

(Amendment No. 1)\*

**RHYTHM PHARMACEUTICALS, INC.**

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(Name of Issuer)

**Common Stock, par value \$0.001 per share**

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(Title of Class of Securities)

**76243J105**

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(CUSIP Number)

**October 16, 2019**

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(Date of Event Which Requires Filing of this Statement)

Check the appropriate box to designate the rule pursuant to which this Schedule is filed:

- Rule 13d-1(b)  
 Rule 13d-1(c)  
 Rule 13d-1(d)

\*The remainder of this cover page shall be filled out for a reporting person's initial filing on this form with respect to the subject class of securities, and for any subsequent amendment containing information which would alter the disclosures provided in a prior cover page.

The information required in the remainder of this cover page shall not be deemed to be "filed" for the purpose of Section 18 of the Securities Exchange Act of 1934 ("**Act**") or otherwise subject to the liabilities of that section of the Act but shall be subject to all other provisions of the Act (however, see the Notes).

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1. Names of Reporting Persons.  
I.R.S. Identification Nos. of above persons (entities only).

**RA Capital Management, LLC**

2. Check the Appropriate Box if a Member of a Group (See Instructions)  
(a)   
(b)

3. SEC Use Only

4. Citizenship or Place of Organization **Massachusetts**

Number of Shares Beneficially Owned by Each Reporting Person With	5. Sole Voting Power	<b>0 shares</b>
	6. Shared Voting Power	<b>5,422,312 shares</b>
	7. Sole Dispositive Power	<b>0 shares</b>
	8. Shared Dispositive Power	<b>5,422,312 shares</b>

9. Aggregate Amount Beneficially Owned by Each Reporting Person  
**5,422,312 shares**

Check if the Aggregate Amount in Row (9) Excludes

10. Certain Shares (See Instructions)

11. Percent of Class Represented by Amount in Row (9)  
**12.7%<sup>1</sup>**

12. Type of Reporting Person (See Instructions)  
**IA**

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<sup>1</sup> The percentage calculation assumes that there are currently 42,605,650 outstanding shares of Common Stock of the Issuer, based on the Issuer's Form 424B5 Prospectus as filed with the Securities and Exchange Commission ("SEC") on October 16, 2019.

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1. Names of Reporting Persons.  
I.R.S. Identification Nos. of above persons (entities only).

**Peter Kolchinsky**

2. Check the Appropriate Box if a Member of a Group (See Instructions)

(a)

(b)

3. SEC Use Only

4. Citizenship or Place of Organization **United States**

5. Sole Voting Power **0 shares**

Number of Shares Beneficially Owned by Each Reporting Person With

6. Shared Voting Power **5,422,312 shares**

7. Sole Dispositive Power **0 shares**

8. Shared Dispositive Power **5,422,312 shares**

9. Aggregate Amount Beneficially Owned by Each Reporting Person  
**5,422,312 shares**

Check if the Aggregate Amount in Row (9) Excludes

10. Certain Shares (See Instructions)

11. Percent of Class Represented by Amount in Row (9)  
**12.7%<sup>1</sup>**

12. Type of Reporting Person (See Instructions)  
**IN**

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<sup>1</sup> The percentage calculation assumes that there are currently 42,605,650 outstanding shares of Common Stock of the Issuer, based on the Issuer's Form 424B5 Prospectus as filed with the Securities and Exchange Commission ("SEC") on October 16, 2019.

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**Item 1.**

- (a) **Name of Issuer:** Rhythm Pharmaceuticals, Inc. (the “Issuer”).
- (b) **Address of the Issuer’s Principal Executive Offices:** 222 Berkeley Street, 12<sup>th</sup> Floor, Boston, MA 02116

**Item 2.**

- (a) **Name of Person Filing:** This Amendment No. 1 to Schedule 13G (this “Amendment No. 1”) amends and the Statement on Schedule 13G originally filed with the Securities and Exchange Commission on February 14, 2019, as amended to date (the “Statement”) by the Reporting Persons with respect to the Common Stock, \$0.001 par value (the “Common Stock”), of the Issuer. This joint statement on Schedule 13G is being filed by RA Capital Management, LLC (“Capital”) and Peter Kolchinsky. Capital and Dr. Kolchinsky are collectively referred to herein as the “Reporting Persons.” Capital is the general partner of the RA Capital Healthcare Fund, L.P. (the “Fund”), which owns 4,599,403 shares of the Issuer’s Common Stock, and serves as investment adviser for a separately managed account (the “Account”), which owns 822,909 shares of the Issuer’s Common Stock. Dr. Kolchinsky is the manager of Capital. As the investment adviser to the Fund and the Account, Capital may be deemed a beneficial owner, for purposes of Section 13(d) of the Securities Exchange Act of 1934 (the “Act”), of any securities of the Issuer owned by the Fund or the Account. The Fund has delegated to Capital the sole power to vote and the sole power to dispose of all securities held in the Fund’s portfolio, including the shares of the Issuer’s Common Stock reported herein. Because the Fund has divested itself of voting and investment power over the reported securities and may not revoke that delegation on less than 61 days’ notice, the Fund disclaims beneficial ownership of the reported securities for purposes of Section 13(d) of the Act and therefore disclaims any obligation to report ownership of the reported securities under Section 13(d) of the Act. As the manager of Capital, Dr. Kolchinsky may be deemed a beneficial owner, for purposes of Section 13(d) of the Act, of any securities of the Issuer beneficially owned by Capital. Capital and Dr. Kolchinsky disclaim beneficial ownership of the securities reported in this Amendment No. 1 other than for the purpose of determining their obligations under Section 13(d) of the Act, and the filing of the Amendment No. 1 shall not be deemed an admission that either Capital or Dr. Kolchinsky is or was the beneficial owner of such securities for any other purpose.
- (b) **Address of Principal Business Office:** The principal business office of the Reporting Persons is c/o RA Capital Management, LLC, 200 Berkeley Street, 18<sup>th</sup> Floor, Boston, MA 02116.
- (c) **Citizenship:** Capital is a Massachusetts limited liability company. Dr. Kolchinsky is a United States citizen.
- (d) **Title and Class of Securities:** Common stock (“Common Stock”)
- (e) **CUSIP Number:** 76243J105
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**Item 3. If this statement is filed pursuant to §§240.13d-1(b) or 240.13d-2(b) or (c), check whether the person filing is a:**

(e) RA Capital Management, LLC is a registered investment adviser and is filing this statement in accordance with §240.13d-1(b)(1)(ii)(E);

(g) Peter Kolchinsky is a control person and is filing this statement in accordance with §240.13d-1(b)(1)(ii)(G).

**Item 4. Ownership:**

Provide the following information regarding the aggregate number and percentage of the class of securities of the issuer identified in Item 1.

- (a) Amount Beneficially Owned:  
See the response(s) to Item 9 on the attached cover page(s).
  - (b) Percent of Class:  
See the response(s) to Item 11 on the attached cover page(s).
  - (c) Number of shares as to which such person has:
    - (i) sole power to vote or to direct the vote:  
See the response(s) to Item 5 on the attached cover page(s).
    - (ii) shared power to vote or to direct the vote  
See the response(s) to Item 6 on the attached cover page(s).
    - (iii) sole power to dispose or to direct the disposition of  
See the response(s) to Item 7 on the attached cover page(s).
    - (iv) shared power to dispose or to direct the disposition of  
See the response(s) to Item 8 on the attached cover page(s).
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**Item 5. Ownership of Five Percent or Less of a Class:**

Not applicable.

**Item 6. Ownership of More than Five Percent on Behalf of Another Person:**

Not applicable.

**Item 7. Identification and Classification of the Subsidiary Which Acquired the Security Being Reported on By the Parent Holding Company or Control Person:**

Not applicable.

**Item 8. Identification and Classification of Members of the Group:**

Not applicable.

**Item 9. Notice of Dissolution of Group:**

Not applicable.

**Item 10. Certification:**

By signing below I hereby certify that, to the best of my knowledge and belief, the securities referred to above were not acquired and are not held for the purpose of or with the effect of changing or influencing the control of the issuer of the securities and were not acquired and are not held in connection with or as a participant in any transaction having that purpose or effect.

Exhibits

- 1 Joint Filing Agreement by and among the Reporting Persons is incorporated herein by reference to Exhibit 1 to the Schedule 13G filed by the Reporting Persons with the Securities and Exchange Commission on February 14, 2019.
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**SIGNATURE**

After reasonable inquiry and to the best of my knowledge and belief, I certify that the information set forth in this statement is true, complete and correct.

DATE: October 18, 2019

RA CAPITAL MANAGEMENT, LLC

By: /s/ Peter Kolchinsky

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Peter Kolchinsky  
Authorized Signatory

PETER KOLCHINSKY

/s/ Peter Kolchinsky  
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