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

SCHEDULE 13D

**Under the Securities Exchange Act of 1934
(Amendment No.)***

Rhythm Pharmaceuticals, Inc.

(Name of Issuer)

Common Stock
(Title of Class of Securities)

76243J 10 5
(CUSIP Number)

Todd Foley
MPM Asset Management
450 Kendall Street
Cambridge, MA 01242
Telephone: (617) 425-9200

(Name, Address and Telephone Number of Person Authorized to Receive Notices and Communications)

October 10, 2017
(Date of Event Which Requires Filing of This Statement)

If the filing person has previously filed a statement on Schedule 13G to report the acquisition that is the subject of this Schedule 13D, and is filing this schedule because of §§240.13d-1(e), 240.13d-1(f) or 240.13d-1(g), check the following box.

Note: Schedules filed in paper format shall include a signed original and five copies of the schedule, including all exhibits. See §240.13d-7 for other parties to whom copies are to be sent.

* 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 disclosures provided in a prior cover page.

The information required on 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).

1.	Name of Reporting Persons. MPM BioVentures V, L.P.
2.	Check the Appropriate Box if a Member of a Group (See Instructions) (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (1)
3.	SEC USE ONLY
4.	Source of Funds (See Instructions) WC
5.	Check if Disclosure of Legal Proceedings Is Required Pursuant to Items 2(d) or 2(e)
6.	Citizenship or Place of Organization Delaware
Number of Shares Beneficially Owned by Each Reporting Person With:	7. Sole Voting Power 2,595,559
	8. Shared Voting Power 0
	9. Sole Dispositive Power 2,595,559
	10. Shared Dispositive Power 0
11.	Aggregate Amount Beneficially Owned by Each Reporting Person 2,595,559
12.	Check if the Aggregate Amount in Row (11) Excludes Certain Shares (See Instructions)
13.	Percent of Class Represented by Amount in Row (11) 9.5%(2)
14.	Type of Reporting Person (See Instructions) PN

- (1) This schedule is filed by MPM BioVentures V, L.P. (“BV V”), MPM Asset Management Investors BV5 LLC (“AM LLC”), MPM BioVentures V GP LLC (“BV V GP”), MPM BioVentures V LLC (“BV V LLC”) (collectively, the “MPM Entities”) and Ansbert Gadick, Luke Evin and Todd Foley (collectively, the “Listed Persons” and together with the MPM Entities, the “Filing Persons”). The Listed Persons are members of BV V LLC. The MPM Entities and the Listed Persons expressly disclaim status as a “group” for purposes of this Schedule 13D.
- (2) This percentage is calculated based upon 27,284,140 shares of the Issuer’s common stock outstanding, as adjusted pursuant to Rule 13d-3(d)(1) promulgated under the Securities Exchange Act, which is the number of shares of the Issuer’s Common Stock outstanding upon completion of the Issuer’s initial public offering, as set forth in the Issuer’s final prospectus dated October 4, 2017 with respect to such offering, filed with the Securities and Exchange Commission on October 5, 2017, after giving effect to the exercise in full of the underwriters’ over-allotment option.

1.	Name of Reporting Persons. MPM Asset Management Investors BV5 LLC	
2.	Check the Appropriate Box if a Member of a Group (See Instructions) (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (1)	
3.	SEC USE ONLY	
4.	Source of Funds (See Instructions) WC	
5.	Check if Disclosure of Legal Proceedings Is Required Pursuant to Items 2(d) or 2(e)	
6.	Citizenship or Place of Organization Delaware	
Number of Shares Beneficially Owned by Each Reporting Person With:	7.	Sole Voting Power 100,833
	8.	Shared Voting Power 0
	9.	Sole Dispositive Power 100,833
	10.	Shared Dispositive Power 0
11.	Aggregate Amount Beneficially Owned by Each Reporting Person 100,833	
12.	Check if the Aggregate Amount in Row (11) Excludes Certain Shares (See Instructions)	
13.	Percent of Class Represented by Amount in Row (11) 0.4%(2)	
14.	Type of Reporting Person (See Instructions) OO	

- (1) This Schedule is filed by the MPM Entities and the Listed Persons. The MPM Entities and the Listed Persons expressly disclaim status as a "group" for purposes of this Schedule 13D.
- (2) This percentage is calculated based upon 27,284,140 shares of the Issuer's common stock outstanding, as adjusted pursuant to Rule 13d-3(d)(1) promulgated under the Securities Exchange Act, which is the number of shares of the Issuer's Common Stock outstanding upon completion of the Issuer's initial public offering, as set forth in the Issuer's final prospectus dated October 4, 2017 with respect to such offering, filed with the Securities and Exchange Commission on October 5, 2017, after giving effect to the exercise in full of the underwriters' over-allotment option.

1.	Name of Reporting Persons. MPM BioVentures V GP LLC
2.	Check the Appropriate Box if a Member of a Group (See Instructions) (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (1)
3.	SEC USE ONLY
4.	Source of Funds (See Instructions) WC
5.	Check if Disclosure of Legal Proceedings Is Required Pursuant to Items 2(d) or 2(e)
6.	Citizenship or Place of Organization Delaware
Number of Shares Beneficially Owned by Each Reporting Person With:	7. Sole Voting Power 0
	8. Shared Voting Power 2,595,559(2)
	9. Sole Dispositive Power 0
	10. Shared Dispositive Power 2,595,559(2)
11.	Aggregate Amount Beneficially Owned by Each Reporting Person 2,595,559(2)
12.	Check if the Aggregate Amount in Row (11) Excludes Certain Shares (See Instructions)
13.	Percent of Class Represented by Amount in Row (11) 9.5%(3)
14.	Type of Reporting Person (See Instructions) OO

- (1) This Schedule is filed by the MPM Entities and the Listed Persons. The MPM Entities and the Listed Persons expressly disclaim status as a “group” for purposes of this Schedule 13D.
- (2) Represents shares of Common Stock held by BV V. BV V GP and BV V LLC are the direct and indirect general partners of BV V.
- (3) This percentage is calculated based upon 27,284,140 shares of the Issuer’s common stock outstanding, as adjusted pursuant to Rule 13d-3(d)(1) promulgated under the Securities Exchange Act, which is the number of shares of the Issuer’s Common Stock outstanding upon completion of the Issuer’s initial public offering, as set forth in the Issuer’s final prospectus dated October 4, 2017 with respect to such offering, filed with the Securities and Exchange Commission on October 5, 2017, after giving effect to the exercise in full of the underwriters’ over-allotment option.

1.	Name of Reporting Persons. MPM BioVentures V LLC
2.	Check the Appropriate Box if a Member of a Group (See Instructions) (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (1)
3.	SEC USE ONLY
4.	Source of Funds (See Instructions) WC
5.	Check if Disclosure of Legal Proceedings Is Required Pursuant to Items 2(d) or 2(e)
6.	Citizenship or Place of Organization Delaware
Number of Shares Beneficially Owned by Each Reporting Person With:	7. Sole Voting Power 0
	8. Shared Voting Power 2,696,392(2)
	9. Sole Dispositive Power 0
	10. Shared Dispositive Power 2,696,392(2)
11.	Aggregate Amount Beneficially Owned by Each Reporting Person 2,696,392(2)
12.	Check if the Aggregate Amount in Row (11) Excludes Certain Shares (See Instructions)
13.	Percent of Class Represented by Amount in Row (11) 9.9%(3)
14.	Type of Reporting Person (See Instructions) OO

- (1) This Schedule is filed by the MPM Entities and the Listed Persons. The MPM Entities and the Listed Persons expressly disclaim status as a "group" for purposes of this Schedule 13D.
- (2) Includes 2,595,559 shares of Common Stock held by BV V and 100,833 shares of Common Stock held by AM LLC. BV V GP and BV V LLC are the direct and indirect general partners of BV V and BV V LLC is the manager of AM LLC.
- (3) This percentage is calculated based upon 27,284,140 shares of the Issuer's common stock outstanding, as adjusted pursuant to Rule 13d-3(d)(1) promulgated under the Securities Exchange Act, which is the number of shares of the Issuer's Common Stock outstanding upon completion of the Issuer's initial public offering, as set forth in the Issuer's final prospectus dated October 4, 2017 with respect to such offering, filed with the Securities and Exchange Commission on October 5, 2017, after giving effect to the exercise in full of the underwriters' over-allotment option.

1.	Name of Reporting Persons. Ansbert Gadicke	
2.	Check the Appropriate Box if a Member of a Group (See Instructions) (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (1)	
3.	SEC USE ONLY	
4.	Source of Funds (See Instructions) OO	
5.	Check if Disclosure of Legal Proceedings Is Required Pursuant to Items 2(d) or 2(e)	
6.	Citizenship or Place of Organization United States	
Number of Shares Beneficially Owned by Each Reporting Person With:	7.	Sole Voting Power 0
	8.	Shared Voting Power 2,696,392(2)
	9.	Sole Dispositive Power 0
	10.	Shared Dispositive Power 2,696,392(2)
11.	Aggregate Amount Beneficially Owned by Each Reporting Person 2,696,392(2)	
12.	Check if the Aggregate Amount in Row (11) Excludes Certain Shares (See Instructions)	
13.	Percent of Class Represented by Amount in Row (11) 9.9%(3)	
14.	Type of Reporting Person (See Instructions) IN	

- (1) This Schedule is filed by the MPM Entities and the Listed Persons. The MPM Entities and the Listed Persons expressly disclaim status as a "group" for purposes of this Schedule 13D.
- (2) Includes 2,595,559 shares of Common Stock held by BV V and 100,833 shares of Common Stock held by AM LLC. BV V GP and BV V LLC are the direct and indirect general partners of BV V and BV V LLC is the manager of AM LLC. The Reporting Person is a member of BV V LLC.
- (3) This percentage is calculated based upon 27,284,140 shares of the Issuer's common stock outstanding, as adjusted pursuant to Rule 13d-3(d)(1) promulgated under the Securities Exchange Act, which is the number of shares of the Issuer's Common Stock outstanding upon completion of the Issuer's initial public offering, as set forth in the Issuer's final prospectus dated October 4, 2017 with respect to such offering, filed with the Securities and Exchange Commission on October 5, 2017, after giving effect to the exercise in full of the underwriters' over-allotment option.

1.	Name of Reporting Persons. Luke Evnin	
2.	Check the Appropriate Box if a Member of a Group (See Instructions) (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (1)	
3.	SEC USE ONLY	
4.	Source of Funds (See Instructions) OO	
5.	Check if Disclosure of Legal Proceedings Is Required Pursuant to Items 2(d) or 2(e)	
6.	Citizenship or Place of Organization United States	
Number of Shares Beneficially Owned by Each Reporting Person With:	7.	Sole Voting Power 0
	8.	Shared Voting Power 2,696,392(2)
	9.	Sole Dispositive Power 0
	10.	Shared Dispositive Power 2,696,392(2)
11.	Aggregate Amount Beneficially Owned by Each Reporting Person 2,696,392(2)	
12.	Check if the Aggregate Amount in Row (11) Excludes Certain Shares (See Instructions)	
13.	Percent of Class Represented by Amount in Row (11) 9.9%(3)	
14.	Type of Reporting Person (See Instructions) IN	

- (1) This Schedule is filed by the MPM Entities and the Listed Persons. The MPM Entities and Listed Persons expressly disclaim status as a “group” for purposes of this Schedule 13D.
- (2) Includes 2,595,559 shares of Common Stock held by BV V and 100,833 shares of Common Stock held by AM LLC. BV V GP and BV V LLC are the direct and indirect general partners of BV V and BV V LLC is the manager of AM LLC. The Reporting Person is a member of BV V LLC.
- (3) This percentage is calculated based upon 27,284,140 shares of the Issuer’s common stock outstanding, as adjusted pursuant to Rule 13d-3(d)(1) promulgated under the Securities Exchange Act, which is the number of shares of the Issuer’s Common Stock outstanding upon completion of the Issuer’s initial public offering, as set forth in the Issuer’s final prospectus dated October 4, 2017 with respect to such offering, filed with the Securities and Exchange Commission on October 5, 2017, after giving effect to the exercise in full of the underwriters’ over-allotment option.

1.	Name of Reporting Persons. Todd Foley	
2.	Check the Appropriate Box if a Member of a Group (See Instructions) (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (1)	
3.	SEC USE ONLY	
4.	Source of Funds (See Instructions) OO	
5.	Check if Disclosure of Legal Proceedings Is Required Pursuant to Items 2(d) or 2(e)	
6.	Citizenship or Place of Organization United States	
Number of Shares Beneficially Owned by Each Reporting Person With:	7.	Sole Voting Power 0
	8.	Shared Voting Power 2,696,392(2)
	9.	Sole Dispositive Power 0
	10.	Shared Dispositive Power 2,696,392(2)
11.	Aggregate Amount Beneficially Owned by Each Reporting Person 2,696,392(2)	
12.	Check if the Aggregate Amount in Row (11) Excludes Certain Shares (See Instructions)	
13.	Percent of Class Represented by Amount in Row (11) 9.9%(3)	
14.	Type of Reporting Person (See Instructions) IN	

- (1) This Schedule is filed by the MPM Entities and the Listed Persons. The MPM Entities and the Listed Persons expressly disclaim status as a "group" for purposes of this Schedule 13D.
- (2) Includes 2,595,559 shares of Common Stock held by BV V and 100,833 shares of Common Stock held by AM LLC. BV V GP and BV V LLC are the direct and indirect general partners of BV V and BV V LLC is the manager of AM LLC. The Reporting Person is a member of BV V LLC.
- (3) This percentage is calculated based upon 27,284,140 shares of the Issuer's common stock outstanding, as adjusted pursuant to Rule 13d-3(d)(1) promulgated under the Securities Exchange Act, which is the number of shares of the Issuer's Common Stock outstanding upon completion of the Issuer's initial public offering, as set forth in the Issuer's final prospectus dated October 4, 2017 with respect to such offering, filed with the Securities and Exchange Commission on October 5, 2017, after giving effect to the exercise in full of the underwriters' over-allotment option.

Item 1. Security and Issuer.

This Schedule 13D (this "Schedule 13D") relates to the common stock, par value \$0.001 per share (the "Common Stock"), of Rhythm Pharmaceuticals, Inc. (the "Issuer"). The Issuer's principal executive office is located at 500 Boylston Street, 11th Floor, Boston, MA 02116.

Item 2. Identity and Background

(a) The entities and persons filing this statement are MPM BioVentures V, L.P. ("BV V"), MPM Asset Management Investors BV5 LLC ("AM LLC"), MPM BioVentures V GP LLC ("BV V GP"), MPM BioVentures V LLC ("BV V LLC") (collectively, the "MPM Entities") and Ansbert Gadicke, Luke Evnin and Todd Foley (collectively, the "Listed Persons" and together with the MPM Entities, the "Filing Persons").

(b) The address of the principal place of business for each of the MPM Entities and Ansbert Gadicke, Luke Evnin and Todd Foley is 450 Kendall Street, Cambridge, MA 02142.

(c) The principal business of each of the Filing Persons is the venture capital investment business.

(d) During the last five years, none of the Filing Persons has been convicted in any criminal proceeding (excluding traffic violations or similar misdemeanors).

(e) During the last five years, none of the Filing Persons has been a party to a civil proceeding of a judicial or administrative body of competent jurisdiction and as a result of such proceeding was or is subject to a judgment, decree, or final order enjoining future violations of, or prohibiting or mandating activities subject to, federal or state securities laws or finding any violation with respect to such laws.

(f) Each of the Listed Persons is a United States citizen and each of the MPM Entities is a Delaware limited partnership or limited liability company.

In accordance with the provisions of General Instruction C to Schedule 13D, information concerning the managers and each other person controlling the general partners of the MPM Entities required by Item 2 of Schedule 13D is listed on Schedule 1 hereto and is incorporated by reference herein.

Item 3. Source and Amount of Funds or Other Consideration

On October 4, 2017, the Registration Statement on Form S-1 (the "Registration Statement") filed with the Securities and Exchange Commission by the Issuer (File No. 333-220337) in connection with its initial public offering of 7,050,000 shares of Common Stock was declared effective. The closing of the offering took place on October 10, 2017, and at such closing the MPM Entities purchased an aggregate of 100,000 shares of Common Stock at the initial public offering price of \$17.00 per share. The source of funds for such purchase was the working capital of the MPM Entities and capital contributions made to the MPM Entities by its partners.

Item 4. Purpose of Transaction

The MPM Entities purchased the shares of Common Stock of the Issuer in the initial public offering for investment purposes.

Todd Foley is a member of the Board of Directors of the Issuer and is also a member of BV V LLC.

Subject to applicable legal requirements, one or more of the Filing Persons may purchase additional securities of the Issuer from time to time in open market or private transactions, depending on their evaluation of the Issuer's business, prospects and financial condition, the market for the Issuer's securities, other developments concerning the Issuer, the reaction of the Issuer to the Filing Persons' ownership of the Issuer's securities, other opportunities available to the Filing Persons, and general economic, money market and stock market conditions. In addition, depending upon the factors referred to above, the Filing Persons may dispose of all or a portion of their securities of the Issuer at any time. Each of the Filing Persons reserves the right to increase or decrease its holdings on such terms and at such times as each may decide.

Other than as described above in this Item 4, none of the Filing Persons have any plan or proposal relating to or that would result in: (a) the acquisition by any person of additional securities of the Issuer or the disposition of securities of the Issuer; (b) an extraordinary corporate transaction, such as a merger, reorganization or liquidation, involving the Issuer or any of its subsidiaries; (c) a sale or transfer of a material amount of assets of the Issuer or any of its subsidiaries; (d) any change in the present board of directors or management of the Issuer, including any plans or proposals to change the number or terms of directors or to fill any existing vacancies on the board; (e) any material change in the present capitalization or dividend policy of the Issuer; (f) any other material change in the Issuer's business or corporate structure; (g) any changes in the Issuer's charter, by-laws or instruments corresponding thereto or other actions which may impede the acquisition of control of the Issuer by any person; (h) causing a class of securities of the Issuer to be delisted from a national securities exchange or to cease to be authorized to be quoted in an inter-dealer quotation system of a registered national securities association; (i) a class of equity securities of the Issuer becoming eligible for termination of registration pursuant to Section 12(g)(4) of the Exchange Act; or (j) any action similar to those enumerated above.

Item 5. Interest in Securities of the Issuer

(a) – (b) The following information with respect to the ownership of the Common Stock of the Issuer by the Filing Persons is provided as of October 10, 2017:

Reporting Person	Shares Held Directly	Sole Voting Power	Shared Voting Power	Sole Dispositive Power	Shared Dispositive Power	Beneficial Ownership	Percentage of Class (1)
BV V	2,595,559	2,595,559	0	2,595,559	0	2,595,559	9.5%
AM LLC	100,833	100,833	0	100,833	0	100,833	0.4%
BV V GP(2)	0	0	2,595,559	0	2,595,559	2,595,559	9.5%
BV V LLC(3)	0	0	2,696,392	0	2,696,392	2,696,392	9.9%
Ansbert Gadicke(4)	0	0	2,696,392	0	2,696,392	2,696,392	9.9%
Luke Evnin(4)	0	0	2,696,392	0	2,696,392	2,696,392	9.9%
Todd Foley(4)	0	0	2,696,392	0	2,696,392	2,696,392	9.9%

- (1) This percentage is calculated based upon 27,284,140 shares of the Issuer's common stock outstanding, as adjusted pursuant to Rule 13d-3(d)(1) promulgated under the Securities Exchange Act, which is the number of shares of the Issuer's Common Stock outstanding upon completion of the Issuer's initial public offering, as set forth in the Issuer's final prospectus dated October 4, 2017 with respect to such offering, filed with the Securities and Exchange Commission on October 5, 2017, after giving effect to the exercise in full of the underwriters' over-allotment option.
- (2) Includes securities held by BV V. BV V GP is the direct general partner of BV V.
- (3) Includes securities held by BV V and AM LLC. BV V LLC is the indirect general partner of BV V and the manager of AM LLC.
- (4) Includes securities held by BV V and AM LLC. The Reporting Person is a member of BV V LLC.

(c) The information provided in Item 3 is hereby incorporated by reference. In addition, on August 18, 2017, the MPM Entities purchased an aggregate of 3,015,915 shares of Series A Preferred Stock of the Issuer, with each share of Series A Preferred Stock convertible into approximately 0.10905125 shares of Common Stock upon the closing of the Issuer's initial public offering. On October 10, 2017, the MPM Entities acquired an aggregate of 2,567,014 shares of Common Stock of the Issuer upon the automatic conversion of preferred stock of the Issuer in connection with the closing of the Issuer's initial public offering.

Each Filing Person disclaims membership in a "group." Each Filing Person also disclaims beneficial ownership of any shares of the Issuer, except for the shares set forth in the table above next to the respective Filing Person's name in subsection (b) of this Item 5.

(d) Inapplicable.

(e) Inapplicable.

Item 6. Contracts, Arrangements, Understandings or Relationships with Respect to Securities of the Issuer

Investor Rights Agreement

The Issuer and certain stockholders of the Issuer, including the MPM Entities, have entered into an Amended and Restated Investors' Rights Agreement dated August 21, 2017 (the "Investor Rights Agreement"). Subject to the terms of the Investor Rights Agreement, holders of shares having registration rights ("Registrable Securities") can demand that the Issuer file a registration statement or request that their shares be covered by a registration statement that the Issuer is otherwise filing.

Demand Registration Rights

If, at any time after 180 days after effective date of the Registration Statement, the Issuer shall receive a written request from the Holders (as defined in the Investor Rights Agreement) of at least a majority of the Registrable Securities then outstanding (the "Initiating Holders") that the Issuer file a Form S-1 registration statement under the Securities Act of 1933 (the "Securities Act") with respect to Registrable Securities owned by such Holder or Holders having an aggregate offering price, net of Selling Expenses (as defined in the Investor Rights Agreement), of at least \$15,000,000, then the Issuer shall give notice thereof (the "Demand Notice") to all Holders other than the Initiating Holders and, as soon as practicable, and in any event within sixty (60) days after the date such request is given by the Initiating Holders, file a Form S-1 registration statement under the Securities Act covering all Registrable Securities that the Initiating Holders requested to be registered and any additional Registrable Securities requested to be included in such registration by any other Holders.

The Issuer shall not be obligated to effect, or to take any action to effect, any demand registration after the Issuer has effected two Form S-1 demand registrations.

Form S-3 Demand Registration Rights

If at any time when it is eligible to use a Form S-3 registration statement, the Issuer receives a request from the Holders of at least 10% of the Registrable Securities then outstanding that the Issuer file a Form S-3 registration statement with respect to outstanding Registrable Securities of such Holders having an anticipated aggregate offering price of at least \$10,000,000, then the Issuer shall give a Demand Notice to all Holders other than the Initiating Holders and, as soon as practicable, and in any event within forty-five (45) days after the date such request is given by the Initiating Holders, file a Form S-3 registration statement under the Securities Act covering all Registrable Securities requested to be included in such registration by any other Holders.

The Issuer shall not be obligated to effect, or to take any action to effect, any Form S-3 demand registration if the Issuer has effected two Form S-3 demand registrations within the twelve month period immediately preceding the date of such request.

Piggyback Registration Rights

If the Issuer proposes to register any of its stock in connection with the public offering of such securities by the Issuer or on behalf of selling stockholders, the Issuer shall, at such time, promptly give each Holder written notice of such registration. Upon the written request of each Holder, the Issuer shall, subject to the certain limitations, use its reasonable best efforts to cause to be registered all of the Registrable Securities that each such Holder has requested to be registered.

Expenses of Registration

Subject to certain limitations, the Issuer will pay all registration expenses, other than underwriting discounts and commissions, related to any registration effected pursuant to the Investor Rights Agreement.

Indemnification

The Investor Rights Agreement contains customary cross-indemnification provisions, pursuant to which the Issuer is obligated to indemnify the selling stockholders in the event of material misstatements or omissions in the registration statement attributable to the Issuer, and the selling stockholders are obligated to indemnify the Issuer for material misstatements or omissions attributable to them.

Termination

No Holder shall be entitled to exercise any registration rights after the fifth anniversary of the Issuer's initial public offering or, with respect to a particular Holder, such time as Rule 144 under the Securities Act is available to permit the Holder to sell all shares held by the Holder during a three-month period without registration and the without the requirement that the Issuer be in compliance with the current public information requirement of Rule 144(c)(1).

Lock-up Agreements

The MPM Entities and Mr. Foley, along with all of the Issuer's officers, directors, and holders of substantially all of the Issuer's common stock, have entered into letter agreements (the "**Lock-up Agreements**"), whereby they have agreed, subject to certain exceptions, not to offer, sell, contract to sell, pledge or otherwise dispose of or hedge any of its common stock or securities convertible into or exchangeable for shares of common stock through the date that is 180 days following the date of the prospectus for the initial public offering (ending on April 2, 2018) except with the prior written consent of Morgan, Stanley & Co. LLC and Merrill Lynch, Pierce, Fenner & Smith Incorporated on behalf of the underwriters.

The foregoing description of the terms of the Investor Rights Agreement and the Lock-up Agreement is intended as a summary only and is qualified in its entirety by reference to the Investor Rights Agreement and Form of Lock-up Agreement, which are filed as exhibits to this Schedule 13D and incorporated by reference herein.

Other than as described in this Schedule 13D, to the best of the Filing Persons' knowledge, there are no other contracts, arrangements, understandings or relationships (legal or otherwise) among the persons named in Item 2 and between such persons and any person with respect to any securities of the Issuer.

Item 7. Material to Be Filed as Exhibits

- A. Amended and Restated Investors' Rights Agreement by and among the Issuer and each of the investors listed on Exhibit A thereto, dated as of August 21, 2017 (incorporated by reference to Exhibit 4.2 to the Issuer's Registration Statement on Form S-1 (SEC File No. 333-220337), filed with the SEC on September 5, 2017).
- B. Form of Lock-up Agreement
- C. Agreement regarding filing of joint Schedule 13D.

Signatures

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 24, 2017

MPM BioVENTURES V GP LLC

By: MPM BioVentures V LLC,
its Managing Member

By: /s/ Todd Foley
Name: Todd Foley
Title: Member

MPM BioVENTURES V LLC

By: /s/ Todd Foley
Name: Todd Foley
Title: Member

MPM BioVENTURES V, L.P.

By: MPM BioVentures V GP LLC, its General Partner
By: MPM BioVentures V LLC, its Managing Member

By: /s/ Todd Foley
Name: Todd Foley
Title: Member

MPM ASSET MANAGEMENT INVESTORS BV5 LLC

By: MPM BioVentures V LLC
Its: Manager

By: /s/ Todd Foley
Name: Todd Foley
Title: Member

By: /s/ Todd Foley
Name: Todd Foley

By: /s/ Luke Evnin
Name: Luke Evnin

By: /s/ Ansbert Gadicke
Name: Ansbert Gadicke

Schedule I

General Partners/Members

Ansbert Gadicke

c/o MPM Asset Management

450 Kendall Street

Cambridge, MA 02142

Principal Occupation: Member of the managing member of the general partner of MPM BioVentures V, L.P. and member of the manager of MPM Asset Management Investors BV5 LLC.

Citizenship: USA

Luke Evin

c/o MPM Asset Management

450 Kendall Street

Cambridge, MA 02142

Principal Occupation: Member of the managing member of the general partner of MPM BioVentures V, L.P. and member of the manager of MPM Asset Management Investors BV5 LLC.

Citizenship: USA

Todd Foley

c/o MPM Asset Management

450 Kendall Street

Cambridge, MA 02142

Principal Occupation: Member of the managing member of the general partner of MPM BioVentures V, L.P. and member of the manager of MPM Asset Management Investors BV5 LLC.

Citizenship: USA

Exhibit Index

- A. Amended and Restated Investors' Rights Agreement by and among the Issuer and each of the investors listed on Exhibit A thereto, dated as of August 21, 2017 (incorporated by reference to Exhibit 4.2 to the Issuer's Registration Statement on Form S-1 (SEC File No. 333-220337), filed with the SEC on September 5, 2017).
- B. Form of Lock-up Agreement
- C. Agreement regarding filing of joint Schedule 13D.

FORM OF LOCK-UP AGREEMENT

Rhythm Pharmaceuticals, Inc.
Public Offering of Common Stock

, 2017

Morgan Stanley & Co. LLC
Merrill Lynch, Pierce, Fenner & Smith
Incorporated

As Representatives of the several Underwriters,
c/o Morgan Stanley & Co. LLC
1585 Broadway
New York, NY 10036

Ladies and Gentlemen:

This letter is being delivered to you in connection with the proposed Underwriting Agreement (the “Underwriting Agreement”), between Rhythm Pharmaceuticals, Inc., a Delaware corporation, including any predecessor or successor company, as the case may be (the “Company”), and each of you as representatives of a group of Underwriters named therein (the “Underwriters”), relating to an underwritten public offering of shares of common stock (“Common Stock”), of the Company (the “Offering”).

In order to induce you and the other Underwriters to enter into the Underwriting Agreement, the undersigned will not, without the prior written consent of the Representatives, offer, sell, contract to sell, pledge or otherwise dispose of, (or enter into any transaction which is designed to, or might reasonably be expected to, result in the disposition (whether by actual disposition or effective economic disposition due to cash settlement or otherwise) by the undersigned or any affiliate of the undersigned or any person in privity with the undersigned or any affiliate of the undersigned), directly or indirectly, including the filing (or participation in the filing) of a registration statement (other than a registration statement on Form S-8) with the Securities and Exchange Commission (the “SEC”) in respect of, or establish or increase a put equivalent position or liquidate or decrease a call equivalent position within the meaning of Section 16 of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), and the rules and regulations of the SEC promulgated thereunder with respect to, any capital stock of the Company or any securities convertible into, or exercisable or exchangeable for such capital stock, or publicly announce an intention to effect any such transaction, for a period from the date hereof until 180 days after the date of the Underwriting Agreement (the “Lock-up Period”). If the undersigned is an officer or director of the Company, the undersigned further agrees that the foregoing restrictions shall be equally applicable to any issuer-directed shares of Common Stock the undersigned may purchase in the Offering.

The provisions of the immediately preceding paragraph shall not apply to (i) the sale of shares of Common Stock by the undersigned to the Underwriters pursuant to the Underwriting Agreement, (ii) transfers of shares of capital stock of the Company or any securities convertible into, or exercisable or exchangeable for such capital stock as a bona fide gift or gifts, (iii) transfers or dispositions of shares of capital stock of the Company or any securities convertible into, or exercisable or exchangeable for such capital stock to any trust for the direct or indirect benefit of the undersigned or the immediate family of the undersigned in transactions not involving a disposition for value; (iv) transfers or dispositions of shares of capital stock of the Company or any securities convertible into, or exercisable or exchangeable for such capital stock to any corporation, partnership, limited liability company or other entity all of the beneficial ownership interests of which are held by the undersigned or the immediate family of the undersigned in a transaction not involving a disposition for value; (v) transfers or dispositions of shares of capital stock of the Company or any securities convertible into, or exercisable or exchangeable for such capital stock by will, other testamentary document or intestate succession to the legal representative, heir, beneficiary or a member of the immediate family of the undersigned; or (vi) distributions of shares of capital stock of the Company or any securities convertible into, or exercisable or exchangeable for such capital stock to partners, members or stockholders of the undersigned; *provided*, that in the case of any transfer, disposition or distribution pursuant to clause (ii), (iii), (iv), (v) or (vi), each transferee, donee or distributee shall execute and deliver to the Representatives a lock-up letter in the form of this letter; *and provided further*, that in the case of any transfer, disposition or distribution pursuant to clause (ii), (iii), (iv) or (vi), no filing by any party (donor, donee, transferor or transferee) under the Exchange Act or other public announcement reporting a reduction in the beneficial ownership of Common Stock held by the undersigned shall be required or shall be made voluntarily in connection with such transfer, disposition or distribution (other than a filing on a Form 5 made after the expiration of the 180-day period referred to in the immediately preceding paragraph). For purposes of this letter, “immediate family” shall mean any relationship by blood, marriage, domestic partnership, or adoption, not more remote than first cousin. Furthermore, notwithstanding the restrictions imposed by this letter, the undersigned may, without the prior written consent of the Representatives, (a) exercise an option to purchase shares of Common Stock granted under any equity incentive plan or equity purchase plan of the Company which is described in the registration statement relating to the Offering, *provided* that the underlying equity securities shall continue to be subject to the restrictions on transfer set forth in this letter, (b) establish a trading plan pursuant to Rule 10b5-1 under the Exchange Act for the transfer of shares of Common Stock, *provided* that such plan does not provide for any transfers of Common Stock, and no filing with the SEC or other public announcement shall be required or voluntarily made by the undersigned or any other person in connection therewith, in each case during the 180-day period referred to in the immediately preceding paragraph, (c) transfer shares of Common Stock to the Company in connection with the termination of the undersigned’s employment with the Company, and (d) transfer or dispose of shares of Common Stock purchased in the Offering from the Underwriters (other than any issuer-directed shares of Common Stock purchased in the Offering by an officer or director of the Company) or on the open market following the Offering; *provided* that, in the case of clauses (b), (c) and (d) above, no filing with the SEC or other public announcement shall be required or voluntarily made by the undersigned or any other person in connection therewith, in each case during the 180-day period referred to in the immediately preceding paragraph, other than in the case of clause (c) to the extent such filing is required and the employment termination is footnoted or otherwise disclosed therein.

If the undersigned is an officer or director of the Company, (i) the Representatives agree that, at least three business days before the effective date of any release or waiver of the foregoing restrictions in connection with a transfer of shares of Common Stock, the Representatives will notify the Company of the impending release or waiver, and (ii) the Company has agreed in the Underwriting Agreement to announce the impending release or waiver by press release through a major news service at least two business days before the effective date of the release or waiver. Any release or waiver granted by the Representatives hereunder to any such officer or director shall only be effective two business days after the publication date of such press release. The provisions of this paragraph will not apply if (a) the release or waiver is effected solely to permit a transfer not for consideration and (b) the transferee has agreed in writing to be bound by the same terms described in this letter to the extent and for the duration that such terms remain in effect at the time of the transfer.

This letter shall automatically terminate and the undersigned shall be released from all obligations under this letter upon the earliest to occur, if any, of (i) either the Company, on the one hand, or the Representatives, on the other hand, advising the other in writing, prior to the execution of the Underwriting Agreement, that they have determined not to proceed with the Offering, (ii) the Underwriting Agreement being terminated prior to the Closing Date (as defined in the Underwriting Agreement), (iii) the registration statement filed with the SEC with respect to the Offering being withdrawn and (iv) December 31, 2017, in the event that the Underwriting Agreement has not been executed by such date.

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Yours very truly,

MPM BioVentures V, L.P.

By: MPM BioVentures V GP LLC, its General Partner

By: MPM BioVentures V LLC, its Managing Member

By: _____

Name: Todd Foley

Title: Member

MPM Asset Management Investors BV5 LLC

By: MPM BioVentures V LLC, its Manager

By: _____

Name: Todd Foley

Title: Member

Joint Filing Statement

I, the undersigned, hereby express my agreement that the attached Schedule 13D (and any amendments thereto) relating to the beneficial ownership by the undersigned of the equity securities of Rhythm Pharmaceuticals, Inc. is filed on behalf of each of the undersigned.

Date: October 24, 2017

MPM BIOVENTURES V GP LLC

By: MPM BioVentures V LLC,
its Managing Member

By: /s/ Todd Foley
Name: Todd Foley
Title: Member

MPM BIOVENTURES V LLC

By: /s/ Todd Foley
Name: Todd Foley
Title: Member

MPM BIOVENTURES V, L.P.

By: MPM BioVentures V GP LLC, its General Partner
By: MPM BioVentures V LLC, its Managing Member

By: /s/ Todd Foley
Name: Todd Foley
Title: Member

MPM ASSET MANAGEMENT INVESTORS BV5 LLC

By: MPM BioVentures V LLC
Its: Manager

By: /s/ Todd Foley
Name: Todd Foley
Title: Member

By: /s/ Todd Foley
Name: Todd Foley

By: /s/ Luke Evnin
Name: Luke Evnin

By: /s/ Ansbert Gadicke
Name: Ansbert Gadicke