

SECURITIES AND EXCHANGE COMMISSION  
WASHINGTON, DC 20549

**SCHEDULE 13G**  
(Rule 13d-102)

INFORMATION TO BE INCLUDED IN STATEMENTS FILED PURSUANT  
TO RULES 13d-1(b)(c), AND (d) AND AMENDMENTS THERETO FILED  
PURSUANT TO RULE 13d-2(b)

(Amendment No. ) \*

**AcelRx Pharmaceuticals, Inc.**

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(Name of Issuer)

Common Stock

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(Title of Class of Securities)

00444T100

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(CUSIP Number)

June 1, 2012

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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)

(Page 1 of 11 Pages)

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\* 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 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.  | NAME OF REPORTING PERSONS<br>I.R.S. IDENTIFICATION NO. OF ABOVE PERSONS (ENTITIES ONLY)<br><br>Deerfield Capital, L.P.    |   |
| 2.  | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP* (a) <input type="checkbox"/><br>(b) <input checked="" type="checkbox"/> |   |
| 3.  | SEC USE ONLY  |   |
| 4.  | CITIZENSHIP OR PLACE OF ORGANIZATION<br><br>Delaware  |   |
| NUMBER OF<br>SHARES<br>BENEFICIALLY<br>OWNED BY<br>EACH<br>REPORTING<br>PERSON WITH | 5.  | SOLE VOTING POWER<br><br>0                    |
|   | 6.  | SHARED VOTING POWER<br><br>1,113,965 (1)      |
|   | 7.  | SOLE DISPOSITIVE POWER<br><br>0               |
|   | 8.  | SHARED DISPOSITIVE POWER<br><br>1,113,965 (1) |
| 9.  | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON<br><br>1,113,965 (1)   |   |
| 10.   | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) <input type="checkbox"/><br>EXCLUDES CERTAIN SHARES*                         |   |
| 11.   | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW 9<br><br>4.83%  |   |
| 12.   | TYPE OF REPORTING PERSON*<br><br>PN   |   |

(1) Comprised of 672,435 shares of common stock and warrants to purchase 441,530 shares of common stock held by Deerfield Special Situations Fund, L.P.

|   |  |   |
|---|--|---|
| 1.  | NAME OF REPORTING PERSONS<br>I.R.S. IDENTIFICATION NO. OF ABOVE PERSONS (ENTITIES ONLY)<br><br>Deerfield Special Situations Fund, L.P. |   |
| 2.  | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP* (a) <input type="checkbox"/><br>(b) <input checked="" type="checkbox"/>              |   |
| 3.  | SEC USE ONLY   |   |
| 4.  | CITIZENSHIP OR PLACE OF ORGANIZATION<br><br>Delaware   |   |
| NUMBER OF<br>SHARES<br>BENEFICIALLY<br>OWNED BY<br>EACH<br>REPORTING<br>PERSON WITH | 5.   | SOLE VOTING POWER<br><br>0                    |
|   | 6.   | SHARED VOTING POWER<br><br>1,113,965 (2)      |
|   | 7.   | SOLE DISPOSITIVE POWER<br><br>0               |
|   | 8.   | SHARED DISPOSITIVE POWER<br><br>1,113,965 (2) |
| 9.  | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON<br><br>1,113,965 (2)  |   |
| 10.   | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) <input type="checkbox"/><br>EXCLUDES CERTAIN SHARES*                                      |   |
| 11.   | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW 9<br><br>4.83%   |   |
| 12.   | TYPE OF REPORTING PERSON*<br><br>PN  |   |

(2) Includes warrants to purchase 441,530 shares of common stock.

|   |   |   |
|---|---|---|
| 1.  | NAME OF REPORTING PERSONS<br>I.R.S. IDENTIFICATION NO. OF ABOVE PERSONS (ENTITIES ONLY)<br><br>Deerfield Management Company, L.P. |   |
| 2.  | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP* (a) <input type="checkbox"/><br>(b) <input checked="" type="checkbox"/>         |   |
| 3.  | SEC USE ONLY  |   |
| 4.  | CITIZENSHIP OR PLACE OF ORGANIZATION<br><br>Delaware  |   |
| NUMBER OF<br>SHARES<br>BENEFICIALLY<br>OWNED BY<br>EACH<br>REPORTING<br>PERSON WITH | 5.  | SOLE VOTING POWER<br><br>0                    |
|   | 6.  | SHARED VOTING POWER<br><br>1,557,415 (3)      |
|   | 7.  | SOLE DISPOSITIVE POWER<br><br>0               |
|   | 8.  | SHARED DISPOSITIVE POWER<br><br>1,557,415 (3) |
| 9.  | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON<br><br>1,557,415 (3)   |   |
| 10.   | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) <input type="checkbox"/><br>EXCLUDES CERTAIN SHARES*                                 |   |
| 11.   | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW 9<br><br>6.70%  |   |
| 12.   | TYPE OF REPORTING PERSON*<br><br>PN   |   |

(3) Comprised of 940,121 shares of common stock and warrants to purchase 617,294 shares of common stock held by Deerfield Special Situations Fund International Limited.

|   |  |   |
|---|--|---|
| 1.  | NAME OF REPORTING PERSONS<br>I.R.S. IDENTIFICATION NO. OF ABOVE PERSONS (ENTITIES ONLY)<br><br>Deerfield Special Situations Fund International Limited |   |
| 2.  | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP* (a) <input type="checkbox"/><br>(b) <input checked="" type="checkbox"/>                              |   |
| 3.  | SEC USE ONLY   |   |
| 4.  | CITIZENSHIP OR PLACE OF ORGANIZATION<br><br>British Virgin Islands   |   |
| NUMBER OF<br>SHARES<br>BENEFICIALLY<br>OWNED BY<br>EACH<br>REPORTING<br>PERSON WITH | 5.   | SOLE VOTING POWER<br><br>0                    |
|   | 6.   | SHARED VOTING POWER<br><br>1,557,415 (4)      |
|   | 7.   | SOLE DISPOSITIVE POWER<br><br>0               |
|   | 8.   | SHARED DISPOSITIVE POWER<br><br>1,557,415 (4) |
| 9.  | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON<br><br>1,557,415 (4)  |   |
| 10.   | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) <input type="checkbox"/><br>EXCLUDES CERTAIN SHARES*  |   |
| 11.   | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW 9<br><br>6.70%   |   |
| 12.   | TYPE OF REPORTING PERSON*<br><br>CO  |   |

(4) Includes warrants to purchase 617,294 shares of common stock.

|   |   |   |
|---|---|---|
| 1.  | NAME OF REPORTING PERSONS<br>I.R.S. IDENTIFICATION NO. OF ABOVE PERSONS (ENTITIES ONLY)<br><br>James E. Flynn             |   |
| 2.  | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP* (a) <input type="checkbox"/><br>(b) <input checked="" type="checkbox"/> |   |
| 3.  | SEC USE ONLY  |   |
| 4.  | CITIZENSHIP OR PLACE OF ORGANIZATION<br><br>United States   |   |
| NUMBER OF<br>SHARES<br>BENEFICIALLY<br>OWNED BY<br>EACH<br>REPORTING<br>PERSON WITH | 5.  | SOLE VOTING POWER<br><br>0                    |
|   | 6.  | SHARED VOTING POWER<br><br>2,671,380 (5)      |
|   | 7.  | SOLE DISPOSITIVE POWER<br><br>0               |
|   | 8.  | SHARED DISPOSITIVE POWER<br><br>2,671,380 (5) |
| 9.  | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON<br><br>2,671,380 (5)   |   |
| 10.   | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) <input type="checkbox"/><br>EXCLUDES CERTAIN SHARES*                         |   |
| 11.   | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW 9<br><br>9.99% (5)  |   |
| 12.   | TYPE OF REPORTING PERSON*<br><br>IN   |   |

(5) Comprised of 672,435 shares of common stock and warrants to purchase 441,530 shares of common stock held by Deerfield Special Situations Fund, L.P. and 940,121 shares of common stock and warrants to purchase 617,294 shares of common stock held by Deerfield Special Situations Fund International Limited. The provisions of the warrants beneficially owned by the reporting person restrict the exercise of such warrants to the extent that, after giving effect to such exercise, the number of shares then beneficially owned by the holder and its affiliates would exceed 9.99% of the total number of shares of the Issuer then outstanding (the "Ownership Cap"). Accordingly, notwithstanding the number of shares reported, the reporting person disclaims beneficial ownership of the shares underlying such warrants to the extent beneficial ownership of such shares would cause all reporting persons hereunder, in the aggregate, to exceed the Ownership Cap.

Item 1(a). Name of Issuer:

AcelRx Pharmaceuticals, Inc.

Item 1(b). Address of Issuer's Principal Executive Offices:

351 Galveston Drive  
Redwood City, CA 94063

Item 2(a). Name of Person Filing:

James E. Flynn, Deerfield Capital, L.P., Deerfield Special  
Situations Fund, L.P., Deerfield Management Company, L.P., Deerfield  
Special Situations Fund International Limited

Item 2(b). Address of Principal Business Office, or if None, Residence:

James E. Flynn, Deerfield Capital, L.P., Deerfield Special  
Situations Fund, L.P., Deerfield Management Company, L.P., 780 Third  
Avenue, 37th Floor, New York, NY 10017, Deerfield Special Situations  
Fund International Limited, c/o Citi Hedge Fund  
Services (B.V.I.) Ltd., Bison Court, Columbus Centre, P.O. Box 3460, Road Town,  
Tortola, D8, British Virgin Islands

Item 2(c). Citizenship:

Deerfield Capital, L.P., Deerfield Management Company, L.P. and Deerfield  
Special Situations Fund, L.P. - Delaware limited partnerships, Deerfield  
Special Situations Fund International Limited- British Virgin Islands  
corporation, James E. Flynn - United States citizen

Item 2(d). Title of Class of Securities:

Common Stock

Item 2(e). CUSIP Number:

00444T100

Item 3. If This Statement is Filed Pursuant to Rule 13d-1(b), or 13d-2(b) or (c), Check Whether the Person Filing is a:

- (a)  Broker or dealer registered under Section 15 of the Exchange Act.
  - (b)  Bank as defined in Section 3(a)(6) of the Exchange Act.
  - (c)  Insurance company as defined in Section 3(a)(19) of the Exchange Act.
  - (d)  Investment company registered under Section 8 of the Investment Company Act.
  - (e)  An investment adviser in accordance with Rule 13d-1(b)(1)(ii)(E);
  - (f)  An employee benefit plan or endowment fund in accordance with Rule 13d-1(b)(1)(ii)(F);
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- (g)  A parent holding company or control person in accordance with Rule 13d-1(b)(1)(ii)(G);
- (h)  A savings association as defined in Section 3(b) of the Federal Deposit Insurance Act;
- (i)  A church plan that is excluded from the definition of an investment company under Section 3(c)(14) of the Investment Company Act;
- (j)  A non-U.S. institution in accordance with Rule 13d-1(b)(1)(ii)(J);
- (k)  Group, in accordance with Rule 13d-1(b)(1)(ii)(K).

If filing as a non-U.S. institution in accordance with Rule 13d-1(b)(1)(ii)(J), please specify the type of institution: \_\_\_\_\_

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\*\*:

Deerfield Capital, L.P. – 1,113,965 shares  
 Deerfield Special Situations Fund, L.P. – 1,113,965 shares  
 Deerfield Management Company, L.P. – 1,557,415 shares  
 Deerfield Special Situations Fund International Limited – 1,557,415  
 shares  
 James E. Flynn – 2,671,380 shares

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- (b) Percent of class\*\*:

Deerfield Capital, L.P. – 4.83%  
 Deerfield Special Situations Fund, L.P. – 4.83%  
 Deerfield Management Company, L.P. – 6.70%  
 Deerfield Special Situations International Limited – 6.70%  
 James E. Flynn – 9.99%

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- (c) Number of shares as to which such person has\*\*:

|   |  |
|---|--|
| (i) Sole power to vote or to direct the vote:   | All Reporting Persons - 0  |
| (ii) Shared power to vote or to direct the vote | Deerfield Capital, L.P. – 1,113,965<br>Deerfield Special Situations Fund, L.P. – 1,113,965<br>Deerfield Management Company, L.P. – 1,557,415<br>Deerfield Special Situations Fund International Limited –<br>1,557,415<br>James E. Flynn – 2,671,380 |

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- (iii) Sole power to dispose or to direct the disposition of
- (iv) Shared power to dispose or to direct the disposition of

All Reporting Persons - 0  
Deerfield Capital, L.P. – 1,113,965  
Deerfield Special Situations Fund, L.P. – 1,113,965  
Deerfield Management Company, L.P. – 1,557,415  
Deerfield Special Situations Fund International Limited  
– 1,557,415  
James E. Flynn – 2,671,380

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\*\*See footnotes on cover pages which are incorporated by reference herein.

Item 5. Ownership of Five Percent or Less of a Class.

If this statement is being filed to report the fact that as of the date hereof the reporting person has ceased to be the beneficial owner of more than five percent of the class of securities check the following .

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Item 6. Ownership of More Than Five Percent on Behalf of Another Person.

If any other person is known to have the right to receive or the power to direct the receipt of dividends from, or the proceeds from the sale of, such securities, a statement to that effect should be included in response to this item and, if such interest relates to more than five percent of the class, such person should be identified. A listing of the shareholders of an investment company registered under the Investment Company Act of 1940 or the beneficiaries of employee benefit plan, pension fund or endowment fund is not required.

N/A

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

If a parent holding company or Control person has filed this schedule, pursuant to Rule 13d-1(b)(1)(ii)(G), so indicate under Item 3(g) and attach an exhibit stating the identity and the Item 3 classification of the relevant subsidiary. If a parent holding company or control person has filed this schedule pursuant to Rule 13d-1(c) or Rule 13d-1(d), attach an exhibit stating the identification of the relevant subsidiary.

N/A

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

If a group has filed this schedule pursuant to ss.240.13d-1(b)(1)(ii)(J), so indicate under Item 3(j) and attach an exhibit stating the identity and Item 3 classification of each member of the group. If a group has filed this schedule pursuant to ss.240.13d-1(c) or ss.240.13d-1(d), attach an exhibit stating the identity of each member of the group.

See Exhibit B

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Item 9. Notice of Dissolution of Group.

Notice of dissolution of a group may be furnished as an exhibit stating the date of the dissolution and that all further filings with respect to transactions in the security reported on will be filed, if required, by members of the group, in their individual capacity. See Item 5.

N/A

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Item 10. Certifications.

"By signing below I 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, other than activities solely in connection with a nomination under §240.14a-11."

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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.

DEERFIELD CAPITAL, L.P.

By: J.E. Flynn Capital LLC, General Partner

By: /s/ Darren Levine  
Darren Levine, Attorney-In-Fact

DEERFIELD SPECIAL SITUATIONS FUND, L.P.

By: Deerfield Capital, L.P., General Partner

By: J.E. Flynn Capital LLC, General Partner

By: /s/ Darren Levine  
Darren Levine, Attorney-In-Fact

DEERFIELD MANAGEMENT COMPANY, L.P.

By: Flynn Management LLC, General Partner

By: /s/ Darren Levine  
Darren Levine, Attorney-In-Fact

DEERFIELD SPECIAL SITUATIONS FUND INTERNATIONAL LIMITED

By: /s/ Darren Levine  
Darren Levine, Attorney-In-Fact

JAMES E. FLYNN

/s/ Darren Levine  
Darren Levine, Attorney-In-Fact

Date: June 7, 2012

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Exhibit List

Exhibit A. Joint Filing Agreement.

Exhibit B. Item 8 Statement.

Exhibit C. (1) Power of Attorney.

(1) Previously filed as Exhibit C to the Schedule 13G for Antares Pharma, Inc. filed with the Commission on February 14, 2012 by Deerfield Capital, L.P., Deerfield Special Situations Fund, L.P., Deerfield Management Company, L.P., Deerfield Special Situations Fund International Limited and James E. Flynn.

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Exhibit A

Agreement

The undersigned agree that this Schedule 13G, and all amendments thereto, relating to the Common Stock of AcclRx Pharmaceuticals, Inc. shall be filed on behalf of the undersigned.

DEERFIELD CAPITAL, L.P.

By: J.E. Flynn Capital LLC, General Partner

By: /s/ Darren Levine  
Darren Levine, Attorney-In-Fact

DEERFIELD SPECIAL SITUATIONS FUND, L.P.

By: Deerfield Capital, L.P., General Partner

By: J.E. Flynn Capital LLC, General Partner

By: /s/ Darren Levine  
Darren Levine, Attorney-In-Fact

DEERFIELD MANAGEMENT COMPANY, L.P.

By: Flynn Management LLC, General Partner

By: /s/ Darren Levine  
Darren Levine, Attorney-In-Fact

DEERFIELD SPECIAL SITUATIONS FUND INTERNATIONAL LIMITED

By: /s/ Darren Levine  
Darren Levine, Attorney-In-Fact

JAMES E. FLYNN

/s/ Darren Levine  
Darren Levine, Attorney-In-Fact

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Exhibit B

Due to the relationships between them, the reporting persons hereunder may be deemed to constitute a “group” with one another for purposes of Section 13(d)(3) of the Securities Exchange Act of 1934.