

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

**FORM S-8
REGISTRATION STATEMENT**
*UNDER
THE SECURITIES ACT OF 1933*

ACELRX PHARMACEUTICALS, INC.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation or organization)

575 Chesapeake Drive
Redwood City, CA 94063
(650) 216-3500
(Address of principal executive offices,
including zip code)

41-2193603
(I.R.S. Employer Identification No.)

2011 Equity Incentive Plan
2011 Employee Stock Purchase Plan
(Full titles of the plans)

Richard A. King
President and Chief Executive Officer
AcelRx Pharmaceuticals, Inc.
575 Chesapeake Drive
Redwood City, CA 94063
(650) 216-3500

(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:
Mark B. Weeks
Cooley LLP
3175 Hanover Street
Palo Alto, California 94304
(650) 843-5000
Facsimile: (650) 849-7400

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act.

Large Accelerated filer

Accelerated filer

Non-accelerated filer (Do not check if a smaller reporting company)

Smaller reporting company

CALCULATION OF REGISTRATION FEE

| Title of Securities to be Registered | Amount to be Registered(1) | Proposed Maximum Offering Price Per Share(2) | Proposed Maximum Aggregate Offering Price(2) | Amount of Registration Fee |
|---|-----------------------------------|---|---|-----------------------------------|
| Common Stock, par value \$0.001 per share | 1,174,066 shares | \$3.44 | \$4,038,787 | \$462.85 |

- (1) Pursuant to Rule 416(a) promulgated under the Securities Act of 1933, as amended (the "Securities Act"), this Registration Statement shall also cover any additional shares of the Registrant's Common Stock that become issuable under the plans set forth herein by reason of any stock dividend, stock split, recapitalization or other similar transaction effected without receipt of consideration that increases the number of outstanding shares of the Registrant's Common Stock.
- (2) Estimated solely for the purpose of calculating the amount of the registration fee pursuant to Rule 457(h) and Rule 457(c) promulgated under the Securities Act. The offering price per share and the aggregate offering price are based upon the average of the high and low prices of the Registrant's Common Stock as reported on the NASDAQ Global Market on March 19, 2012. The chart below details the calculations of the registration fee:

| Securities | Number of Shares | Offering Price Per Share | Aggregate Offering Price |
|---|-------------------------|---------------------------------|---------------------------------|
| Shares reserved for future issuance under the 2011 Equity Incentive Plan | 782,711 | \$3.44 | \$2,692,526 |
| Shares reserved for future issuance under the 2011 Employee Stock Purchase Plan | 391,355 | \$3.44 | \$1,346,261 |
| Proposed Maximum Aggregate Offering Price | | | \$4,038,787 |
| Registration Fee | | | \$462.85 |

EXPLANATORY NOTE

This Registration Statement on Form S-8 is being filed for the purpose of registering an additional (i) 782,711 shares of the common stock of AcclRx Pharmaceuticals, Inc. (the "Registrant") to be issued pursuant to the Registrant's 2011 Equity Incentive Plan and (ii) 391,355 shares of the Registrant's common stock to be issued pursuant to the Registrant's 2011 Employee Stock Purchase Plan.

INCORPORATION BY REFERENCE OF CONTENTS OF REGISTRATION STATEMENT ON FORM S-8

The contents of the Registration Statement on Form S-8 previously filed with the Securities and Exchange Commission on February 24, 2011 (File No. 333-172409) are incorporated by reference herein.

EXHIBITS

| <u>Exhibit Number</u> | <u>Description</u> |
|---------------------------|--|
| 4.1 ⁽¹⁾ | Amended and Restated Certificate of Incorporation of the Registrant. |
| 4.2 ⁽²⁾ | Amended and Restated Bylaws of the Registrant. |
| 4.3 ⁽³⁾ | Specimen Common Stock Certificate of the Registrant. |
| 4.4 ⁽⁴⁾ | Second Amended and Restated Investor's Rights Agreement, among the Registrant and certain of its security holders, dated as of November 23, 2009. |
| 4.5 ⁽⁵⁾ | Warrant to Purchase Stock of the Registrant, issued to Wells Fargo Bank, N.A., dated March 15, 2007. |
| 4.6 ⁽⁶⁾ | Warrant to Purchase Preferred Stock of the Registrant, issued to Pinnacle Ventures II Equity Holdings, L.L.C., dated September 16, 2008. |
| 4.7 ⁽⁷⁾ | Warrant to Purchase Common Stock of the Registrant, issued to Hercules Technology II, L.P., dated as of June 29, 2011. |
| 4.8 ⁽⁸⁾ | Warrant to Purchase Common Stock of the Registrant, issued to Hercules Technology Growth Capital, dated as of June 29, 2011. |
| 5.1 | Opinion of Cooley LLP. |
| 23.1 | Consent of Independent Registered Public Accounting Firm. |
| 23.2 | Consent of Cooley LLP (included in Exhibit 5.1). |
| 24.1 | Power of Attorney. Reference is made to the signature page of this Form S-8. |
| 99.1 ⁽⁹⁾ | 2011 Equity Incentive Plan. |
| 99.2 ⁽¹⁰⁾ | Forms of Stock Option Grant Notice, Stock Option Exercise Notice and Stock Option Agreement under 2011 Equity Incentive Plan. |
| 99.3 ⁽¹¹⁾ | Form of Restricted Stock Unit Award Agreement under 2011 Equity Incentive Plan. |
| 99.4 ⁽¹²⁾ | 2011 Employee Stock Purchase Plan. |
| (1) | Previously filed as Exhibit 3.1 to the Registrant's Current Report on Form 8-K (File No. 000-35068), filed with the Commission on February 18, 2011, and incorporated by reference herein. |
| (2) | Previously filed as Exhibit 3.4 to the Registrant's Registration Statement on Form S-1 (File No. 333-170594), originally filed with the Commission on November 12, 2010, as amended, and incorporated by reference herein. |
| (3) | Previously filed as Exhibit 4.2 to the Registrant's Registration Statement on Form S-1 (File No. 333-170594), originally filed with the Commission on November 12, 2010, as amended, and incorporated by reference herein. |
| (4) | Previously filed as Exhibit 4.3 to the Registrant's Registration Statement on Form S-1 (File No. 333-170594), originally filed with the Commission on November 12, 2010, as amended, and incorporated by reference herein. |
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- (6) Previously filed as Exhibit 4.5 to the Registrant's Registration Statement on Form S-1 (File No. 333-170594), originally filed with the Commission on November 12, 2010, as amended, and incorporated by reference herein.
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 - (9) Previously filed as Exhibit 99.3 to the Registrant's Registration Statement on Form S-8 (File No. 333-172409), originally filed with the Commission on February 24, 2011, and incorporated by reference herein.
 - (10) Previously filed as Exhibit 10.5 to the Registrant's Annual Report on Form 10-K (File No. 001-35068), originally filed with the Commission on March 30, 2011, and incorporated by reference herein.
 - (11) Previously filed as Exhibit 10.6 to the Registrant's Annual Report on Form 10-K (File No. 001-35068), originally filed with the Commission on March 30, 2011, and incorporated by reference herein.
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SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, as amended, the Registrant certifies that it has reasonable grounds to believe that it meets all of the requirements for filing on Form S-8 and has duly caused this Registration Statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Redwood City, State of California, on this 23rd day of March, 2012.

ACELRX PHARMACEUTICALS, INC.

By: /s/ RICHARD A. KING
Richard A. King
President and Chief Executive Officer

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints **RICHARD A. KING** and **JAMES H. WELCH**, jointly and severally, as his true and lawful attorneys-in-fact and agent, with full power of substitution and resubstitution, for him and in his name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this Registration Statement on Form S-8, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or any of them, or their or his substitutes or substitute, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, as amended, this Registration Statement has been signed by the following persons in the capacities and on the dates indicated.

| <u>Signature</u> | <u>Title</u> | <u>Date</u> |
|---|---|----------------|
| <u>/s/ RICHARD A. KING</u> RICHARD A. KING | President, Chief Executive Officer and Director <i>(Principal Executive Officer)</i> | March 23, 2012 |
| <u>/s/ JAMES H. WELCH</u> JAMES H. WELCH | Chief Financial Officer <i>(Principal Financial and Accounting Officer)</i> | March 23, 2012 |
| <u>/s/ THOMAS A. SCHRECK</u> THOMAS A. SCHRECK | Chairman of the Board of Directors and Co-Founder | March 23, 2012 |
| <u>/s/ PAMELA P. PALMER, M.D., PH.D.</u> PAMELA P. PALMER, M.D., PH.D. | Director | March 23, 2012 |
| <u>/s/ STEPHEN J. HOFFMAN, PH.D., M.D.</u> STEPHEN J. HOFFMAN, PH.D., M.D. | Director | March 23, 2012 |
| <u>/s/ GUY P. NOHRA</u> GUY P. NOHRA | Director | March 23, 2012 |
| <u>/s/ HOWARD B. ROSEN</u> HOWARD B. ROSEN | Director | March 23, 2012 |
| <u>/s/ MARK WAN</u> MARK WAN | Director | March 23, 2012 |
| <u>/s/ MARK EDWARDS</u> MARK EDWARDS | Director | March 23, 2012 |

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March 23, 2012

AcelRx Pharmaceuticals, Inc.
575 Chesapeake Drive
Redwood City, CA 94063

Ladies and Gentlemen:

You have requested our opinion with respect to certain matters in connection with the filing by AcelRx Pharmaceuticals, Inc., a Delaware corporation (the "**Company**"), of a Registration Statement on Form S-8 (the "**Registration Statement**") with the Securities and Exchange Commission covering the offering of up to an aggregate of 1,174,066 shares of the Company's Common Stock, par value \$0.001 per share, consisting of (i) 782,711 shares (the "**2011 EIP Shares**") pursuant to the Company's 2011 Equity Incentive Plan (the "**2011 EIP**") and (ii) 391,355 shares (the "**2011 ESPP Shares**") pursuant to the Company's 2011 Employee Stock Purchase Plan (the "**2011 ESPP**", and together with the 2011 EIP, the "**Plans**").

In connection with this opinion, we have examined and relied upon (a) the Registration Statement and related prospectuses, (b) the Plans, (c) the Company's Amended and Restated Certificate of Incorporation and Amended and Restated Bylaws, each as currently in effect, and (d) such other documents, records, certificates, memoranda and other instruments as in our judgment are necessary or appropriate to enable us to render the opinion expressed below. We have assumed the genuineness and authenticity of all documents submitted to us as originals, the conformity to originals of all documents submitted to us as copies thereof, and the due execution and delivery of all documents where due execution and delivery are a prerequisite to the effectiveness thereof.

As to certain factual matters, we have relied upon a certificate of officers of the Company and have not sought to independently verify such matters. Our opinion is expressed only with respect to the General Corporation Law of the State of Delaware.

On the basis of the foregoing, and in reliance thereon, we are of the opinion that the 2011 EIP Shares and the 2011 ESPP Shares, when sold and issued in accordance with the 2011 EIP and the 2011 ESPP, respectively, and the Registration Statement and applicable related prospectus, will be validly issued, fully paid, and nonassessable (except as to shares issued pursuant to certain deferred payment arrangements, which will be fully paid and nonassessable when such deferred payments are made in full).

We consent to the filing of this opinion as an exhibit to the Registration Statement.

Sincerely,

Cooley LLP

By: /s/ Mark B. Weeks
Mark B. Weeks

FIVE PALO ALTO SQUARE, 3000 EL CAMINO REAL, PALO ALTO, CA 94306-2155 T: (650) 843-5000 F: (650) 849-7400 WWW.COOLEY.COM

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in the Registration Statement (Form S-8) pertaining to the 2011 Equity Incentive Plan and 2011 Employee Stock Purchase Plan of AcelRx Pharmaceuticals, Inc. of our report dated March 23, 2012, with respect to the financial statements of AcelRx Pharmaceuticals, Inc. included in its Annual Report (Form 10-K) for the year ended December 31, 2011 filed with the Securities and Exchange Commission.

/s/ Ernst & Young LLP

Redwood City, California
March 23, 2012