

Prospectus



Common Stock

In accordance with the terms of our existing Controlled Equity OfferingSM Sales Agreement or the sales agreement, with Cantor Fitzgerald & Co., or Cantor, we may offer and sell shares of our common stock from time to time through Cantor, acting as agent, having an aggregate offering price of up to \$40,000,000. As of the date of this prospectus, we had not sold any shares of our common pursuant to the sales agreement and a prior prospectus and related prospectus supplements. Accordingly, we may offer and sell shares of our common stock having an aggregate offering price of up to \$40,000,000 pursuant to this prospectus.

Our common stock is listed on The NASDAQ Global Market under the symbol "ACRX." The last reported sale price of our common stock on The NASDAQ Global Market on May 31, 2017 was \$2.50 per share.

Sales of our common stock, if any, under this prospectus may be made in sales deemed to be "at the market offerings" as defined in Rule 415 promulgated under the Securities Act of 1933, as amended, including sales made directly on or through The NASDAQ Global Market, the existing trading market for our common stock or any other existing trading market for our common stock. Cantor will act as sales agent on a best efforts basis and use commercially reasonable efforts to sell on our behalf all of the shares of common stock requested to be sold by us, consistent with its normal trading and sales practices, on mutually agreed terms between Cantor and us. There is no arrangement for funds to be received in any escrow, trust or similar arrangement.

Cantor will be entitled to compensation under the terms of the sales agreement at a fixed commission rate of up to 3.0% of the gross sales price per share sold. In connection with the sale of the common stock on our behalf, Cantor will be deemed to be an "underwriter" within the meaning of the Securities Act and the compensation of Cantor will be deemed to be underwriting commissions or discounts. We have also agreed to provide indemnification and contribution to Cantor against certain civil liabilities, including liabilities under the Securities Act.

Investing in our common stock involves a high degree of risk. Please read the information contained in and incorporated by reference under the heading "Risk Factors" on page 3 of this prospectus, and under similar headings in the other documents that are filed after the date hereof and incorporated by reference into this prospectus.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.



The date of this prospectus is June 14, 2017.

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ABOUT THIS PROSPECTUS

This prospectus relates to the offering of our common stock. Before buying any of the common stock that we are offering, we urge you to carefully read this prospectus, together with the information incorporated by reference as described under the headings “Where You Can Find More Information” and “Incorporation of Certain Information by Reference” in this prospectus. These documents contain important information that you should consider when making your investment decision.

This prospectus describes the specific terms of the common stock we are offering and also adds to, and updates information contained in the documents incorporated by reference into this prospectus. To the extent there is a conflict between the information contained in this prospectus, on the one hand, and the information contained in any document incorporated by reference into this prospectus that was filed with the Securities and Exchange Commission, or SEC, before the date of this prospectus, on the other hand, you should rely on the information in this prospectus. If any statement in one of these documents is inconsistent with a statement in another document having a later date—for example, a document incorporated by reference into this prospectus—the statement in the document having the later date modifies or supersedes the earlier statement.

You should rely only on the information contained in, or incorporated by reference into, this prospectus and in any free writing prospectus that we may authorize for use in connection with this offering. We have not, and Cantor has not, authorized any other person to provide you with different information. If anyone provides you with different or inconsistent information, you should not rely on it. We are not, and Cantor is not, making an offer to sell or soliciting an offer to buy our common stock in any jurisdiction in which an offer or solicitation is not authorized or in which the person making that offer or solicitation is not qualified to do so or to anyone to whom it is unlawful to make an offer or solicitation. You should assume that the information appearing in this prospectus, the documents incorporated by reference into this prospectus, and in any free writing prospectus that we may authorize for use in connection with this offering, is accurate only as of the date of those respective documents. Our business, financial condition, results of operations and prospects may have changed since those dates. You should read this prospectus, the documents incorporated by reference into this prospectus, and any free writing prospectus that we may authorize for use in connection with this offering, in their entirety before making an investment decision. You should also read and consider the information in the documents to which we have referred you in the sections of this prospectus entitled “Where You Can Find More Information” and “Incorporation of Certain Information by Reference.”

PROSPECTUS SUMMARY

This summary highlights certain information about us, this offering and selected information contained elsewhere in or incorporated by reference into this prospectus. This summary is not complete and does not contain all of the information that you should consider before deciding whether to invest in our common stock. For a more complete understanding of our company and this offering, we encourage you to read and consider carefully the more detailed information in this prospectus, including the information incorporated by reference into this prospectus, and the information included in any free writing prospectus that we may authorize for use in connection with this offering, including the information referred to under the heading "Risk Factors" in this prospectus on page 3 and in the documents incorporated by reference into this prospectus.

Overview

We are a specialty pharmaceutical company focused on the development and commercialization of innovative therapies for the treatment of acute pain. Our lead product candidate, DSUVIA™ (known as ARX-04 outside of the United States), and our follow-on product candidate, ZALVISO®, utilize sublingual sufentanil, delivered via a non-invasive route of sublingual administration. We anticipate developing a distribution capability and commercial organization to market and sell DSUVIA in the United States by ourselves, and potentially, in certain European Economic Area, or EEA, countries with strategic partners. In geographies where we decide not to commercialize ourselves, we may seek to out-license commercialization rights. We intend to seek regulatory approval for ZALVISO in the United States and, if successful, potentially promote ZALVISO as a follow-on product to DSUVIA, either by ourselves or with strategic partners.

We have chosen sufentanil as the therapeutic ingredient for our current product candidates. Opioids have been utilized for pain relief for centuries and are the standard-of-care for the treatment of moderate-to-severe acute pain. Sufentanil is available as an injectable in several markets around the world and is used by anesthesiologists for induction of sedation or as an epidural; however, the injectable formulation is not suitable for the treatment of acute pain. We have created a proprietary sublingual (under the tongue) formulation of sufentanil intended for the treatment of moderate-to-severe acute pain. The sublingual formulation retains the therapeutic value of sufentanil and novel delivery devices provide a non-invasive route of administration. Sufentanil is highly lipophilic which provides for rapid absorption in the mucosal tissue, or fatty cells, found under the tongue, and for rapid transit across the blood-brain barrier to reach the mu-opioid receptors in the brain. The sublingual route of delivery used by DSUVIA and ZALVISO provides a recognized onset of analgesia. The sublingual delivery system also eliminates the risk of intravenous, or IV, complications, such as catheter-related infections. In addition, because patients do not require direct connection to an IV infusion pump, or IV line, DSUVIA and ZALVISO may allow for ease of patient mobility.

Company Information

We were originally incorporated as SuRx Pharmaceuticals, Inc. in Delaware on July 13, 2005. We subsequently changed our name to AcelRx Pharmaceuticals, Inc. on August 13, 2006.

Our corporate address is 351 Galveston Drive, Redwood City, California 94063, and our telephone number is (650) 216-3500. Our website address is www.acelrx.com. Information found on, or accessible through, our website is not a part of, and is not incorporated into, this prospectus supplement, and you should not consider it part of this prospectus supplement or the accompanying prospectus. Our website address is included in this document as an inactive textual reference only.

Unless the context indicates otherwise, as used in this prospectus, the terms "AcelRx," "AcelRx Pharmaceuticals, Inc.," "we," "us" and "our" refer to AcelRx Pharmaceuticals, Inc., a Delaware corporation, and its wholly-owned subsidiary.

The Offering**Common stock offered by us pursuant to this prospectus**

Shares of common stock having an aggregate offering price of up to \$40,000,000.

Manner of offering

“At the market offering” that may be made from time to time through our agent, Cantor. See “Plan of Distribution” on page 9 of this prospectus.

Use of proceeds

We intend to use the net proceeds from this offering, if any, for working capital and general corporate purposes, including commercialization activities, research and development expenses and general and administrative expenses, for making scheduled payments under our debt facility and capital expenditures. See “Use of Proceeds” on page 5 of this prospectus.

NASDAQ Global Market listing

ACRX

Risk factors

Investing in our common stock involves a high degree of risk. Please read the information contained in and incorporated by reference under the heading “Risk Factors” on page 3 of this prospectus and under similar headings in the other documents that are filed after the date hereof and incorporated by reference into this prospectus, together with the other information included in or incorporated by reference into this prospectus, before deciding whether to invest in our common stock.

RISK FACTORS

You should consider carefully the risks described below and discussed under the section captioned "Risk Factors" contained in our annual report on Form 10-K for the year ended December 31, 2016, and in our subsequent quarterly reports on Form 10-Q as updated by our subsequent filings under the Securities Exchange Act of 1934, as amended, or the Exchange Act, each of which is incorporated by reference in this prospectus in their entirety, together with other information in this prospectus, and the information and documents incorporated by reference in this prospectus, and any free writing prospectus that we have authorized for use in connection with this offering before you make a decision to invest in our common stock. If any of the following events actually occur, our business, operating results, prospects or financial condition could be materially and adversely affected. This could cause the trading price of our common stock to decline and you may lose all or part of your investment. The risks below and incorporated by reference in this prospectus are not the only ones we face. Additional risks not currently known to us or that we currently deem immaterial may also affect our business operations. Please also read carefully the section below entitled "Forward-Looking Statements."

Additional Risks Relating To The Offering

Management will have broad discretion as to the use of the proceeds from this offering, and may not use the proceeds effectively.

Because we have not designated the amount of net proceeds from this offering to be used for any particular purpose, our management will have broad discretion as to the application of the net proceeds from this offering and could use them for purposes other than those contemplated at the time of the offering. Our management may use the net proceeds for corporate purposes that may not improve our financial condition or market value.

You may experience immediate and substantial dilution.

The offering price per share in this offering may exceed the net tangible book value per share of our common stock outstanding prior to this offering. Assuming that an aggregate of 16,000,000 shares of our common stock are sold at a price of \$2.50 per share pursuant to this prospectus, which was the last reported sale price of our common stock on The NASDAQ Global Market on May 31, 2017, for aggregate gross proceeds of \$40.0 million, after deducting commissions and estimated aggregate offering expenses payable by us, you would experience immediate dilution of \$2.19 per share, representing the difference between our as adjusted net tangible book value per share as of March 31, 2017, after giving effect to this offering and the assumed offering price. The exercise of outstanding stock options and warrants may result in further dilution of your investment. See the section entitled "Dilution" below for a more detailed illustration of the dilution you would incur if you participate in this offering.

You may experience future dilution as a result of future equity offerings.

In order to raise additional capital, we may in the future offer additional shares of our common stock or other securities convertible into or exchangeable for our common stock at prices that may not be the same as the price per share paid by any investor in this offering. We may sell shares or other securities in any other offering at a price per share that is less than the price per share paid by investors in this offering, and investors purchasing shares or other securities in the future could have rights superior to existing stockholders. The price per share at which we sell additional shares of our common stock, or securities convertible or exchangeable into common stock, in future transactions may be higher or lower than the price per share paid by investors in this offering.

We do not intend to pay dividends in the foreseeable future.

We have never paid cash dividends on our common stock and currently do not plan to pay any cash dividends in the foreseeable future. In addition, our credit facility prohibits us from paying dividends and making other cash distributions.

FORWARD-LOOKING STATEMENTS

This prospectus, the documents we have filed with the SEC that are incorporated by reference and any free writing prospectus that we have authorized for use in connection with this offering contain “forward-looking statements” within the meaning of Section 27A of the Securities Act of 1933, as amended, or the Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or the Exchange Act. These statements relate to future events or to our future operating or financial performance and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performances or achievements expressed or implied by the forward-looking statements. Forward-looking statements may include, but are not limited to, statements about:

- our ability to obtain, without delays, and maintain regulatory approval of DSUVIA™ (sufentanil sublingual tablet, 30 mcg), formerly known as ARX-04 in the United States, and any related restrictions, limitations, and/or warnings in the label of an approved product candidate;
- our ability to obtain, without delays, and maintain regulatory approval of ARX-04 (sufentanil sublingual tablet, 30 mcg) in the European Union, and any related restrictions, limitations, and/or warnings in the label of an approved product candidate;
- the success, cost and timing of our product development activities and clinical trials, including the additional clinical study, IAP312, for ZALVISO® (sufentanil sublingual tablet system);
- our ability to successfully execute the pathway towards a resubmission of the ZALVISO New Drug Application, or NDA, including our ability to satisfactorily conduct the clinical study, IAP312, requested by the U.S. Food and Drug Administration, or FDA, and any additional studies or activities that may be required by the FDA in order to resubmit the ZALVISO NDA, and subsequently obtain, without further delays, and maintain regulatory approval of ZALVISO in the United States and any related restrictions, limitations, and/or warnings in the label of an approved product candidate;
- our ability to manufacture and supply ZALVISO to Grünenthal GmbH, or Grünenthal, in accordance with their forecast and the Manufacture and Supply Agreement with Grünenthal;
- the outcome of any potential FDA Advisory Committee meetings held for any of our product candidates;
- the status of the Collaboration and License Agreement with Grünenthal or any other future potential collaborations, including potential milestones and royalty payments under the Grünenthal agreement and obligations under the Purchase and Sale Agreement with PDL BioPharma, Inc., or PDL;
- our plans to research, develop and commercialize our product candidates;
- our ability to attract additional collaborators with development, regulatory and commercialization expertise;
- our ability to successfully retain our key scientific, engineering, medical or management personnel and hire new personnel as needed;
- the size and growth potential of the markets for our product candidates, and our ability to serve those markets;
- our ability to successfully commercialize our product candidates;
- the rate and degree of market acceptance of our product candidates;
- our ability to develop sales and marketing capabilities in a timely fashion, whether alone through recruiting qualified employees, by engaging a contract sales organization, or with potential future collaborators;
- our ability to manufacture and supply DSUVIA, if approved, in support of any potential U.S. commercial launch;

- our ability to obtain adequate government or third-party payor reimbursement;
- regulatory developments in the United States and foreign countries;
- the performance of our third party suppliers and manufacturers;
- the success of competing therapies that are or become available;
- the accuracy of our estimates regarding expenses, future revenues, capital requirements and needs for additional financing;
- our liquidity and capital resources; and
- our ability to obtain and maintain intellectual property protection for our product candidates.

In some cases, you can identify forward-looking statements by terms such as “may,” “will,” “should,” “could,” “would,” “expects,” “plans,” “anticipates,” “believes,” “estimates,” “projects,” “predicts,” “potential” and similar expressions intended to identify forward-looking statements. These statements reflect our current views with respect to future events, are based on assumptions and are subject to risks and uncertainties. Given these uncertainties, you should not place undue reliance on these forward-looking statements. We discuss in greater detail, and incorporate by reference into this prospectus in their entirety, many of these risks under the headings “Risk Factors” on page 3 of this prospectus and in our Quarterly Report on Form 10-Q for the quarter ended March 31, 2017, which is incorporated herein by reference, as may be updated or superseded by the risks and uncertainties described under similar headings in the other documents that are filed after the date hereof and incorporated by reference into this prospectus. Also, these forward-looking statements represent our estimates and assumptions only as of the date of the document containing the applicable statement.

You should read this prospectus, the documents we have filed with the SEC that are incorporated by reference and any free writing prospectus that we have authorized for use in connection with this offering completely and with the understanding that our actual future results may be materially different from what we expect. We qualify all of the forward-looking statements in the foregoing documents by these cautionary statements.

Unless required by law, we undertake no obligation to update or revise any forward-looking statements to reflect new information or future events or developments. Thus, you should not assume that our silence over time means that actual events are bearing out as expressed or implied in such forward-looking statements.

USE OF PROCEEDS

We currently intend to use the net proceeds from this offering, if any, for working capital and general corporate purposes, including commercialization activities, research and development expenses, general and administrative expenses, and capital expenditures. We may use a portion of the proceeds to make scheduled payments of principal and interest on our outstanding loan with Hercules Technology II, L.P., and Hercules Capital, Inc., formally known as Hercules Technology Growth Capital, Inc., collectively referred to as Hercules, under which we may borrow up to \$30.5 million in two tranches and which is scheduled to be fully repaid by March 1, 2020 (which would be extended until September 1, 2020 if we achieve that certain liquidity milestone for the first tranche and March 1, 2021 if we achieve that liquidity milestone and the tranche 2 milestone. The interest rate for each tranche will be calculated at a rate equal to the greater of either (i) 9.55% plus the prime rate as reported from time to time in The Wall Street Journal minus 3.50%, and (ii) 9.55%. If we prepay the loan prior to the maturity date, we will pay Hercules a prepayment charge, based on a percentage of the then outstanding principal balance, equal to 3% if the prepayment occurs prior to March 2, 2018, 2% if the prepayment occurs after March 2, 2018, but prior to March 2, 2019, or 1% if the prepayment occurs after March 2, 2019.

The amounts and timing of our use of the net proceeds from this offering, if any, will depend on a number of factors, such as the timing and progress of our research and development efforts, the timing and progress of any partnering and collaboration efforts and technological advances. As of the date of this prospectus, we cannot specify with certainty all of the particular uses for the net proceeds to us from this offering. Accordingly, our management will have broad discretion in the timing and application of these proceeds. Pending application of the net proceeds as described above, we intend to temporarily invest the proceeds in short-term, interest-bearing instruments.

DIVIDEND POLICY

To date, we have paid no cash dividends to our stockholders, and we do not intend to pay cash dividends in the foreseeable future.

DILUTION

If you invest in this offering, your ownership interest will be diluted to the extent of the difference between the public offering price per share and the as adjusted net tangible book value per share after giving effect to this offering. We calculate net tangible book value per share by dividing the net tangible book value, which is tangible assets less total liabilities, by the number of outstanding shares of our common stock. Dilution represents the difference between the portion of the amount per share paid by purchasers of shares in this offering and the as adjusted net tangible book value per share of our common stock immediately after giving effect to this offering. Our net tangible book value as of March 31, 2017 was approximately \$(19.7) million, or \$(0.43) per share.

After giving effect to the sale of our common stock during the term of the sales agreement with Cantor in the aggregate amount of \$40,000,000 at an assumed offering price of \$2.50 per share, the last reported sale price of our common stock on The NASDAQ Global Market on May 31, 2017, and after deducting commissions and estimated aggregate offering expenses payable by us, our net tangible book value as of March 31, 2017 would have been \$19.0 million, or \$0.31 per share of common stock. This represents an immediate increase in the net tangible book value of \$0.74 per share to our existing stockholders and an immediate dilution in net tangible book value of \$2.19 per share to new investors. The following table illustrates this per share dilution:

Assumed offering price per share		\$	2.50
Net tangible book value per share as of March 31, 2017	\$	(0.43)	
Increase in net tangible book value per share attributable to new investors in offering	\$	0.74	
Pro forma net tangible book value per share after giving effect to the offering	\$	0.31	
Dilution per share to new investors		\$	2.19

The table above assumes for illustrative purposes that an aggregate of 16,000,000 shares of our common stock are sold during the term of the sales agreement with Cantor at a price of \$2.50 per share, the last reported sale price of our common stock on The NASDAQ Global Market on May 31, 2017, for aggregate gross proceeds of \$40,000,000. The shares subject to the sales agreement with Cantor are being sold from time to time at various prices. An increase of \$0.50 per share in the price at which the shares are sold from the assumed offering price of \$2.50 per share shown in the table above, assuming all of our common stock in the aggregate amount of \$40,000,000 under the sales agreement with Cantor is sold at that price, would increase our adjusted net tangible book value per share after the offering to \$0.32 per share and would increase the dilution in net tangible book value per share to new investors in this offering to \$2.68 per share, after deducting commissions and estimated aggregate offering expenses payable by us. A decrease of \$0.50 per share in the price at which the shares are sold from the assumed offering price of \$2.50 per share shown in the table above, assuming all of our common stock in the aggregate amount of \$40,000,000 under the sales agreement with Cantor is sold at that price, would decrease our adjusted net tangible book value per share after the offering to \$0.29 per share and would decrease the dilution in net tangible book value per share to new investors in this offering to \$1.71 per share, after deducting commissions and estimated aggregate offering expenses payable by us. This information is supplied for illustrative purposes only.

The above discussion and table are based on 45,371,351 shares of our common stock issued and outstanding as of March 31, 2017 and excludes the following, all as of March 31, 2017:

- 8,559,217 shares of common stock issuable upon the exercise of outstanding stock options with a weighted-average exercise price of \$4.50 per share;
- 689,186 shares of common stock issuable upon the exercise of outstanding warrants with a weighted-average exercise price of \$3.32 per share; and
- up to an aggregate of 3,435,326 shares of common stock reserved for future issuance under our 2006 Stock Plan, 2011 Equity Incentive Plan and 2011 Employee Stock Purchase Plan.

To the extent that options or warrants outstanding as of March 31, 2017 have been or are exercised, or other shares are issued, investors purchasing shares in this offering could experience further dilution. In addition, we may choose to raise additional capital due to market conditions or strategic considerations, even if we believe we have sufficient funds for our current or future operating plans. To the extent that additional capital is raised through the sale of equity or convertible debt securities, the issuance of these securities could result in further dilution to our stockholders.

PLAN OF DISTRIBUTION

In accordance with the terms of our existing Controlled Equity OfferingSM Sales Agreement with Cantor Fitzgerald & Co., or the sales agreement, we may offer and sell shares of our common stock from time to time through Cantor, acting as agent, having an aggregate offering price of up to \$40,000,000. As of June 5, 2017, we had not sold any shares of our common stock pursuant to the sales agreement and a prior prospectus and related prospectus supplements. Accordingly, we may offer and sell additional shares of our common stock having an aggregate offering price of up to \$40,000,000 pursuant to this prospectus.

Cantor may sell the common stock by any method that is deemed to be an “at the market offering” as defined in Rule 415 promulgated under the Securities Act of 1933, as amended, including sales made directly on or through The NASDAQ Global Market or any other existing trading market for the common stock in the U.S. Cantor may also sell the common stock in negotiated transactions, subject to our prior approval.

Each time we wish to issue and sell common stock under the sales agreement, we will notify Cantor of the number of shares to be issued, the dates on which such sales are anticipated to be made and any minimum price below which sales may not be made. Once we have so instructed Cantor, unless it declines to accept the terms of this notice, Cantor has agreed to use its commercially reasonable efforts consistent with its normal trading and sales practices to sell such shares up to the amount specified on such terms. The obligations of Cantor under the sales agreement to sell our common stock are subject to a number of conditions that we must meet.

The settlement between us and Cantor is generally anticipated to occur on the third trading day following the date on which the sale was made. Sales of our common stock as contemplated in this prospectus will be settled through the facilities of The Depository Trust Company or by such other means as we and Cantor may agree upon. There is no arrangement for funds to be received in an escrow, trust or similar arrangement.

Pursuant to the sales agreement, Cantor will be entitled to a commission equal to an aggregate of up to 3.0% of the gross proceeds we receive from the sales of our common stock. Because there is no minimum offering amount required as a condition to close this offering, the actual total public offering amount, commissions and proceeds to us, if any, are not determinable at this time. In connection with the sale of the common stock on our behalf, Cantor may, and will with respect to sales effected in an “at-the-market-offering,” be deemed to be an “underwriter” within the meaning of the Securities Act and the compensation of each sales agent will be deemed to be underwriting commissions or discounts. We have agreed to provide indemnification and contribution to Cantor with respect to certain civil liabilities, including liabilities under the Securities Act. We estimate that the total expenses for the offering, excluding compensation payable to the Cantor under the terms of the sales agreement, will be approximately \$300,000.

The offering of common stock pursuant to the sales agreement and this prospectus will terminate upon the earlier of (i) the sale of our common stock provided for in this prospectus, or (ii) termination of the sales agreement as permitted therein. Cantor may terminate the sales agreement at any time in certain circumstances, including the occurrence of a material adverse change with respect to us that, in Cantor’s sole judgment, makes it impracticable or inadvisable to market the shares, if there has occurred any material adverse change in the U.S. financial markets or international financial markets, which in Cantor’s sole judgment makes it impracticable to market the shares, if trading in the shares has been suspended or limited by the SEC or The NASDAQ Global Market, or the Exchange, or if trading generally has been suspended or limited by Exchange, if any suspension of trading of any shares of AcelRx on any exchange or over-the-counter market shall have occurred and be continuing, if there is a major disruption of securities settlements or clearance services in the U.S. which shall be continuing, or if a banking moratorium has been declared in the U.S. Federal or New York authorities. We and Cantor may each terminate the sales agreement at any time upon 5 and 10 days prior notice, respectively.

This summary of the material provisions of the sales agreement does not purport to be a complete statement of its terms and conditions. Copies of our Controlled Equity OfferingSM Sales Agreement that we entered into with Cantor in June 2016 are filed with the SEC and are incorporated by reference into the registration statement of which this prospectus is a part. See “Where You Can Find More Information” below.

Cantor and its affiliates may in the future provide various investment banking, commercial banking and other financial services for us and our affiliates, for which services they may in the future receive customary fees. To the extent required by Regulation M under the Exchange Act, Cantor will not engage in any market making activities involving our common stock while the offering is ongoing under this prospectus.

A prospectus in electronic format may be made available on a website maintained by Cantor, and Cantor may distribute the prospectus electronically.

LEGAL MATTERS

Cooley LLP, Palo Alto, California, will pass upon the validity of the common stock offered by this prospectus. Latham & Watkins LLP, San Diego, California, is counsel for Cantor in connection with this offering.

EXPERTS

OUM & Co. LLP, independent registered public accounting firm, has audited our consolidated financial statements as of December 31, 2016 and 2015 and for each of the two years in the period ended December 31, 2016 included in our Annual Report on Form 10-K, as set forth in their report, which is incorporated by reference in this prospectus and elsewhere in the registration statement. Such financial statements are incorporated by reference in reliance on OUM & Co. LLP's report, given on their authority as experts in accounting and auditing.

Ernst & Young LLP, independent registered public accounting firm, has audited our consolidated financial statements for the period ended December 31, 2014 included in our Annual Report on Form 10-K for the year ended December 31, 2016, as set forth in their report, which is incorporated by reference in this prospectus supplement and elsewhere in the registration statement of which this prospectus supplement and the accompanying prospectus form a part. Such financial statements are incorporated by reference in reliance on Ernst & Young LLP's report, given on their authority as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

This prospectus is part of the registration statement on Form S-3 we filed with the SEC under the Securities Act and does not contain all the information set forth in the registration statement. Whenever a reference is made in this prospectus to any of our contracts, agreements or other documents, the reference may not be complete and you should refer to the exhibits that are a part of the registration statement or the exhibits to the reports or other documents incorporated by reference into this prospectus for a copy of such contract, agreement or other document. Because we are subject to the information and reporting requirements of the Exchange Act, we file annual, quarterly and current reports, proxy statements and other information with the SEC. Our SEC filings are available to the public over the Internet at the SEC's website at <http://www.sec.gov>. You may also read and copy any document we file at the SEC's Public Reference Room at 100 F Street, N.E., Washington, D.C. 20549. Please call the SEC at 1-800-SEC-0330 for further information on the operation of the Public Reference Room.

INCORPORATION OF CERTAIN INFORMATION BY REFERENCE

The SEC allows us to "incorporate by reference" information from other documents that we file with it, which means that we can disclose important information to you by referring you to those documents. The information incorporated by reference is considered to be part of this prospectus. Information in this prospectus supersedes information incorporated by reference that we filed with the SEC prior to the date of this prospectus, while information that we file later with the SEC will automatically update and supersede the information in this prospectus. We incorporate by reference into this prospectus and the registration statement of which this prospectus is a part the information or documents listed below that we have filed with the SEC (Commission File No. 001-35068):

- our Annual Report on Form 10-K for the year ended December 31, 2016, which was filed on March 3, 2017;

- the information specifically incorporated by reference into our Annual Report on Form 10-K for the year ended December 31, 2016 from our definitive proxy statement relating to our 2017 annual meeting of stockholders, which was filed on April 28, 2017;
- our Quarterly Report on Form 10-Q for the quarter ended March 31, 2017, which was filed on May 8, 2017;
- our Current Reports on Form 8-K which were filed on January 9, 2017, February 9, 2017, February 16, 2017, March 7, 2017, March 10, 2017, May 10, 2017, June 5, 2017 and June 7, 2017; and
- the description of our common stock in our registration statement on Form 8-A filed with the SEC on February 1, 2011.
- All filings filed by us pursuant to the Exchange Act after the date of the initial filing of the registration statement of which this prospectus is a part and prior to effectiveness of the registration statement shall be deemed to be incorporated by reference into this prospectus.

We also incorporate by reference any future filings (other than current reports furnished under Item 2.02 or Item 7.01 of Form 8-K and exhibits filed on such form that are related to such items unless such Form 8-K expressly provides to the contrary) made with the SEC pursuant to Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act, including those made after the date of the initial filing of the registration statement of which this prospectus is a part and prior to effectiveness of such registration statement, until we file a post-effective amendment that indicates the termination of the offering of the securities made by this prospectus and will become a part of this prospectus from the date that such documents are filed with the SEC. Information in such future filings updates and supplements the information provided in this prospectus. Any statements in any such future filings will automatically be deemed to modify and supersede any information in any document we previously filed with the SEC that is incorporated or deemed to be incorporated herein by reference to the extent that statements in the later filed document modify or replace such earlier statements.

You can request a copy of these filings, at no cost, by writing or telephoning us at the following address or telephone number:

AcelRx Pharmaceuticals, Inc.
351 Galveston Drive
Redwood City, CA 94063
(650) 216-3500
Attn: Secretary



Up to \$40,000,000 of Shares

Common Stock

PROSPECTUS



June 14, 2017
