

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**

Washington, D.C. 20549

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

X4 Pharmaceuticals, Inc.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation or organization)
955 Massachusetts Avenue, 4th Floor
Cambridge, Massachusetts
(Address of Principal Executive Offices)

27-3181608
(I.R.S. Employer
Identification No.)

02139
(Zip Code)

X4 Pharmaceuticals, Inc. 2019 Inducement Equity Incentive Plan
(Full title of the plan)

Paula Ragan, Ph.D.
President and Chief Executive Officer
X4 Pharmaceuticals, Inc.
955 Massachusetts Avenue, 4th Floor
Cambridge, Massachusetts 02139
(857) 529-8300

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

Copy to:

Daniel I. Goldberg
Richard C. Segal
Courtney T. Thorne
Cooley LLP
55 Hudson Yards
New York, NY 10001-2157
(212) 479 6000

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

Large accelerated filer Accelerated filer
Non-accelerated filer Smaller reporting company
Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 7(a)(2)(B) of the Securities Act.

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, \$0.001 par value per share	150,000 shares	\$11.10	\$1,665,000	\$201.80

- (1) X4 Pharmaceuticals, Inc. (the "Registrant") is filing this Registration Statement to register 150,000 shares of common stock, \$0.001 par value per share (the "Common Stock"), of the Registrant for issuance under the X4 Pharmaceuticals, Inc. 2019 Inducement Equity Incentive Plan (the "Inducement Plan"). The maximum number of shares which may be sold upon the exercise of options or issuance of other stock-based awards granted under the Inducement Plan is subject to adjustment in accordance with certain anti-dilution and other provisions of the Inducement Plan. Accordingly, pursuant to Rule 416 under the Securities Act of 1933, as amended (the "Securities Act"), this Registration Statement covers, in addition to the number of shares stated above, an indeterminate number of shares which may be subject to grant or otherwise issuable after the operation of any such anti-dilution and other provisions.
- (2) This calculation is made solely for the purpose of determining the registration fee pursuant to the provisions of Rule 457(c) and (h) under the Securities Act. The offering price per share and the aggregate offering price for shares reserved for future grant or issuance under the Inducement Plan are based on the average of the high and low sale prices per share of the Common Stock as reported on The Nasdaq Capital Market as of a date (August 5, 2019) within five business days prior to filing this Registration Statement.

PART I

INFORMATION REQUIRED IN THE SECTION 10(a) PROSPECTUS

In accordance with the instructional Note to Part I of Form S-8 as promulgated by the Securities and Exchange Commission (the "Commission"), the information specified by Part I of Form S-8 has been omitted from this Registration Statement on Form S-8 for offers of Common Stock pursuant to the Inducement Plan. The documents containing the information specified in Part I will be delivered to the participants in the Inducement Plan covered by this Registration Statement as required by Rule 428(b)(1) under the Securities Act.

PART II

INFORMATION REQUIRED IN THE REGISTRATION STATEMENT

Item 3. Incorporation of Documents by Reference.

The following documents filed by the Registrant with the Commission are incorporated herein by reference:

- (a) the Registrant's Annual Report on [Form 10-K](#) (File No. 001-38295) for the fiscal year ended December 31, 2018 filed with the Commission on March 11, 2019;
- (b) the portions of the Registrant's definitive proxy statement on [Schedule 14A](#) filed on May 22, 2019 that are deemed "filed" with the Commission under the Securities Exchange Act of 1934, as amended (the "Exchange Act");
- (c) The Registrant's Quarterly Report on Form 10-Q for the fiscal quarter ended March 31, 2019 filed with the SEC on [May 15, 2019](#) and our Quarterly Report on Form 10-Q for the fiscal quarter ended June 30, 2019 filed with the Commission on [August 7, 2019](#);
- (d) The Registrant's Current Reports on Form 8-K filed with the Commission on [January 16, 2019](#); [February 8, 2019](#); [March 1, 2019](#); [March 8, 2019](#); [March 13, 2019](#) (as amended on [April 3, 2019](#) and [May 13, 2019](#)); [April 1, 2019](#); [April 2, 2019](#) (as amended on [May 17, 2019](#)); [April 11, 2019](#); [April 12, 2019](#); [April 15, 2019](#); [June 19, 2019](#); [June 26, 2019](#), [June 28, 2019](#) and [August 9, 2019](#) (in each case, except for information contained therein which is furnished rather than filed); and
- (e) the description of the Registrant's Common Stock which is contained in the Registrant's registration statement on [Form 8-A](#) (File No. 001-38295), filed with the Commission on November 15, 2017, including any amendment or report filed for the purpose of updating such description.

All reports and other documents filed by the Registrant after the date hereof pursuant to Sections 13(a), 13(c), 14 and 15(d) of the Exchange Act prior to the filing of a post-effective amendment which indicates that all securities offered hereby have been sold or which deregisters all securities then remaining unsold, shall be deemed to be incorporated by reference herein and to be part hereof from the date of filing of such reports and documents.

Item 4. Description of Securities.

Not applicable.

Item 5. Interests of Named Experts and Counsel.

None.

Item 6. Indemnification of Directors and Officers.

Subsection (a) of Section 145 of the General Corporation Law of the State of Delaware ("DGCL"), empowers a corporation to indemnify any person who was or is a party or who is threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative (other than an action by or in the right of the corporation) by reason of the fact that the person is or was a director, officer, employee or agent of the corporation, or is or was serving at the request of the corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise, against expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by the person in connection with such action, suit or proceeding if the person acted in good faith and in a manner the person reasonably believed to be in or not opposed to the best interests of the corporation, and, with respect to any criminal action or proceeding, had no reasonable cause to believe the person's conduct was unlawful.

Subsection (b) of Section 145 empowers a corporation to indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action or suit by or in the right of the corporation to procure a judgment in its favor by reason of the fact that the person acted in any of the capacities set forth above, against expenses (including attorneys' fees) actually and reasonably incurred by the person in connection with the defense or settlement of such action or suit if the person acted in good faith and in a manner the person reasonably believed to be in or not opposed to the best interests of the corporation, except that no indemnification shall be made in respect of any claim, issue or matter as to which such person shall have been adjudged to be liable to the corporation unless and only to the extent that the Court of Chancery or the court in which such action or suit was brought shall determine upon application that, despite the adjudication of liability but in view of all the circumstances of the case, such person is fairly and reasonably entitled to indemnity for such expenses which the Court of Chancery or such other court shall deem proper.

Section 145 further provides that to the extent a director or officer of a corporation has been successful on the merits or otherwise in the defense of any action, suit or proceeding referred to in subsections (a) and (b) of Section 145, or in defense of any claim, issue or matter therein, such person shall be indemnified against expenses (including attorneys' fees) actually and reasonably incurred by such person in connection therewith; that indemnification provided for by Section 145 shall not be deemed exclusive of any other rights to which the indemnified party may be entitled; and the indemnification provided for by Section 145 shall, unless otherwise provided

when authorized or ratified, continue as to a person who has ceased to be a director, officer, employee or agent and shall inure to the benefit of such person's heirs, executors and administrators. Section 145 also empowers the corporation to purchase and maintain insurance on behalf of any person who is or was a director, officer, employee or agent of the corporation, or is or was serving at the request of the corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise against any liability asserted against such person and incurred by such person in any such capacity, or arising out of his status as such, whether or not the corporation would have the power to indemnify such person against such liabilities under Section 145.

Section 102(b)(7) of the DGCL provides that a corporation's certificate of incorporation may contain a provision eliminating or limiting the personal liability of a director to the corporation or its stockholders for monetary damages for breach of fiduciary duty as a director, provided that such provision shall not eliminate or limit the liability of a director (i) for any breach of the director's duty of loyalty to the corporation or its stockholders, (ii) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (iii) under Section 174 of the DGCL or (iv) for any transaction from which the director derived an improper personal benefit.

The restated certificate of incorporation of the Registrant, as amended, provides that the Registrant will indemnify each person who was or is a party or threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative (other than an action by or in the right of the Registrant), by reason of the fact that he or she is or was, or has agreed to become, the Registrant's director or officer, or is or was serving, or has agreed to serve, at the Registrant's request as a director, officer, partner, employee or trustee of, or in a similar capacity with, another corporation, partnership, joint venture, trust or other enterprise (all such persons being referred to as an Indemnitee), or by reason of any action alleged to have been taken or omitted in such capacity, against all expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred in connection with such action, suit or proceeding and any appeal therefrom if such Indemnitee acted in good faith and in a manner he or she reasonably believed to be in, or not opposed to, the Registrant's best interests, and, with respect to any criminal action or proceeding, he or she had no reasonable cause to believe his or her conduct was unlawful.

The Registrant's restated certificate of incorporation, as amended, also provides that the Registrant will indemnify any Indemnitee who was or is a party to an action or suit by or in the right of the Registrant to procure a judgment in the Registrant's favor by reason of the fact that the Indemnitee is or was, or has agreed to become, the Registrant's director or officer, or is or was serving, or has agreed to serve, at the Registrant's request as a director, officer, partner, employee or trustee of, or in a similar capacity with, another corporation, partnership, joint venture, trust or other enterprise, or by reason of any action alleged to have been taken or omitted in such capacity, against all expenses (including attorneys' fees) and, to the extent permitted by law, amounts paid in settlement actually and reasonably incurred in connection with such action, suit or proceeding and any appeal therefrom, if the Indemnitee acted in good faith and in a manner he or she reasonably believed to be in, or not opposed to, the Registrant's best interests, except that no indemnification shall be made with respect to any claim, issue or matter as to which such person shall have been adjudged to be liable to the Registrant, unless a court determines that, despite such adjudication but in view of all of the circumstances, he or she is entitled to indemnification of such expenses. Notwithstanding the foregoing, to the extent that any Indemnitee has been successful, on the merits or otherwise, he or she will be indemnified by the Registrant against all expenses (including attorneys' fees) actually and reasonably incurred by him or her or on his or her behalf in connection therewith. If the Registrant does not assume the defense, expenses must be advanced to an Indemnitee under certain circumstances. Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, executive officers or persons controlling the Registrant, in the opinion of the Commission, such indemnification is against public policy as expressed in the Securities Act and is therefore unenforceable.

The Registrant has indemnification agreements with its directors and executive officers, in addition to the indemnification provided for in its restated certificate of incorporation, as amended, and intends to enter into indemnification agreements with any new directors and executive officers in the future.

The Registrant has purchased and intends to maintain insurance on behalf of any person who is or was a director or officer of the Registrant against any loss arising from any claim asserted against him or her and incurred by him or her in any such capacity, subject to certain exclusions.

In addition, under the terms of the Agreement and Plan of Merger, dated November 26, 2018, as amended, by and among the Registrant, Artemis AC Corp., a wholly owned subsidiary of the Registrant ("Merger Sub"), and X4 Therapeutics, Inc., formerly known as X4 Pharmaceuticals, Inc. ("X4") (the "Merger Agreement"), pursuant to which Merger Sub merged with and into X4, with X4 surviving as a wholly owned subsidiary of the Registrant (the "Merger"), which occurred on March 13, 2019, and subject to applicable law, from the effective time (the "Effective Time") of the Merger through the sixth anniversary of the date on which the Effective Time occurs, each of the Registrant and the corporation surviving the Merger between X4 and Merger Sub (the "Surviving Corporation") will, jointly and severally, indemnify and hold harmless each person who is was, as of November 26, 2018, or has been at any time prior to such date, or who becomes prior to the Effective Time, a director or officer of the Registrant, X4 or any of their respective subsidiaries, against all claims, losses, liabilities, damages, judgments, fines and reasonable fees, costs and expenses, including attorneys' fees and disbursements, incurred in connection with any claim, action, suit, proceeding or investigation, whether civil, criminal, administrative or investigative, arising out of or pertaining to the fact that such person is or was a director, officer, employee or agent of the Registrant, X4, or any of their respective subsidiaries (or, while a director or officer of the Registrant, X4 or any of their respective subsidiaries, is or was serving at the request of the Registrant, X4 or any of their respective subsidiaries as a

director, officer, employee or agent of another person), whether asserted or claimed prior to, at or after the Effective Time, in each case, to the fullest extent permitted by applicable law. Subject to applicable law, each such director and officer will be entitled to advancement of expenses (including attorneys' fees) incurred in the defense of any such claim, action, suit, proceeding or investigation from each of the Registrant and the Surviving Corporation following receipt by Arsanis or the Surviving Corporation from such indemnified person of a request therefor; provided that any such person to whom expenses are advanced provides an undertaking, to the extent then required by the DGCL or the applicable governing document of the Registrant or the Surviving Corporation, as applicable, to repay such advances if it is ultimately determined that such person is not entitled to indemnification.

Further, pursuant to the Merger Agreement, for a period of six years following the closing of the Merger (the "Closing"), which occurred on March 13, 2019, the provisions of the Surviving Corporation's certificate of incorporation and bylaws will contain provisions at least as favorable as the provisions relating to the indemnification, advancement of expenses and elimination of liability for monetary damages set forth in the certificate of incorporation and bylaws of X4 and the Registrant immediately before the Effective Time.

Pursuant to the Merger Agreement, the Registrant agreed to either (A) maintain in effect for six years after the Closing, the Registrant's existing directors' and officers' insurance policies in place as of the date of the Merger Agreement (November 26, 2018), or (B) prior to the Closing, purchase a six-year "tail" policy under its own existing directors' and officers' liability insurance policy, with an effective date as of the Closing (provided, that the Registrant may substitute therefor a policy of at least the same coverage containing terms and conditions that are not less favorable in any material respect). In no event, however, will the Registrant be required to expend for an annual premium for such policies more than an amount equal to 200% of the annual premiums paid by the Registrant for such insurance as of the date of the Merger Agreement. During the term of the "tail" policy, however, neither the Registrant nor the Surviving Corporation may take any action following the Closing to cause such "tail" policy to be cancelled or any of its provisions to be amended or waived in any manner that would adversely affect in any material respect the rights of their former and current officers and directors, their heirs or representatives.

From and after the Effective Time, the Registrant agreed to pay all expenses, including reasonable attorneys' fees, that may be incurred by indemnified persons in connection with their successful enforcement of the rights provided to such persons in the Merger Agreement. All rights to exculpation, indemnification and advancement of expenses for acts or omissions occurring at or prior to the Effective Time, whether asserted or claimed prior to, at or after the Effective Time, existing in favor of the current or former directors, officers or employees, as the case may be, of the Registrant, X4 or any of their respective subsidiaries as provided in their respective certificates of incorporation or by-laws or other organization documents or in any agreement in existence immediately before the Effective Time, will survive the Merger and continue in full force and effect. The director and officer indemnification provisions of the Merger Agreement are intended to be in addition to the rights otherwise available to the current and former officers and directors of the Registrant and X4 by law, charter, statute, bylaw or agreement, and shall operate for the benefit of, and will be enforceable by, each of such indemnified persons, their heirs and their representatives.

In the event the Registrant or the Surviving Corporation or any of their respective successors or assigns (i) consolidates with or merges into any other person and is not the continuing or surviving corporation or entity of such consolidation or merger, or (ii) transfers all or substantially all of its properties and assets to any person, then, and in each such case, proper provision will be made so that the successors and assigns of the Registrant or the Surviving Corporation, as the case may be, will succeed to the indemnification obligations set forth in the Merger Agreement. The Registrant will cause the Surviving Corporation to perform all of the director and officer indemnification obligations of the Surviving Corporation under the Merger Agreement.

Item 7. Exemption from Registration Claimed.

Not applicable.

Item 8. Exhibits.

Exhibit Number	Exhibit Description	Filed Herewith	Incorporated Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
4.1.1	Restated Certificate of Incorporation of the Registrant, filed with the Secretary of State of the State of Delaware on November 20, 2017		8-K (Exhibit 3.1)	11/20/2017	001-38295
4.1.2	Certificate of Amendment (Reverse Stock Split) to the Restated Certificate of Incorporation of the Registrant, filed with the Secretary of State of the State of Delaware on March 13, 2019.		8-K (Exhibit 3.1)	03/13/2019	001-38295
4.1.3	Certificate of Amendment (Name Change) to the Restated Certificate of Incorporation of the Registrant, filed with the Secretary of State of the State of Delaware on March 13, 2019.		8-K (Exhibit 3.2)	03/13/2019	001-38295

4.2	Amended and Restated By-laws of the Registrant.		8-K (Exhibit 3.2)	11/20/2017	001-38295
4.3	Form of Common Stock Certificate		8-K (Exhibit 4.1)	03/13/2019	001-38295
5.1	Opinion of Cooley LLP with respect to the legality of the securities being registered.	X			
23.1	Consent of PricewaterhouseCoopers LLP, independent registered public accounting firm to X4 Pharmaceuticals, Inc. (formerly Arsanis, Inc.).	X			
23.2	Consent of PricewaterhouseCoopers LLP, independent registered public accounting firm to X4 Therapeutics, Inc. (formerly X4 Pharmaceuticals, Inc.).	X			
23.3	Consent of Cooley LLP (included in Exhibit 5.1).	X			
24.1	Power of Attorney to file future amendments (set forth on the signature page of this Registration Statement)	X			
99.1	2019 Inducement Equity Incentive Plan		8-K (Exhibit 10.1)	06/19/2019	001-38295
99.2	Form of Stock Option Agreement under the 2019 Inducement Equity Incentive Plan		8-K (Exhibit 10.2)	06/19/2019	001-38295
99.3	Form of Restricted Stock Agreement under 2019 Inducement Equity Incentive Plan		8-K (Exhibit 10.3)	06/19/2019	001-38295
99.4	Form of Restricted Stock Unit Agreement under the 2019 Inducement Equity Incentive Plan		8-K (Exhibit 10.4)	06/19/2019	001-38295

Item 9. Undertakings.

(a) The undersigned Registrant hereby undertakes:

- (1) To file, during any period in which offers or sales are being made, a post-effective amendment to this Registration Statement:
 - (i) To include any prospectus required by Section 10(a)(3) of the Securities Act of 1933;
 - (ii) To reflect in the prospectus any facts or events arising after the effective date of the Registration Statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the Registration Statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Commission pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than a 20% change in the maximum aggregate offering price set forth in the "Calculation of Registration Fee" table in the effective Registration Statement;
 - (iii) To include any material information with respect to the plan of distribution not previously disclosed in the Registration Statement or any material change to such information in the Registration Statement;

Provided, however, that paragraphs (1)(i) and (1)(ii) of this section do not apply if the information required to be included in a post-effective amendment by those paragraphs is contained in reports filed with or furnished to the Commission by the Registrant pursuant to Section 13 or Section 15(d) of the Securities Exchange Act of 1934 that are incorporated by reference in the Registration Statement.

- (2) That, for the purpose of determining any liability under the Securities Act of 1933, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.
- (3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.

(b) The undersigned Registrant hereby undertakes that, for purposes of determining any liability under the Securities Act of 1933, each filing of the Registrant's annual report pursuant to Section 13(a) or Section 15(d) of the Securities Exchange Act of 1934 that is incorporated by reference in this Registration Statement shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

(c) Insofar as indemnification for liabilities arising under the Securities Act of 1933 may be permitted to directors, officers and controlling persons of the Registrant pursuant to the indemnification provisions summarized in Item 6, or otherwise, the Registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Act and will be governed by the final adjudication of such issue.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, 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 Cambridge, Commonwealth of Massachusetts, on August 9, 2019.

X4 PHARMACEUTICALS, INC.

By: /s/ Paula Ragan, Ph.D

Paula Ragan, Ph.D.

President and Chief Executive Officer

SIGNATURES AND POWER OF ATTORNEY

We, the undersigned officers and directors of X4 Pharmaceuticals, Inc., hereby severally constitute and appoint Paula Ragan, Ph.D. and Adam S. Mostafa, and each of them singly (with full power to each of them to act alone), our true and lawful attorneys-in-fact and agents, with full power of substitution and resubstitution in each of them for him or her and in his or her name, place and stead, and in any and all capacities, to sign any and all amendments (including post-effective amendments) to this Registration Statement on Form S-8 of X4 Pharmaceuticals, Inc., 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 or necessary to be done in and about the premises, as full to all intents and purposes as he or she 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 or her substitute or substitutes may lawfully do or cause to be done by virtue hereof.

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

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Paula Ragan, Ph.D.</u> Paula Ragan, Ph.D.	President, Chief Executive Officer and Director (principal executive officer)	August 9, 2019
<u>/s/ Adam S. Mostafa</u> Adam S. Mostafa	Chief Financial Officer and Treasurer (principal financial officer and principal accounting officer)	August 9, 2019
<u>/s/ Michael S. Wyzga</u> Michael S. Wyzga	Chairman of the Board of Directors	August 9, 2019
<u>/s/ Gary J. Bridger, Ph.D.</u> Gary J. Bridger, Ph.D.	Director	August 9, 2019
<u>/s/ David McGirr, M.B.A.</u> David McGirr	Director	August 9, 2019
<u>/s/ René Russo, Pharm.D.</u> René Russo, Pharm.D.	Director	August 9, 2019
<u>/s/ Murray W. Stewart, M.D.</u> Murray W. Stewart, M.D.	Director	August 9, 2019



Daniel I. Goldberg
+1 212 479 6722
dgoldberg@cooley.com

EXHIBIT 5.1

August 9, 2019

X4 Pharmaceuticals, Inc.
955 Massachusetts Avenue
Cambridge, MA 02139

Ladies and Gentlemen:

You have requested our opinion, as counsel to X4 Pharmaceuticals, Inc., a Delaware corporation (the "**Company**"), in connection with the filing by 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 150,000 shares (the "**Shares**") of the Company's Common Stock, par value \$0.001 per share (the "**Common Stock**"), pursuant to the Company's 2019 Inducement Equity Incentive Plan (the "**Plan**").

In connection with this opinion, we have examined and relied upon (a) the Registration Statement and the related prospectus, (b) the Company's Amended and Restated Certificate of Incorporation, as amended, and the Company's Amended and Restated Bylaws, each as currently in effect, (c) the Plan and (d) originals or copies certified to our satisfaction of such records, documents, 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, the accuracy, completeness and authenticity of certificates of public officials; and the due authorization, execution and delivery of all documents by all persons other than the Company where authorization, execution and delivery are prerequisites to the effectiveness of such documents. As to certain factual matters, we have relied upon a certificate of an officer of the Company and have not sought independently to verify such matters.

Our opinion is expressed only with respect to the General Corporation Law of the State of Delaware. We express no opinion to the extent that any other laws are applicable to the subject matter hereof and express no opinion and provide no assurance as to compliance with any federal or state securities law, rule or regulation.

On the basis of the foregoing, and in reliance thereon, we are of the opinion that the Shares, when sold and issued in accordance with the Plan, the Registration Statement and the 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).

Our opinion is limited to the matters stated herein and no opinion is implied or may be inferred beyond the matters expressly stated and is based on those laws as in effect on the date hereof, and we disclaim any obligation to advise you of facts, circumstances, events or developments which hereafter may be brought to our attention and which may alter, affect or modify the opinion expressed herein.

Cooley LLP 55 Hudson Yards New York, NY 10001-2157
t: (212) 479-6000 f: (212) 479-6275 cooley.com



X4 Pharmaceuticals, Inc.
August 9, 2019
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We consent to the filing of this opinion as an exhibit to the Registration Statement.

Sincerely,

COOLEY LLP

By: /s/ Daniel I. Goldberg
Daniel I. Goldberg, Partner

Cooley LLP 55 Hudson Yards New York, NY 10001-2157
t: (212) 479-6000 f: (212) 479-6275 cooley.com

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in this Registration Statement on Form S-8 of X4 Pharmaceuticals, Inc. of our report dated March 11, 2019 relating to the financial statements, which appears in Arsanis, Inc.'s Annual Report on Form 10-K for the year ended December 31, 2018.

/s/ PricewaterhouseCoopers LLP

Boston, Massachusetts
August 9, 2019

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in this Registration Statement on Form S-8 of X4 Pharmaceuticals, Inc. of our report dated April 2, 2019 relating to the financial statements of X4 Therapeutics, Inc. (formerly known as X4 Pharmaceuticals, Inc.), which appears in X4 Pharmaceuticals, Inc.'s Amendment No. 1 to the Current Report on Form 8-K dated March 11, 2019.

/s/ PricewaterhouseCoopers LLP

Boston, Massachusetts
August 9, 2019