

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 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. 3)¹

X4 Pharmaceuticals, Inc.

(Name of Issuer)

Common Stock, \$0.001 par value

(Title of Class of Securities)

98420X103

(CUSIP Number)

December 31, 2021

(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)

¹ The remainder of this cover page shall be filled out for a reporting person's initial filing on this form with respect to the subject class of securities, and for any subsequent amendment containing information which would alter disclosures provided in a prior cover page.

The information required on the remainder of this cover page shall not be deemed to be "filed" for the purpose of Section 18 of the Securities Exchange Act of 1934 ("Act") or otherwise subject to the liabilities of that section of the Act but shall be subject to all other provisions of the Act (however, see the *Notes*).

1	NAME OF REPORTING PERSON Biotechnology Value Fund, L.P.	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Delaware	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 1,691,198 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 1,691,198 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 1,691,198 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 5.8% (1)	
12	TYPE OF REPORTING PERSON PN	

(1) Includes 450,314 Shares (defined in Item 2(d)) underlying certain Class A Warrants (defined in Item 4).

Includes 518,856 Shares underlying certain Class B Warrants (defined in Item 4).

Includes 259,739 Shares underlying certain Pre-Funded B Warrants (defined in Item 4).

1	NAME OF REPORTING PERSON BVF I GP LLC	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Delaware	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 1,691,198 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 1,691,198 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 1,691,198 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 5.8% (1)	
12	TYPE OF REPORTING PERSON OO	

(1) Includes 450,314 Shares underlying certain Class A Warrants.

Includes 518,856 Shares underlying certain Class B Warrants.

Includes 259,739 Shares underlying certain Pre-Funded B Warrants.

1	NAME OF REPORTING PERSON Biotechnology Value Fund II, L.P.	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Delaware	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 1,079,183 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 1,079,183 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 1,079,183 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 3.7% (1)	
12	TYPE OF REPORTING PERSON PN	

(1) Includes 363,810 Shares underlying certain Class A Warrants.

Includes 385,449 Shares underlying certain Class B Warrants.

Includes 9,304 Shares underlying certain Pre-Funded B Warrants and excludes 195,161 Shares underlying certain Pre-Funded B Warrants that may not be exercised due to the Pre-Funded B Warrants Blocker (defined in Item 4).

1	NAME OF REPORTING PERSON BVF II GP LLC	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Delaware	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 1,079,183 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 1,079,183 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 1,079,183 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 3.7% (1)	
12	TYPE OF REPORTING PERSON PN	

(1) Includes 363,810 Shares underlying certain Class A Warrants.

Includes 385,449 Shares underlying certain Class B Warrants.

Includes 9,304 Shares underlying certain Pre-Funded B Warrants and excludes 195,161 Shares underlying certain Pre-Funded B Warrants that may not be exercised due to the Pre-Funded B Warrants Blocker.

1	NAME OF REPORTING PERSON Biotechnology Value Trading Fund OS LP	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Cayman Islands	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 178,467 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 178,467 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 178,467 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) Less than 1% (1)	
12	TYPE OF REPORTING PERSON PN	

(1) Includes 64,996 Shares underlying certain Class A Warrants.

Includes 66,236 Shares underlying certain Class B Warrants.

Excludes 35,796 Shares underlying certain Pre-Funded B Warrants that may not be exercised due to the Pre-Funded B Warrants Blocker.

1	NAME OF REPORTING PERSON BVF Partners OS Ltd.	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Cayman Islands	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 178,467 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 178,467 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 178,467 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) Less than 1% (1)	
12	TYPE OF REPORTING PERSON CO	

(1) Includes 64,996 Shares underlying certain Class A Warrants.

Includes 66,236 Shares underlying certain Class B Warrants.

Excludes 35,796 Shares underlying certain Pre-Funded B Warrants that may not be exercised due to the Pre-Funded B Warrants Blocker.

1	NAME OF REPORTING PERSON BVF GP Holdings LLC	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Delaware	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 2,770,381 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 2,770,381 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 2,770,381 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 9.2% (1)	
12	TYPE OF REPORTING PERSON OO	

(1) Includes 814,124 Shares underlying certain Class A Warrants.

Includes 904,305 Shares underlying certain Class B Warrants.

Includes 269,043 Shares underlying certain Pre-Funded B Warrants and excludes 195,161 Shares underlying certain Pre-Funded B Warrants that may not be exercised due to the Pre-Funded B Warrants Blocker.

1	NAME OF REPORTING PERSON BVF Partners L.P.	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Delaware	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 3,027,672 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 3,027,672 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 3,027,672 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 9.99% (1)	
12	TYPE OF REPORTING PERSON PN, IA	

(1) Includes 910,750 Shares underlying certain Class A Warrants.

Includes 1,000,000 Shares underlying certain Class B Warrants.

Includes 269,043 Shares underlying certain Pre-Funded B Warrants and excludes 230,957 Shares underlying certain Pre-Funded B Warrants that may not be exercised due to the Pre-Funded B Warrants Blocker.

1	NAME OF REPORTING PERSON BVF Inc.	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION Delaware	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 3,027,672 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 3,027,672 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 3,027,672 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 9.99% (1)	
12	TYPE OF REPORTING PERSON CO	

(1) Includes 910,750 Shares underlying certain Class A Warrants.

Includes 1,000,000 Shares underlying certain Class B Warrants.

Includes 269,043 Shares underlying certain Pre-Funded B Warrants and excludes 230,957 Shares underlying certain Pre-Funded B Warrants that may not be exercised due to the Pre-Funded B Warrants Blocker.

1	NAME OF REPORTING PERSON Mark N. Lampert	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/>	
3	SEC USE ONLY	
4	CITIZENSHIP OR PLACE OF ORGANIZATION United States	
NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH	5	SOLE VOTING POWER 0 shares
	6	SHARED VOTING POWER 3,027,672 (1)
	7	SOLE DISPOSITIVE POWER 0 shares
	8	SHARED DISPOSITIVE POWER 3,027,672 (1)
9	AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 3,027,672 (1)	
10	CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/>	
11	PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 9.99% (1)	
12	TYPE OF REPORTING PERSON IN	

(1) Includes 910,750 Shares underlying certain Class A Warrants.

Includes 1,000,000 Shares underlying certain Class B Warrants.

Includes 269,043 Shares underlying certain Pre-Funded B Warrants and excludes 230,957 Shares underlying certain Pre-Funded B Warrants that may not be exercised due to the Pre-Funded B Warrants Blocker.

Item 1(a). Name of Issuer:
X4 Pharmaceuticals, Inc., a Delaware corporation (the "Issuer").

Item 1(b). Address of Issuer's Principal Executive Offices:
61 North Beacon Street, 4th Floor
Boston, Massachusetts 02134

Item 2(a). Name of Person Filing
Item 2(b). Address of Principal Business Office or, if None, Residence
Item 2(c). Citizenship

Biotechnology Value Fund, L.P. ("BVF")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

BVF I GP LLC ("BVF GP")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

Biotechnology Value Fund II, L.P. ("BVF2")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

BVF II GP LLC ("BVF2 GP")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

Biotechnology Value Trading Fund OS LP ("Trading Fund OS")
PO Box 309 Uglan House
Grand Cayman, KY1-1104
Cayman Islands
Citizenship: Cayman Islands

BVF Partners OS Ltd. ("Partners OS")
PO Box 309 Uglan House
Grand Cayman, KY1-1104
Cayman Islands
Citizenship: Cayman Islands

BVF GP Holdings LLC ("BVF GPH")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

BVF Partners L.P. ("Partners")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

BVF Inc.
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

Mark N. Lampert (“Mr. Lampert”)
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: United States

Each of the foregoing is referred to as a “Reporting Person” and collectively as the “Reporting Persons.”

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

Common Stock, \$0.001 par value (the “Shares”)

Item 2(e). CUSIP Number:

98420X103

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:

- | | | |
|-----|-------------------------------------|--|
| | <input checked="" type="checkbox"/> | Not applicable. |
| (a) | <input type="checkbox"/> | Broker or dealer registered under Section 15 of the Exchange Act. |
| (b) | <input type="checkbox"/> | Bank as defined in Section 3(a)(6) of the Exchange Act. |
| (c) | <input type="checkbox"/> | Insurance company as defined in Section 3(a)(19) of the Exchange Act. |
| (d) | <input type="checkbox"/> | Investment company registered under Section 8 of the Investment Company Act. |
| (e) | <input type="checkbox"/> | An investment adviser in accordance with Rule 13d-1(b)(1)(ii)(E). |
| (f) | <input type="checkbox"/> | An employee benefit plan or endowment fund in accordance with Rule 13d-1(b)(1)(ii)(F). |
| (g) | <input type="checkbox"/> | A parent holding company or control person in accordance with Rule 13d-1(b)(1)(ii)(G). |
| (h) | <input type="checkbox"/> | A savings association as defined in Section 3(b) of the Federal Deposit Insurance Act. |
| (i) | <input type="checkbox"/> | A church plan that is excluded from the definition of an investment company under Section 3(c)(14) of the Investment Company Act. |
| (j) | <input type="checkbox"/> | Group, in accordance with Rule 13d-1(b)(1)(ii)(J). |
| (k) | <input type="checkbox"/> | Group, in accordance with Rule 240.13d-1(b)(1)(ii)(K). If filing as a non-U.S. institution in accordance with Rule 240.13d-1(b)(1)(ii)(J), please specify the type of institution: _____ |

Item 4. Ownership

(a) Amount beneficially owned:

As of the close of business on December 31, 2021, the Reporting Persons held 910,750 Class A Warrants (the “Class A Warrants”) exercisable into an aggregate of 910,750 Shares. Each Class A Warrant has an exercise price per Share equal to \$13.20 and expires on April 16, 2024. The Class A Warrants are exercisable, at the option of each holder, provided that the holder will be prohibited, subject to certain exceptions, from exercising the Class A Warrants for Shares to the extent that immediately prior to or after giving effect to such exercise, the holder, together with its affiliates and other attribution parties, would own more than 9.99% of the total number of Shares then issued and outstanding (the “Class A Blocker”). As of the close of business on December 31, 2021, the Class A Blocker limits the aggregate exercise of Class A Warrants by the Reporting Persons to 910,750 out of 910,750 Shares underlying the Class A Warrants owned by the Reporting Persons in the aggregate.

As of the close of business on December 31, 2021, the Reporting Persons held 1,000,000 Class B Warrants (the “Class B Warrants”) exercisable into an aggregate of 1,000,000 Shares. Each Class B Warrant has an exercise price per Share equal to \$8.70 and will expire on the date that is the earlier of (a) the date that is thirty (30) calendar days following the date on which the Issuer issues a press release regarding topline data from its Phase III clinical trial of mavorixafor for the treatment of WHIM syndrome (or, if such date is not a business day, the following business day) and (b) November 28, 2024. The Class B Warrants are exercisable, at the option of each holder, provided that the holder will be prohibited, subject to certain exceptions, from exercising the Class B Warrants for Shares to the extent that immediately prior to or after giving effect to such exercise, the holder, together with its affiliates and other attribution parties, would own more than 9.99% of the total number of Shares then issued and outstanding (the “Class B Blocker”). As of the close of business on December 31, 2021, the Class B Blocker limits the aggregate exercise of Class B Warrants by the Reporting Persons to 1,000,000 out of 1,000,000 Shares underlying the Class B Warrants owned by the Reporting Persons in the aggregate.

As of the close of business on December 31, 2021, the Reporting Persons held 500,000 Pre-Funded B Warrants (the “Pre-Funded B Warrants”) exercisable into an aggregate of 500,000 Shares. Each Pre-Funded Warrant has an exercise price per Share equal to \$0.001 per Share. The Pre-Funded B Warrants are exercisable at any time after their original issuance and do not expire. However, under the Pre-Funded B Warrants, the Issuer may not effect the exercise of any Pre-Funded B Warrant, and a holder will not be entitled to exercise any portion of any Pre-Funded B Warrant, which, upon giving effect to such exercise, would cause (i) the aggregate number of Shares beneficially owned by the holder (together with its affiliates) to exceed 9.99% of the number of Shares outstanding immediately after giving effect to the exercise, or (ii) the combined voting power of the Issuer’s securities beneficially owned by the holder (together with its affiliates) to exceed 9.99% of the combined voting power of all of the Issuer’s securities then outstanding immediately after giving effect to the exercise, as such percentage ownership is determined in accordance with the terms of the Pre-Funded B Warrants (the “Pre-Funded B Warrants Blocker”, and together with the Class A Blocker and the Class B Blocker, the “Beneficial Ownership Limitation”). As of the close of business on December 31, 2021, the Pre-Funded B Warrants Blocker limits the exercise of Pre-Funded B Warrants by the Reporting Persons to 269,043 out of 500,000 Shares underlying the Pre-Funded B Warrants owned by the Reporting Persons in the aggregate. BVF2 holds Pre-Funded B Warrants to purchase 195,161 additional Shares which are excluded herein as a result of the Pre-Funded B Warrants Blocker. Trading Fund OS holds Pre-Funded B Warrants to purchase 35,796 additional Shares which are excluded herein as a result of the Pre-Funded B Warrants Blocker.

The Reporting Persons may choose to exercise the Class A Warrants, the Class B Warrants or the Pre-Funded B Warrants in other amounts among the Reporting Persons, while continuing to comply with the Beneficial Ownership Limitation.

As of the close of business on December 31, 2021, (i) BVF beneficially owned 1,691,198 Shares, including 450,314 Shares issuable upon conversion of certain Class A Warrants, 518,856 Shares issuable upon conversion of certain Class B Warrants and 259,739 Shares issuable upon conversion of certain Pre-Funded B Warrants (ii) BVF2 beneficially owned 1,079,183 Shares, including 363,810 Shares issuable upon conversion of certain Class A Warrants, 385,449 Shares issuable upon conversion of certain Class B Warrants and 9,304 Shares issuable upon conversion of certain Pre-Funded B Warrants, and excluding 195,161 Shares issuable upon conversion of certain Pre-Funded B Warrants, and (iii) Trading Fund OS beneficially owned 178,467 Shares, including 64,996 Shares issuable upon conversion of certain Class A Warrants and 66,236 Shares issuable upon conversion of certain Class B Warrants, and excluding 35,796 Shares issuable upon conversion of certain Pre-Funded B Warrants.

BVF GP, as the general partner of BVF, may be deemed to beneficially own the 1,691,198 Shares beneficially owned by BVF.

BVF2 GP, as the general partner of BVF2, may be deemed to beneficially own the 1,079,183 Shares beneficially owned by BVF2.

Partners OS, as the general partner of Trading Fund OS, may be deemed to beneficially own the 178,467 Shares beneficially owned by Trading Fund OS.

BVF GPH, as the sole member of each of BVF GP and BVF2 GP, may be deemed to beneficially own the 2,770,381 Shares beneficially owned in the aggregate by BVF and BVF2.

Partners, as the investment manager of BVF, BVF2 and Trading Fund OS, and the sole member of Partners OS, may be deemed to beneficially own the 3,027,672 Shares beneficially owned in the aggregate by BVF, BVF2 and Trading Fund OS and held in a certain Partners managed account (the "Partners Managed Account"), including 78,824 Shares held in the Partners Managed Account, which includes 31,630 Shares issuable upon conversion of certain Class A Warrants and 29,459 Shares issuable upon conversion of certain Class B Warrants.

BVF Inc., as the general partner of Partners, may be deemed to beneficially own the 3,027,672 Shares beneficially owned by Partners.

Mr. Lampert, as a director and officer of BVF Inc., may be deemed to beneficially own the 3,027,672 Shares beneficially owned by BVF Inc.

The foregoing should not be construed in and of itself as an admission by any Reporting Person as to beneficial ownership of any Shares owned by another Reporting Person. BVF GP disclaims beneficial ownership of the Shares beneficially owned by BVF. BVF2 GP disclaims beneficial ownership of the Shares beneficially owned by BVF2. Partners OS disclaims beneficial ownership of the Shares beneficially owned by Trading Fund OS. BVF GPH disclaims beneficial ownership of the Shares beneficially owned by BVF and BVF2. Each of Partners, BVF Inc. and Mr. Lampert disclaims beneficial ownership of the Shares beneficially owned by BVF, BVF2 and Trading Fund OS and held in the Partners Managed Account, and the filing of this statement shall not be construed as an admission that any such person or entity is the beneficial owner of any such securities.

(b) Percent of class:

The following percentages are based on a denominator that is the sum of (i) 28,127,315 Shares outstanding, as of December 20, 2021, as disclosed in the Issuer's Registration Statement on Form S-3 filed with the Securities and Exchange Commission on December 23, 2021 and (ii) certain or all of 910,750 Shares issuable upon the exercise of the Class A Warrants, 1,000,000 Shares issuable upon the exercise of the Class B Warrants and 269,043 Shares issuable upon the exercise of the Pre-Funded B Warrants, as applicable.

As of the close of business on December 31, 2021, (i) BVF beneficially owned approximately 5.8% of the outstanding Shares, (ii) BVF2 beneficially owned approximately 3.7% of the outstanding Shares, (iii) Trading Fund OS beneficially owned less than 1% of the outstanding Shares, (iv) BVF GP may be deemed to beneficially own approximately 5.8% of the outstanding Shares, (v) BVF2 GP may be deemed to beneficially own approximately 3.7% of the outstanding Shares, (vi) Partners OS may be deemed to beneficially own less than 1% of the outstanding Shares, (vii) BVF GPH may be deemed to beneficially own approximately 9.2% of the outstanding Shares, and (viii) each of Partners, BVF Inc. and Mr. Lampert may be deemed to beneficially own approximately 9.99% of the outstanding Shares (less than 1% of the outstanding Shares are held in the Partners Managed Account).

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

(i) Sole power to vote or to direct the vote

See Cover Pages Items 5-9.

(ii) Shared power to vote or to direct the vote

See Cover Pages Items 5-9.

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

See Cover Pages Items 5-9.

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

See Cover Pages Items 5-9.

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

Not Applicable.

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

BVF GP, BVF GPH, Partners, BVF Inc. and Mr. Lampert share voting and dispositive power over the Shares beneficially owned by BVF. BVF GPH, Partners, BVF Inc. and Mr. Lampert share voting and dispositive power over the Shares beneficially owned by BVF2. Partners, BVF Inc. and Mr. Lampert share voting and dispositive power over the Shares beneficially owned by Trading Fund OS and held in the Partners Managed Account.

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

Not Applicable.

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

See Exhibit 99.1 to Amendment No. 1 to the Schedule 13G filed with the Securities and Exchange Commission on February 14, 2020.

Item 9. Notice of Dissolution of Group.

Not Applicable.

Item 10. Certifications.

By signing below each of the undersigned certifies that, to the best of its 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.

SIGNATURE

After reasonable inquiry and to the best of his knowledge and belief, each of the undersigned certifies that the information set forth in this statement is true, complete and correct.

Dated: February 14, 2021

BIOTECHNOLOGY VALUE FUND, L.P.

By: BVF I GP LLC., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
Chief Executive Officer

BVF I GP LLC

By: /s/ Mark N. Lampert
Mark N. Lampert
Chief Executive Officer

BIOTECHNOLOGY VALUE FUND II, L.P.

By: BVF II GP LLC, its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
Chief Executive Officer

BVF II GP LLC

By: /s/ Mark N. Lampert
Mark N. Lampert
Chief Executive Officer

BVF PARTNERS OS LTD.

By: BVF Partners L.P., its sole member

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BIOTECHNOLOGY VALUE TRADING FUND OS LP

By: BVF Partners L.P., its investment manager

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BVF GP HOLDINGS LLC

By: /s/ Mark N. Lampert
Mark N. Lampert
Chief Executive Officer

BVF PARTNERS L.P.

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BVF INC.

By: /s/ Mark N. Lampert
Mark N. Lampert
President

/s/ Mark N. Lampert
MARK N. LAMPERT