## **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.  $)^1$ 

Novus Therapeutics, Inc.
(Name of Issuer)
Common Stock, \$0.001 par value
(Title of Class of Securities)
67011N105
(CUSIP Number)
April 30, 2019
(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)
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 <i>Notes</i> ).

1	NAME OF REPORTING PERSON		
	Biotechnolo	gy Value Fund, L.P.	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a)		
			(b) □
3	SEC USE ONLY		
4	CITIZENCIUD OF	R PLACE OF ORGANIZATION	
4	CITIZENSHIP OF	A PLACE OF ORGANIZATION	
	Delaware		
NUMBER OF	5	SOLE VOTING POWER	
SHARES			
BENEFICIALLY		0 shares	
OWNED BY	6	SHARED VOTING POWER	
EACH		000 400*	
REPORTING		808,129*	
PERSON WITH	7	SOLE DISPOSITIVE POWER	
		0 shares	
	8	SHARED DISPOSITIVE POWER	
		808,129*	
9	AGGREGATE AN	MOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON	
	808,129*		
10	CHECK BOX IF	THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES	
11	PERCENT OF CL	ASS REPRESENTED BY AMOUNT IN ROW (9)	
		120 121 122 21 111100111 11 110 11 (0)	
	6.1%*		
12	TYPE OF REPOR	TING PERSON	
	PN		

<sup>\*</sup> Includes 398,861 Shares issuable upon the exercise of certain Series A Warrants (defined in Item 4).

Excludes 398,861 Shares underlying certain Series B Warrants (defined in Item 4) held by BVF that may not be exercised due to the Series B Blocker (defined in Item 4).

	1		
1	NAME OF REPORTING PERSON		
		gy Value Fund II, L.P.	(a) ⊠
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP		
			(b) □
3	SEC USE ONLY		
4	CITIZENSHID OF	R PLACE OF ORGANIZATION	
4	CITIZENSIIII OI	AT LAGE OF ORGANIZATION	
	Delaware		
NUMBER OF	5	SOLE VOTING POWER	
SHARES			
BENEFICIALLY		0 shares	
OWNED BY	6	SHARED VOTING POWER	
EACH REPORTING		420 71 4*	
PERSON WITH	7	439,714*  SOLE DISPOSITIVE POWER	
TERSON WITH	/	SOLE DISPOSITIVE FOWER	
		0 shares	
	8	SHARED DISPOSITIVE POWER	
		439,714*	
9	AGGREGATE AN	MOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON	
	420 54 44		
10	439,714*	THE ACCRECATE AMOUNT IN DOMEON EVOLVIDES CERTAIN SHARES	П
10	CHECK BOX IF	THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES	Ц
11	PERCENT OF CL	ASS REPRESENTED BY AMOUNT IN ROW (9)	
		· /	
	3.4%*		
12	TYPE OF REPOR	TING PERSON	
	PN		

<sup>\*</sup> Includes 108,819 Shares issuable upon the exercise of certain Series A Warrants. Excludes 213,644 Shares underlying Series A Warrants held by BVF2 that may not be exercised due to the Series A Blocker (defined in Item 4).

Excludes 322,463 Shares underlying certain Series B Warrants held by BVF2 that may not be exercised due to the Series B Blocker.

1	NAME OF REPOR	RTING PERSON	
		gy Value Trading Fund OS LP	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP  (a) ⊠		
			(b) □
3	SEC USE ONLY		
	CHERTHALIA	A DI A CE OF OR ON CANYTATION	
4	CITIZENSHIP OF	R PLACE OF ORGANIZATION	
	Cayman Isla	nda	
NUMBER OF	Cayman isia	SOLE VOTING POWER	
SHARES	3	SOLE VOTING FOWER	
BENEFICIALLY		0 shares	
OWNED BY	6	SHARED VOTING POWER	
EACH	Ü	STRIKES VOTING FOWER	
REPORTING		59,006*	
PERSON WITH	7	SOLE DISPOSITIVE POWER	
		0 shares	
	8	SHARED DISPOSITIVE POWER	
		59,006*	
9	AGGREGATE AN	MOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON	
	E0.00C*		
10	59,006*	THE ACCRECATE AMOUNT IN DOW! (0) EVOLUDES CERTAIN SHARES	
10	CHECK BOX IF I	THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES	
11	PERCENT OF CI	ASS REPRESENTED BY AMOUNT IN ROW (9)	
11	I LICEIVI OF CE	TOO KEI KEOEKIED DI TRIOONI IN KON (J)	
	Less than 19	<b>%</b> *	
12	TYPE OF REPOR		
	PN		

<sup>\*</sup> Excludes 57,506 Shares underlying certain Series A Warrants held by Trading Fund OS that may not be exercised due to the Series A Blocker.

Excludes 57,506 Shares underlying certain Series B Warrants held by Trading Fund OS that may not be exercised due to the Series B Blocker.

1	NAME OF REPORTING PERSON		
	BVF Partne	ers OS Ltd.	
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP  (a) ☑		
			(b) □
3	SEC USE ONLY		
4	CITIZENSHIP O	R PLACE OF ORGANIZATION	
	Cayman Isla	ands	
NUMBER OF	5	SOLE VOTING POWER	
SHARES			
BENEFICIALLY		0 shares	
OWNED BY	6	SHARED VOTING POWER	
EACH			
REPORTING		59,006*	
PERSON WITH	7	SOLE DISPOSITIVE POWER	
		0 shares	
	8	SHARED DISPOSITIVE POWER	
		59,006*	
9	AGGREGATE A	MOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON	
	59,006*		
10	CHECK BOX IF	THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES	
	DED CENTE CE CE	ACC DEDUCTIVEED BY ANOTHER DOLL (0)	
11	PERCENT OF CI	LASS REPRESENTED BY AMOUNT IN ROW (9)	
	T 1 44	0/*	
12	Less than 1		
12	TYPE OF REPOR	CLING PERSON	
	60		
	CO		

<sup>\*</sup> Excludes 57,506 Shares underlying certain Series A Warrants held by Trading Fund OS that may not be exercised due to the Series A Blocker.

Excludes 57,506 Shares underlying certain Series B Warrants held by Trading Fund OS that may not be exercised due to the Series B Blocker.

1	NAME OF REPORTING PERSON		
_	BVF Partne		(a) ⊠
2			
			(b) □
	CEC LICE ONLY		
3	SEC USE ONLY		
4	CITIZENSHIP OF	R PLACE OF ORGANIZATION	
7	CITIZENSIIII OI	CLENCE OF ORGANIZATION	
	Delaware		
NUMBER OF	5	SOLE VOTING POWER	
SHARES			
BENEFICIALLY		0 shares	
OWNED BY	6	SHARED VOTING POWER	
EACH		1 220 550%	
REPORTING PERSON WITH	7	1,336,556*  SOLE DISPOSITIVE POWER	
PERSON WITH	/	SOLE DISPOSITIVE POWER	
		0 shares	
	8	SHARED DISPOSITIVE POWER	
		1,336,556*	
9	AGGREGATE AN	MOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON	
	4 226 556*		
10	1,336,556*	THE A CODEC ATE AMOUNT IN DOM/ (0) EVOLUDED CEDTAIN OUADED	П
10	CHECK BOX IF	THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES	Ц
11	PERCENT OF CL	ASS REPRESENTED BY AMOUNT IN ROW (9)	
_	9.99%*		
12	TYPE OF REPOR	TING PERSON	
	PN, IA		

<sup>\*</sup> Includes 507,680 Shares issuable upon the exercise of certain Series A Warrants. Excludes 300,075 Shares underlying Series A Warrants that may not be exercised due to the Series A Blocker.

Excludes 807,755 Shares underlying certain Series B Warrants that may not be exercised due to the Series B Blocker.

1	NAME OF DEDC	DTINC DEDSON		
1	NAME OF REPORTING PERSON			
	BVF Inc.			
2		PROPRIATE BOX IF A MEMBER OF A GROUP	(a) 🗵	
2	CHECK THE AF	FROFRIATE BOA IF A MEMBER OF A GROUP	(a) ⊠ (b) □	
			(6) 🗀	
3	SEC USE ONLY			
4	CITIZENSHIP O	R PLACE OF ORGANIZATION		
	_			
	Delaware			
NUMBER OF	5	SOLE VOTING POWER		
SHARES BENEFICIALLY		0 shares		
OWNED BY	6	SHARED VOTING POWER		
EACH		SHARED VOTING FOWER		
REPORTING		1,336,556*		
PERSON WITH	7	SOLE DISPOSITIVE POWER		
		0 shares		
	8	SHARED DISPOSITIVE POWER		
		1,336,556*		
9	AGGREGATE A	MOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON		
J	TIGGILE TIL	AND CALL POLICE TO ANALO DE LA CALLACTE CALLACTE ACCOLLANGE DE LA CALLACTE DE LA		
	1,336,556*			
10	CHECK BOX IF	THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES		
	DED CENTE CT CT	ACC DEDUCENTED DV ANGUNE IN DOLL (0)		
11	PERCENT OF CI	LASS REPRESENTED BY AMOUNT IN ROW (9)		
	9.99%*			
12	TYPE OF REPOR	RTING PERSON		
	CO			

<sup>\*</sup> Includes 507,680 Shares issuable upon the exercise of certain Series A Warrants. Excludes 300,075 Shares underlying Series A Warrants that may not be exercised due to the Series A Blocker.

Excludes 807,755 Shares underlying certain Series B Warrants that may not be exercised due to the Series B Blocker.

	T		
1	NAME OF REPORTING PERSON		
	Mark N. Lan		
2	CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) ⊠		
			(b) □
			• •
3	SEC USE ONLY		-
4	CITIZENSHID OR	PLACE OF ORGANIZATION	
7	CITIZENSIIII OK	TEACE OF ORGANIZATION	
	United States		
MIMPED OF	5	SOLE VOTING POWER	
NUMBER OF	5	SOLE VOTING POWER	
SHARES			
BENEFICIALLY		0 shares	
OWNED BY	6	SHARED VOTING POWER	
EACH			
REPORTING		1,336,556*	
PERSON WITH	7	SOLE DISPOSITIVE POWER	
		0 shares	
	8	SHARED DISPOSITIVE POWER	
		1,336,556*	
9	AGGREGATE AM	OUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON	
3	I I G G I L G I L I I I I	DEVELORIED OWNED BY ENGINEER OWN OF TENOOR	
	1,336,556*		
10		THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES	
10	CHECK BOX II' I	THE AGGREGATE AMOUNT IN ROW (9) EXCEODES CERTAIN SHARES	
11	DEDCEME OF CL	ACC DEDDECEMEED DV AMOUNT IN DOW (0)	
11	PERCENT OF CL.	ASS REPRESENTED BY AMOUNT IN ROW (9)	
	0.000/1		
	9.99%*		
12	TYPE OF REPORT	TING PERSON	
	IN		

Excludes 807,755 Shares underlying certain Series B Warrants that may not be exercised due to the Series B Blocker.

<sup>\*</sup> Includes 507,680 Shares issuable upon the exercise of certain Series A Warrants. Excludes 300,075 Shares underlying Series A Warrants that may not be exercised due to the Series A Blocker.

Item 1(a). Name of Issuer:

Novus Therapeutics, Inc., a Delaware corporation (the "Issuer").

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

19900 MacArthur Blvd., Suite 550

Irvine, California 92612

Name of Person Filing Item 2(a).

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

Biotechnology Value Fund II, L.P. ("BVF2")

44 Montgomery St., 40th Floor San Francisco, California 94104

Citizenship: Delaware

Biotechnology Value Trading Fund OS LP ("Trading Fund OS")

PO Box 309 Ugland House Grand Cayman, KY1-1104

Cayman Islands

Citizenship: Cayman Islands

BVF Partners OS Ltd. ("Partners OS")

PO Box 309 Ugland House Grand Cayman, KY1-1104

Cayman Islands

Citizenship: Cayman Islands

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	Title of Class of Securities:			
	Common Stock, \$0.001 par value (the "Shares")				
Item 2(e).	CUS	CUSIP Number:			
	6701	1N105			
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:				
		/x/	Not applicable.		
	(a)	//	Broker or dealer registered under Section 15 of the Exchange Act.		
	(b)	//	Bank as defined in Section 3(a)(6) of the Exchange Act.		
	(c)	//	Insurance company as defined in Section 3(a)(19) of the Exchange Act.		
	(d)	//	Investment company registered under Section 8 of the Investment Company Act.		
	(e)	//	An investment adviser in accordance with Rule 13d-1(b)(1)(ii)(E).		
	(f)	//	An employee benefit plan or endowment fund in accordance with Rule 13d-1(b)(1)(ii)(F).		
	(g)	//	A parent holding company or control person in accordance with Rule 13d-1(b)(1)(ii)(G).		
	(h)	//	A savings association as defined in Section 3(b) of the Federal Deposit Insurance Act.		
	(i)	//	A church plan that is excluded from the definition of an investment company under Section 3(c)(14) of the Investment Company Act.		
	(j)	//	Group, in accordance with Rule 13d-1(b)(1)(ii)(J).		
	(k)	//	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:		
			10		

#### Item 4. Ownership

#### (a) Amount beneficially owned:

As of the close of business on May 10, 2019, the Reporting Persons held 807,755 Series A Warrants (the "Series A Warrants") exercisable into an aggregate of 807,755 Shares. Each Series A Warrant has an exercise price per Share of \$4.00 and expires 18 months from the date of issuance. Subject to limited exceptions, a holder of Series A Warrants will not have the right to exercise any portion of its Series A Warrants if the holder, together with its affiliates, would beneficially own in excess of 9.99% of the number of Shares outstanding immediately after giving effect to such exercise (the "Series A Blocker"). As of the close of business on May 10, 2019, the Series A Blocker limits the aggregate exercise of Series A Warrants by the Reporting Persons to 507,680 out of 807,755 Shares underlying the Series A Warrants owned by the Reporting Persons in the aggregate. In providing beneficial ownership described herein, the Reporting Persons have assumed that all of the Series A Warrants held by BVF to acquire 398,861 Shares and certain of the Series A Warrants held by BVF2 to acquire 108,819 Shares would be exercised, which would bring the Reporting Persons to the aggregate 9.99% limitation, and the remaining Series A Warrants exercisable into 213,644 Shares owned by BVF2, the Series A Warrants exercisable into 57,506 Shares owned by Trading Fund OS, and the Series A Warrants exercisable into 28,925 Shares held in a certain Partners managed account (the "Partners Managed Account"), would not be exercised due to the Series A Blocker.

As of the close of business on May 10, 2019, the Reporting Persons held 807,755 Series B Warrants (the "Series B Warrants") exercisable into an aggregate of 807,755 Shares. Each Series B Warrant has an exercise price per Share of \$4.00. Each Series B Warrant becomes exercisable only upon the exercise of the Series A Warrants and expires five years from the date of issuance. Subject to limited exceptions, a holder of Series B Warrants will not have the right to exercise any portion of its Series B Warrants if the holder, together with its affiliates, would beneficially own in excess of 9.99% of the number of Shares outstanding immediately after giving effect to such exercise (the "Series B Blocker" and together with the Series A Blocker, the "Beneficial Ownership Limitation"). As of the close of business on May 10, 2019, the Series B Blocker limits the exercise of Series B Warrants by the Reporting Persons to zero out of the 807,755 Shares underlying the Series B Warrants owned by the Reporting Persons in the aggregate. BVF holds Series B Warrants to purchase 398,861 additional Shares, which are excluded herein as a result of the Series B Blocker. BVTOS holds Series B Warrants to purchase 57,506 additional Shares, which are excluded herein as a result of the Series B Blocker. The Reporting Persons through the Partners Managed Account holds Series B Warrants to purchase 28,925 additional Shares, which are excluded herein as a result of the Series B Blocker.

The Reporting Persons may choose to exercise the Series A Warrants or the Series 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 May 10, 2019 (i) BVF beneficially owned 808,129 Shares, (ii) BVF2 beneficially owned 439,714 Shares, and (iii) Trading Fund OS beneficially owned 59,006 Shares.

Partners OS, as the general partner of Trading Fund OS, may be deemed to beneficially own the 59,006 Shares beneficially owned by Trading Fund OS.

Partners, as the general partner of BVF, BVF2, the investment manager of Trading Fund OS, and the sole member of Partners OS, may be deemed to beneficially own the 1,336,556 Shares beneficially owned in the aggregate by BVF, BVF2, Trading Fund OS, and the Partners Managed Account, including 29,707 Shares held in the Partners Managed Account.

BVF Inc., as the general partner of Partners, may be deemed to beneficially own the 1,336,556 Shares beneficially owned by Partners.

Mr. Lampert, as a director and officer of BVF Inc., may be deemed to beneficially own the 1,336,556 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. Partners OS disclaims beneficial ownership of the Shares beneficially owned by Trading Fund OS. Each of Partners, BVF Inc. and Mr. Lampert disclaims beneficial ownership of the Shares beneficially owned by BVF, BVF2, Trading Fund OS, and 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) 12,871,255 Shares outstanding as disclosed in the Issuer's Prospectus Supplement filed with the Securities and Exchange Commission on May 1, 2019 and (ii) certain or all of the 507,680 Shares issuable upon the exercise of the Series A Warrants, as applicable.

As of the close of business on May 10, 2019 (i) BVF beneficially owned approximately 6.1% of the outstanding Shares, (ii) BVF2 beneficially owned approximately 3.4% of the outstanding Shares, (iii) Trading Fund OS beneficially owned less than 1% of the outstanding Shares, (iv) Partners OS may be deemed to beneficially own less than 1% of the outstanding Shares, and (v) 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 is 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.

Partners, BVF Inc. and Mr. Lampert share voting and dispositive power over the Shares beneficially owned by BVF, BVF2, Trading Fund

OS, and 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.

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: May 10, 2019

BIOTECHNOLOGY VALUE FUND, L.P.

By: BVF Partners L.P., its general partner

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

#### BIOTECHNOLOGY VALUE FUND II, L.P.

By: BVF Partners L.P., its general partner

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert

Mark N. Lampert

President

BVF PARTNERS L.P.

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert

Mark N. Lampert

President

## 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

#### Joint Filing Agreement

The undersigned hereby agree that the Statement on Schedule 13G dated May 10, 2019 with respect to the common stock, par value \$0.001 per share of Novus Therapeutics, Inc., and any further amendments thereto executed by each and any of the undersigned shall be filed on behalf of each of the undersigned pursuant to and in accordance with the provisions of Rule 13d-1(k)(1) under the Securities Exchange Act of 1934, as amended.

Dated: May 10, 2019

BIOTECHNOLOGY VALUE FUND, L.P.

By: BVF Partners L.P., its general partner

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

#### BIOTECHNOLOGY VALUE FUND II, L.P.

By: BVF Partners L.P., its general partner

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert

Mark N. Lampert

President

#### BVF PARTNERS L.P.

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert

Mark N. Lampert

President

#### 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